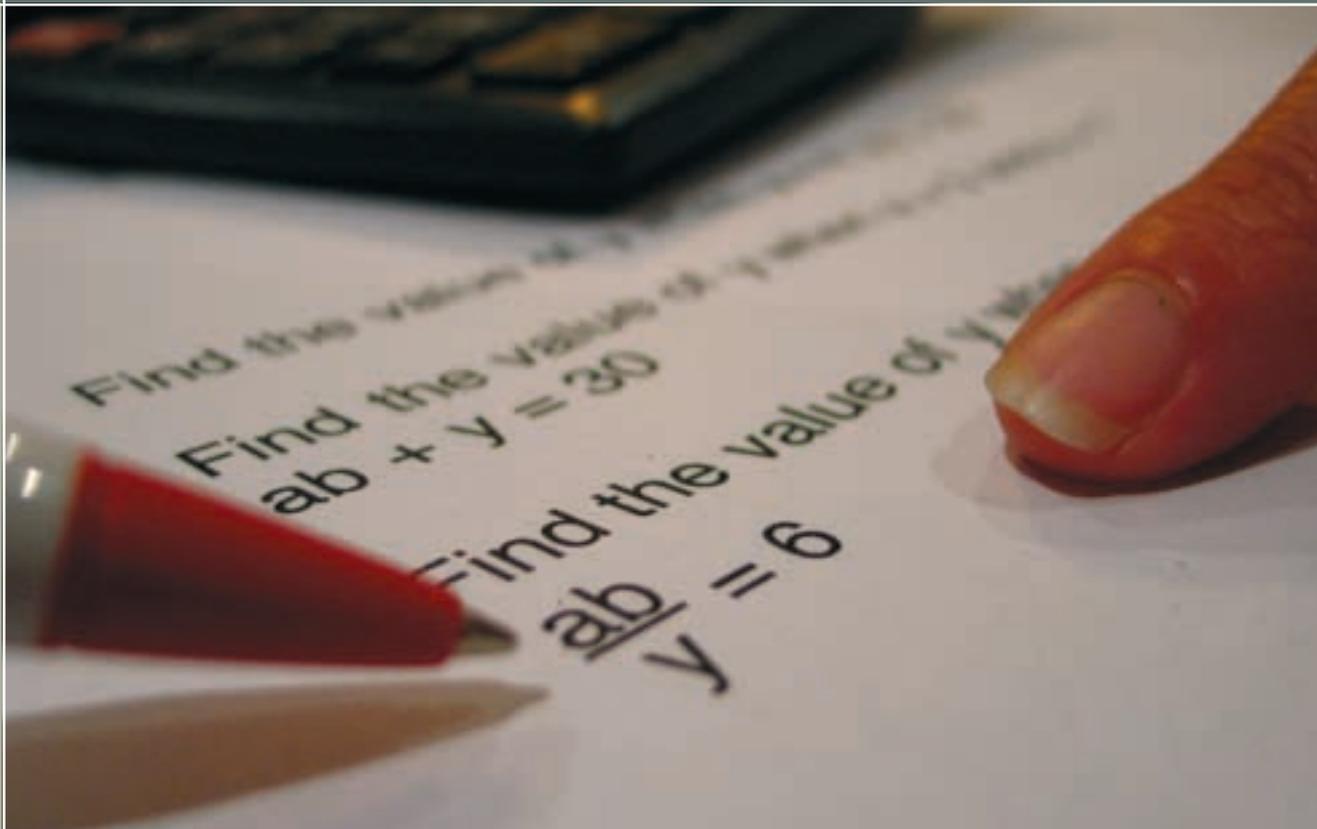




National Research and Development Centre  
for adult literacy and numeracy

## Research report



### **‘Beyond the daily application’: making numeracy teaching meaningful to adult learners**

Jon Swain, Elizabeth Baker, Deborah Holder,  
Barbara Newmarch and Diana Coben

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## The research team

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### Principal investigators

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Barbara Newmarch, The Community College, Shoreditch (Hackney), London

## NRDC’s website

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The following appendices appear on NRDC’s website [www.nrdc.org.uk](http://www.nrdc.org.uk)

- Appendix A. Implications for teachers by Barbara Newmarch and Jon Swain  
Implications for students, by Jon Swain  
Implications for managers, by Deborah Holder  
Implications for government, by Barbara Newmarch
- Appendix B. The management culture in a contemporary FE college,  
by Deborah Holder
- Appendix C. The management changes at East Berkshire College (2003–2004), by  
Elizabeth Baker
- Appendix D. Reflections on being a teacher-researcher (TR), by Elizabeth Baker, Deborah  
Holder and Barbara Newmarch
- Appendix E. Background information on the three colleges: Gloscat, by Deborah Holder;  
Hackney, by Barbara Newmarch; and Slough, by Elizabeth Baker
- Appendix F. Information and plans of classrooms used for research in the three colleges,  
by Jon Swain
- Appendix G. Examples of session notes, by Barbara Newmarch and Elizabeth Baker
- Appendix H. Session Plan of Individual Work, 22 May, by Deborah Holder
- Appendix I. Taxonomy of motivations, by Jon Swain
- Appendix J. The practical difficulties of teaching a class at entry level, by Deborah Holder
- Appendix K. Definitions of what makes a person numerate in today’s society: the research  
teams’ views, by Jon Swain, Elizabeth Baker, Deborah Holder, Barbara  
Newmarch
- Appendix L. Shopping with Trudy, June 2003, by Jon Swain
- Appendix M. Bingo with Emma, February 2003, by Deborah Holder.

**Note on confidentiality**

In the interest of confidentiality it is common practice in research reports to change names of institutions and people. While all students have been given pseudonyms, the names of the colleges are real; this is because the contact details of the three TRs are given at the front of the report which links them to the institutions. We have been given permission by the Principals of the three colleges to use the names.

**Note on authorship and institutional designations in this report**

The report appears in the name of the whole research team. The project was based at King's College London, where Jon Swain then worked. Diana Coben was a Visiting Senior Research Fellow at King's College London, based at the University of Nottingham during the period covered by the project. In the period between the end of the project and the publication of this report, both Jon Swain and Diana Coben have moved institutions: Jon to the Institute of Education, University of London and Diana to King's College London. Their institutional designations reflect their current positions.

**List of tables and figures**

- Table 1. Times and duration of numeracy classes, and the number of teaching hours per college year
- Table 2. Characteristics of students at the three sites
- Table 3. Percentage of students in employment or on a course, and/or who have experience of an accident or illness
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### Acknowledgements

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There are a number of people to whom we would like to express our thanks. These include the college managers who allowed us to use the colleges as research sites. Several people gave us very useful feedback on the interim report completed in April 2004: these included Margaret Brown, Valerie Rhodes, John Vorhaus and Anne O'Grady. We would particularly like to thank Alison Tomlin, working on the teaching and learning common measures project, especially at entry level for her detailed comments. Other researchers, such as Karin Tustin and Yvon Appleby, on the Adult Learners' Lives (ALL) project, and Rose Shier, who worked on the Provision of and learner engagement with adult literacy, numeracy and ESOL support in rural England project, have also given us helpful advice. We are also very grateful to Mona Turnbull at King's College for her ICT expertise and administrative support.

The people we need to thank most are the students, without whom this project and subsequent report would not have been possible. Almost invariably, they were cheerful, helpful and generous with their time, and we dedicate this report to all of them.

### Key to transcripts

- [*text*] Background information;
- [...] extracts edited out of transcript for sake of clarity;
- ... pause;
- / moment when interruption begins.

### Peer review

This report was read and critically peer reviewed by Alison Wedgbury, Oaklands College; Alan Carter, Acton & West London College; Dr Penny Burke, Institute of Education, University of London; and Dr Terry Maquire, National Adult Literacy Agency, Ireland.

# 1 Summary

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## 1.1 Outline of the project

The remit of this 21-month empirical project was to explore what makes numeracy teaching meaningful to adult learners. The study breaks new ground in looking in depth at this issue with respect to adults. Although there is a substantial body of research and theory about teaching and learning mathematics/numeracy, the majority of this work has focused on children and young people in schools.

The project began in December 2002, based in three colleges of FE in different geographical areas in England. Integral to the project were three TRs based in each of the three colleges, who worked on the project for approximately one day each week. They collaborated in the design of the project, in the conduct of the fieldwork and took part in the analysis.

The project investigated four adult numeracy classes, three day classes and one evening class, with 80 students in total, who were working between entry level 1 and level 2. The two principal methods of data collection were semi-participant observation within the classroom and loosely structured interviews.

The study explored a particular and limited cohort of adult learners: these were students who attended discrete numeracy classes on a voluntary basis, who worked with very good teachers and were generally very well motivated. As this is a relatively smallscale, interpretative project we are unable to claim that these findings are representative of a larger population. Nevertheless, we consider that our findings have wider implications for the teaching and learning of adult numeracy.

## 1.2 Main findings

### 1.2.1 Making numeracy teaching meaningful to adult learners

Numeracy teaching generally becomes meaningful to students when it is related to their own purposes and needs and they can see an intrinsic reason for learning. Accordingly, the meaningfulness of numeracy teaching for an individual is linked to that individual's motivation for learning. Mathematics does not have to be functional to capture students' interest, involvement and imagination. What makes a piece of mathematics real or meaningful is the quality of an individual's engagement with a problem, rather than, necessarily, its utility or immediate application to their everyday lives. Therefore, pure or abstract problems, or areas of mathematics such as algebra, can be very real in terms of the interests and commitment they engender in learners. The type of maths the adults generally requested in this study was usually mainstream school mathematics rather than some form of vocational or utilitarian mathematics.

The teacher plays a crucial role and the quality of teaching is at least as important as the mathematical content. Although teachers often need to set mathematics in real contexts, and use real examples to make it more understandable and interesting, mathematics is not necessarily made any more meaningful by making it more directly applicable to a specific adult's everyday life.

### 1.2.2 Contexts

The term 'context' needs greater clarity in the literature of mathematics education, and means far more than simply the setting where numerate practices take place. We define contexts as being *situational* (the setting from which numerate practices come and in which they are used – e.g. DIY, cooking) and *biographical* (the adults' dispositions to learning, which form part of their identity). Learning is inextricably linked to identities and the students' biographical contexts are the most important things they bring to the classroom. It is therefore vital for teachers to get to know their students as well as possible. Although it is possible for teachers to relate their teaching to students' situational contexts on courses designed for a particular client group, in discrete provision (where adults come with a variety of agendas and levels of need) it is much more difficult to find a context that is appropriate to a few students, let alone the whole class. Moreover, there is a tension for teachers between tailoring content to learners' contexts and the government's desire for more whole-class teaching. Nevertheless, the teachers in this study have shown that they do value students' everyday numerate practices and try to incorporate and develop them in class.

### 1.2.3 Students' motivations for attending adult numeracy classes

Students' motivations for joining, and continuing to attend, numeracy classes are many and complex. However, few of these are related to perceived needs within their current employment, or to students feeling that they have a skills deficit in their everyday life. The main motivations for learning expressed by students in this study were:

- to prove that they have the ability to succeed in a subject which they see as being a signifier of intelligence;
- to help their children; and
- for understanding, engagement and enjoyment.

A few students were also attending classes in order to gain a qualification or to cope better with the maths they come across in their lives outside the classroom. However, we found that these are comparatively minor incentives.

### 1.2.4 Identities

Identities fashion learners' beliefs about themselves as learners and as potential mathematicians. Learning mathematics can change who people think they are, and in some cases, how they see the world. For some, the identity of being a student is a powerful one. A major change was seen in increased levels of confidence; students also perceived that they have gained greater independence and autonomy and some developed a series of different aspirations and orientations towards mathematics. We see adult numeracy learning as part of an individual's learning career but in this relatively short study we are unable to say how enduring these changes may be.

### 1.2.5 Definitions of being numerate

The terms 'mathematics' and 'numeracy' are value-laden and deeply contested and adult students have many different understandings of what they mean. However, although some students in this study used the terms interchangeably, many made a clear distinction between the two words. They had a narrow interpretation of numeracy, seeing it as being a subset of mathematics, which they referred to as the basics.

### 1.2.6 Adult numerate practices

The majority of adults in the study reported they used very little maths in their everyday lives.

Those numerate practices they referred to almost exclusively concerned money; there was little mention of measurement, time or data handling. Although there were some notable exceptions, most reported that they could get by and function reasonably well; they have developed survival strategies for day-to-day competency and only a few felt they have a mathematical deficit. This result corresponds to evidence from the *Skills for Life* survey of need in 2003. Few students in the study said that the mathematics they learnt in their classes had helped them in their lives outside the classroom.

### 1.2.7 Anxieties on returning to study

Making the decision to return to formal education can be a daunting experience for many adults. This is because many who return have had a poor experience of schooling (and of mathematics teaching in particular) and see themselves as failures. Although FE colleges are initially viewed as being institutions similar to school, this perception amongst the students in this study soon changed once they started attending classes. The nature of the first contact with the college, and then with the teacher, is therefore crucial.

## 1.3 Implications and recommendations for policy and practice

An expanded version of the next four sections can be found on NRDC's website (see appendix A).

### 1.3.1 For practitioners

The teacher has the most important role in making mathematics as meaningful and stimulating as possible for adult learners. Certainly, we must offer learners something beyond mere instruction. Meaningful numeracy teaching should generally:

- involve teachers finding out as much as possible about their students;
- involve teachers having high expectations of their students' potential<sup>1</sup>;
- build students' confidence in themselves and remove the fear of failure;
- make learning and engaging in maths an enjoyable and satisfying social activity;
- inspire intellectual curiosity about maths issues and topics;
- encourage students to talk about maths and offer opportunities for interaction and collaborative learning, encouraging students to refer to and help each other;
- develop reflective thinking and reasoning;
- offer challenging problems;
- help students interpret mathematical situations and develop problem-solving strategies;
- emphasise that methods and reasoning are more important than just getting correct answers;
- encourage students to move away from rote memorisation and drills and to develop understanding of concepts;
- help students see connections between different mathematical areas and concepts;
- motivate students to measure their success by reflecting on what they have learned and understood;
- encourage students to take responsibility for their learning and develop independent learning and study skills;
- use contexts which are interesting, relevant and appropriate to the students; and

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1. However, we have to acknowledge that, in practice, the goals and expectations of some students can prove problematic when they differ from those of the teacher. This is particularly so when a teacher considers a student's expectations to be unrealistic.

- use appropriate resources and develop learning material which relates to the interests and contexts of the students.

### 1.3.2 For students

The main message from our research findings is a positive one for students. For the vast majority of adults in this study, attending class is a thoroughly enjoyable experience; it is a time when they can leave the cares and worries of their everyday lives at home. It is their time, their freedom and independence: above all, it is their choice (since all the students in this study attended voluntarily). However, we were working with adults who were attending classes on a regular basis: we recognise that some people's circumstances limit their options and opportunities, and make it much more difficult to either join or continue to attend a numeracy class. We also know that many students feel nervous about returning to learning and the decision to enrol can take a lot of courage. Further, we question the currency with employers of the qualifications that are open to students at this level.

The study shows that, even for those who did not enjoy their experience of schooling, learning maths can be fun when it is taught well: most of the students become thoroughly engaged. It also shows that people can change their habits of learning and develop new patterns of study; they can even change their whole outlook on life, and gain new aspirations, although the design of the study meant that we are unable to say how durable or long-lasting these are likely to be. The great majority of students in this study feel they have been successful by achieving personal goals, and they have also reported increased levels of confidence, feelings of autonomy, higher levels of self-esteem and greater control over their lives. They feel that they are doing something for themselves.

### 1.3.3 For managers

The following points and recommendations are aimed at managers working in colleges of further education. While some of these come from the TRs, others have been collated from conversations with students during this study.

- **Provision** – should cater for a wide range of student aims. Many students want what they regard as mainstream school mathematics and to engage with abstract mathematical concepts, not just basic numeracy. Provision that embeds numeracy in the study of other subjects should also be available, with numeracy content made explicit from the outset.
- **Publicity** – should be clear and unambiguous. Sometimes in an effort to avoid terms that carry a stigma, such as the word 'basic', information on the range of classes available becomes confused. Specific examples of the areas of maths covered are more useful. Existing students could also contribute to the development of publicity material to ensure its accessibility.
- **Initial contact** – should ideally be with a person, not an answerphone, which can be off-putting for many potential students. Anyone dealing with enquiries, if not a basic skills specialist, should at least have had some awareness training of basic skills provision.
- **Initial interview** – should be informal and friendly and held as soon as possible after the initial contact. This is an important opportunity to find out more about the person's reasons for attending, their feelings about maths, previous learning experiences and any additional needs they may have. However, this needs to be done sensitively, and they must not be made to feel that the interviewer is intruding into their private life<sup>2</sup>. It can also be a bewildering experience for a prospective student if jargon is used; terms such as 'level 1' and 'accreditation' may be meaningless to them.

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2. It is also important that this is not viewed as a potential mechanism of regulation and surveillance (see section 3.5).

- **Initial and diagnostic assessment** – should be a positive experience for students, giving them the opportunity to demonstrate what they can do. The student may find him/herself being repeatedly assessed with screening, initial and diagnostic assessment. Like the initial interviews, these all need to be handled delicately. Students are often only too aware of their weaknesses and should not be made to feel even more inadequate or that they have been labelled, for example as an entry 3 student. For the teacher, assessment should give an insight into the students' methods of calculation and their ability to make connections between different areas of maths. An assessment that only indicates how many questions a student has right or wrong and an identified level does not give sufficient information on which to base an Individual Learning Plan (ILP). Getting to know the student should form part of this process, as a greater awareness of the students' interests, motivations, experiences of schooling, causes of anxiety and rate of learning will also help inform the ILP.
- **ILPs** – should be an agreement between student and teacher, written in language the student can understand. ILPs should be flexible, as students' motivations and interests often change after they have attended a class for a while. There are many potential areas of conflict when writing ILPs – for example, in trying to match the students' goal with their current level of ability while expressing this in language that meets the needs of auditors, inspectors, teachers and students.

#### 1.3.4 For government

The following points are based on the personal views of the TRs, who are practising teachers of adult numeracy with a combined total of over 40 years experience in this sector.

- **The Adult Numeracy Core Curriculum (ANCC) needs to be expanded to take account of the full range of needs of adult students.** The ANCC is not addressing the needs of many students. Defining, or at the very least constraining, provision and emphasising functional numeracy, has the result that students are not always getting what they actually want – that is numeracy teaching which is both meaningful and relevant to their purposes and needs. There is an emphasis in the curriculum on acquiring mathematical information rather than on understanding mathematical concepts and using mathematical reasoning. There are also many gaps in the curriculum in the three strands: number; measures, shape and space; and data handling – for example, there is virtually no algebra. One of the most significant problems is the very limited range of elements included at levels 1 and 2. Although level 2 is presented in the National Qualifications Framework as being equivalent to GCSE grades A\*–C, it is very far from being equivalent in terms of either standards or range of content.
- **More meaningful forms of assessment need to be devised.** The form of assessment in the National Tests – computer-marked multiple choice questions – does not afford scope for consideration of the candidates' methods or reasoning, and places the sole emphasis on getting the right answer, with no guarantee that there is any real understanding of the concepts involved. The test questions mostly take the form of traditional algorithms, inserted into artificial contexts, often quite irrelevant or even incomprehensible to students from other cultures. While the curriculum may be concerned with functional maths, the tests are not. The form of the test questions often demands that students calculate in a particular way, not as they would do in a real situation; therefore real skills are not valued as much as being able to answer test-type questions.
- **Funding should not be driven by numbers of students who pass the national tests,** without any regard to how much teaching and learning has taken place. There needs to be a form of value added measure which takes account of the progress made by students. The tests cannot be seen as a measure of progress, because simply passing a test is no evidence that learning (or teaching) has taken place if there is no adequate system in place to identify the student's

starting point and to measure the distance that student has travelled during a numeracy course. There needs to be more flexibility for students who are not seeking a qualification.

■ **Funding mechanisms are constraining colleges in what they are able to offer adult learners.**

This can be seen in the growth in short courses, especially one term (10–12 weeks), rather than giving a full year in which to develop numeracy skills and understandings. These short courses are a direct consequence of the funding regime.

■ **There needs to be more ongoing training for existing numeracy teachers on updating teaching methods and resources,** and to give them a sounder conceptual basis and

appreciation of mathematical interconnections. Teachers also need more opportunities to observe good practice in action.

■ **It is essential that research informs training and development** if it is to make an impact on practice. The conclusions from this report, and their implications for policy and practice, are already being used to inform further NRDC numeracy and maths projects, as well as other national and regional programmes for curriculum development, professional development and organisational self-development. These include:

- The 3 year NRDC study 'Effective Practice in Inclusive Adult Numeracy Teaching', which uses observation and learner assessments, to investigate whether specific characteristics of adult numeracy teaching are linked with learners' progress and achievement. The project will be completed in 2006.
- Maths4Life, a national NRDC project which aims to provide a virtual centre for the post-16 maths and numeracy community, and to examine aspects of practice through development projects. Maths4Life also conducts more formal research, building on NRDC and other research knowledge. The main focus of Maths4Life is on improving learning in maths through active professional development and understanding organisational models which enable effective practice. The project will also help to inform the development of new maths qualifications.
- The *Skills for Life* Quality Initiative and other quality improvement strategies will be informed by this research at national, regional, local and institutional levels. Key messages from research need to be built into training and development activities for teachers, managers and into organisation-wide approaches to improving the delivery of numeracy and maths.

## 2 The national context

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### 2.1 The *Skills for Life* survey and the thematic ALI/OfSTED Inspectorate report

Numeracy is recognised as a particularly important domain in the *Skills for Life* strategy (DfES, 2003a), especially since the recent *Skills for Life* survey of need revealed that amongst participants in the survey 47 per cent of respondents were classified at entry level 3 or below in the numeracy assessment, including one in five (21 per cent) at entry level 2 or below. This means that 15 million adults in England had entry 3 or lower level numeracy skills and that 6.8 million of these were classified at entry level 2 or below (DfES 2003b, p 19). Interestingly, though, it seems that the majority of people are unaware of their problems in this area, and very few regarded their maths skills as below average. When asked to provide a self-assessment, 85 per cent of people with numeracy skills at entry level 3 or below felt that their maths skills were either very or fairly good (Williams et al. 2003); and even 67 per cent of those with entry level 1 or lower level numeracy felt that they were fairly good at number work.

The *Skills for Life* strategy insists that people with literacy and numeracy difficulties need to stick with their learning and improve their skills, and for this they need to remain well motivated and find the learning relevant to their needs (DfEE, 2000, p 20). This implies that numeracy teaching should be meaningful and relevant to adults' needs. Although the great majority of students in this study found their teaching and learning to be richly rewarding and satisfying, the recent themed Inspectorate report suggests that this is hardly the case in general in England (ALI/OfSTED, 2003). Specifically on numeracy, the report concluded that there is a need for greater expertise in teaching numeracy. They found that numeracy is too often taught by rote learning rather than by developing understanding of numerical concepts, which are likely to be more enduring and give learners greater opportunities of making connections to other areas of mathematics and learning. A follow-up report is to be published in late 2005.

### 2.2 Definitions of numeracy and the early origins of the numeracy curriculum

Historically, numeracy first officially entered the English language as an important element of education in the Crowther Report on 16–18 Education (DES, 1959) denoting what would now be called 'scientific literacy'. There has been a great deal of debate in adult mathematics/numeracy education about the relationship between the terms 'numeracy' and 'mathematics' (see, for example, Coben et al. 2003; Kaye, 2003). Tikly and Wolf (2000, p 2) maintain that, for the government, numeracy has a narrow definition that is fundamentally connected to arithmetic and number sense. In *Skills for Life* numeracy covers:

the ability to understand, use, calculate, manipulate, interpret results and communicate mathematical information.

while more broadly it is:

the ability to use mathematics at a level *necessary to function* at work and in society in general. (BSA, 2001, p 3; our italics).

As definitions of numeracy and being numerate are closely related this should provide us with a clue about what it means to be a numerate person in today's society. However, as Coben (2004) and others have pointed out, these definitions are rather nebulous and also unhelpful as they do not provide answers to the questions of which aspects of mathematics and mathematical information, and at what levels, are sufficient for these purposes. We are also left unsure what 'necessary' means, and the same is true with 'function'<sup>3</sup> – as what or to do what exactly?

The tendency in official documents is to treat the terms 'numeracy' and 'mathematics' as interchangeable, and in this report we also use the terms in a similar fashion. Indeed, the National Numeracy Strategy (DFES, 2005) for schools is embodied in the framework for teaching mathematics, while the Adult Numeracy Core Curriculum (BSA, 2001), begins with the first sentence, '*Mathematics equips pupils...*'.

The early origins of the *numeracy curriculum* can be traced back to the nineteenth century. The Report from the Schools Inquiry Commission (the Taunton Commission, 1868) recommended that the kind of mathematics provision a person should receive should match their social class. The upper-middle classes should be taught classical Euclidian mathematics, the mercantile classes should be taught practical arithmetic and the rudiments of mathematics beyond it, while working class students should receive the lowest level of mathematics: basic elementary arithmetic. We know from student records and our conversations with them, that very few of the students<sup>4</sup> in our study came from professional middle-class backgrounds, and that the vast majority can be categorised as being working class; it can also be argued that elementary arithmetic is analogous in contemporary language to numeracy. Zevenbergen (2001) argues that the mathematics curriculum acts as a social filter to position some learners at the bottom of the mathematical hierarchy, while Ernest (2001) also claims that the hierarchical structure of school/college mathematics leads to social reproduction. Thus the hierarchical structure of the mathematics National Curriculum, replicated in the ANCC, tends to reproduce class, wealth and, therefore, social opportunities<sup>5</sup>, whatever the intentions of those involved.

Within the last 25 years or so it has become generally accepted in official reports (Cockcroft, 1982; HMI, 1985), and in much academic writing on good practice, that the teaching and learning of mathematics/numeracy should be related to its uses in everyday life and work settings. Cooper (2001) points out that this position assumes that the majority of individuals will find mathematics more interesting, more relevant, and more *meaningful* when it is set in, and related to, supposedly realistic settings and contexts. Rubenson (2004) points out that the idea of relevance became a key concept during the 1980s, a time when government policies on adult education were driven by an economic perspective and the concept of the market was privileged. Some writers (e.g. Dowling, 1998; Cooper, 2001) also argue that the degree to which the mathematics curriculum has related to everyday tasks and working lives has been directly related to the social class of the learners, and working class students have been seen as benefiting most from this approach.

3. It is also of interest that neither Smith (2004) nor Tomlinson (2004) in their reports have actually defined what is meant by 'functional mathematics'.

4. Like Baxter et al. (2005) in their NRDC report (PG3.6), we are generally using the term 'student' rather than 'learner'. This is because, as Baxter et al. point out, 'learner' 'bears little relationship to its meanings in non-research and non-policy circles'; moreover in the three colleges where our research is set, the term 'student' was used by both the teachers and the adults themselves, and so we are maintaining this convention.

5. Many writers (see, for example, Dowling, 1998; Brown, 1999) argue that schooling (including colleges) creates differentiation. The curriculum, with its various instruments of assessment, positions people in a hierarchy, and tells us that some people are better than others; in a way it also legitimises why some people are better than others.

### 2.3 The contemporary culture in FE colleges

The setting of the study is the FE sector in England. This has recently become the focus for reform and massive change, which has affected the practice of teachers working in the post-16 sector. Indeed, Lucas (2004) writes that the last ten years or so have seen more regulation and government policy concerned with further education than ever before.

Current policies on adult basic skills education are intended to increase economic competitiveness and prosperity<sup>6</sup>, learner empowerment and social justice. However, there is a tension between these values which is not always resolvable. In the government's White Paper *Success for All* (DfES, 2002) some of the prevalent discourses are, on the one hand, lifelong learning, increasing and widening participation, improving choice, equality and diversity, and on the other hand, improving productivity, raising standards and meeting skills needs for employers and the economy.

There have also been changes in colleges that have impacted on course design and delivery. The ANCC, although not statutory, is normalised through funding mechanisms geared to accreditation. This constrains colleges in their offer of provision geared to adults' needs, interests and purposes in learning. As a result, provision may be addressing the needs of neither students nor commerce and industry. Adult numeracy students are not always getting what they actually want – that is numeracy teaching which is both meaningful and relevant to their purposes or needs. This can be seen in the growth in short courses (10–12 weeks, i.e. termly) rather than a full year to develop numeracy skills and understandings; these are a direct consequence of the funding regime.

Two pieces of writing about TRs' views on the changes to the management culture can be seen on NRDC's website, appendices B and C.

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6. However, Wolf (2002) argues that there is no causal link between higher qualifications and either greater economic productivity or economic gain. In particular, she maintains that there is no evidence that giving people low-level certificates in their 20s and 30s leads to higher economic productivity and wealth.

## 3 Introduction

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### 3.1 How the project was set up

The remit of this 21-month empirical project (which began in December 2002 and ended in August 2004) has been to explore what makes numeracy teaching meaningful to adult learners. The project was directed by Diana Coben and Margaret Brown, and as well as the lead researcher, Jon Swain (working 0.5 on the project), three practising teachers<sup>7</sup> were recruited and each worked on the project as a TR for approximately one day (0.2) a week. The project was divided into two phases: after a preliminary scoping exercise, phase 1 of the main data collection took place between March and July 2003; phase 2 began in September 2003 and the fieldwork finished in March 2004.

### 3.2 Research questions

The primary aim of the project was to explore what makes numeracy teaching meaningful to adult learners. In order to address this research question we investigated a series of sub-questions as follows.

- 1a) To what extent are numeracy teachers able to access information about students' numerate practices in contexts outside the classroom?
- 1b) Are teachers able to relate their teaching to students' contexts, and if so, how do they do this?
- 1c) To what extent do students' numerate practices outside the classroom inform numeracy teaching?
- 2 What are students' motivations for attending adult numeracy classes?
- 3 In what ways does learning numeracy transform students' identities both within and outside the classroom?
- 4 What do adult students think it means to be numerate in today's society?
- 5 What numerate practices do adults report they use in various contexts outside the classroom?
- 6 Which strategies do adults use, and which mathematical resources do they draw on, when they approach particular mathematical tasks/problems in contexts outside the classroom?

Due to lack of time and resources we were unable to spend much time outside the classroom, and the majority of this data comes from students' self-reports during interviews, and from diary and journal writings (see section 7.6.2). When Hoyles, Noss and Pozzi analysed what they called adults 'mathematising in practice' in different work contexts, they spent many weeks at the workplace with their subjects in order to understand their cultural milieu, and get to know their everyday routines and practices (Hoyles et al. 1999) see also, Noss et al. 2000; Hoyles et al. 2002). Such an approach was not practicable for our project and therefore the main focus has been *inside* the adult numeracy classroom. Questions 5 and 6 were covered partly in this project and, more fully, in NRDC's ALL project, which used ethnographic and biographical data to examine the social and economic context of learners' lives. The ALL project includes research into adults'

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7. Although we use the term 'teacher' here, they are also referred to as 'lecturers', 'practitioners' and/or 'tutors'.

numeracy practices, and we have liaised closely with its researchers and drawn on its work (see, in particular, section 7.6.1).

### 3.3 The teacher-researchers

Debbie and Elizabeth joined the project in February 2003, and Barbara in the following May. Whilst the TRs are experienced teachers in the field of adult numeracy with over 40 years' teaching experience between them<sup>8</sup>, they began the project as novice researchers, inexperienced in ethnographic and qualitative methods of research. Each TR was encouraged to undertake an MA module in methods of research, and although it was not possible to begin this during the first phase of the study (February–June 2003), which would have been ideal, Barbara and Debbie began modules in September 2003 at local universities.

Potter (2001) uses the term 'synergy' to connect the two cultures of research and teaching which together generate knowledge for teaching and reconstruct teachers as subjects or knowers, rather than as objects of study (Appleby, 2004). Indeed, the TRs collaborated in the design of the project and were involved in the conduct of the fieldwork (including observing and interviewing their own students), analysis of the data and early dissemination of its emergent findings<sup>9</sup>. Lytle (1997) refers to the insider perspective which means that teachers are often the experts in the setting and the academics the strangers. As insiders, the TRs not only helped by monitoring whether we were asking the right questions, they also provided an important ethical check, ensuring that the students were treated respectfully, and, for example, were informed of the research findings.

The TRs provided invaluable information on their colleges' ethos and managerial structure, detailed background information on each student, and comprehensive weekly session notes. They also wrote a number of further contributions concerning issues of curricula, pedagogy and students' contexts, as well as an individual reflective essay on their experience of being a TR on this project (see appendix D on NRDC's website). Another piece of writing concerned a typical week in the life of a basic skills teacher in adult numeracy. The main themes that came through were the variety of the teachers' experience, and the fact that basic skills teachers in adult numeracy (no doubt also in other curriculum areas) work extremely hard, often spending over 50 hours a week working at college and home. The scope and speed of change in further education has placed substantial pressure on the TRs (and other teachers) as they have tried to acclimatise to, and make sense of, some of the shifting and sometimes contradictory policy agendas.

### 3.4 Liaison with other projects

From the early days of the project we have liaised closely with researchers and TRs on the ALL project based at Lancaster University. Towards the end of the project, we also compared findings with NRDC's University of Nottingham project, 'Provision of and learner engagement with adult literacy, numeracy and ESOL support in rural England'. The emerging and completed findings from these two projects are both similar to and different from ours, and the research team uses them to compare and contrast with our findings and conclusions in section 7.

8. Experience in adult numeracy was one of the criteria for their selection.

9. Potter (2004) is critical of much practitioners' research that does not include teachers in all stages of the research process such as constructing interview schedules, the methodology, analysis and having a voice in the findings and dissemination.

## 4 Sample

### 4.1 The three sites

The project was based in three colleges of further education in different geographical areas and settings: inner-London, a commercial city about 30 miles from London, and a cathedral city set in a rural area. The Community College Shoreditch is in the East London Borough of Hackney; East Berkshire College is in Slough; and Gloscat is in Gloucester. As we have already mentioned, these are the real names of the colleges (used with the permission of the principals), and we will refer to them throughout as Gloscat, Hackney and Slough. More information about the three individual colleges can be found on NRDC’s website (see appendix E).

### 4.2 The students and their classes

Students were based in four classes, three of which ran in the day, while the one at Hackney was an evening class. For more information, including the times and length of each class, see table 1, below.

Name of college	Time of class	Length of class, and number of weeks	Total number of hours of numeracy teaching each college year
Gloscat (phases 1 and 2)	Day	2.5 hours; 32 weeks	80
Gloscat (phases 1 and 2)	Day	2.5 hours; 32 weeks	80
Hackney phase 1	Evening	2 hours; 30 weeks	60
Hackney phase 2	Evening	2 hours; 30 weeks	60
Slough phase 1	Day	2 hours; 36 weeks	72
Slough phase 2	Day	2.5 hours; 36 weeks	90

**Table 1. Times and lengths of numeracy classes, and the number of teaching hours per college year**

As well as researching these four classes, Jon Swain, project leader, also researched his own class of students, when he was working at an FE college in inner-London on a part-time basis, to trial and refine interview questions, and to gather additional data. He carried out five interviews here and this data is used in this report.

Previous research has shown that significant numbers of learners in the FE sector fail to complete their courses (SOED, 1992). This may be because they have other priorities in their lives, feel that they have no need to improve their numeracy, are unmotivated, disinterested, lack confidence or are disaffected; or they may be people who are prevented by physical and/or structural factors such as time constraints, work commitments, lack of information, geographical location and so on (Hillage and Astor, 2001). It is important to note that this project did not involve people who were *not* attending classes.

Name of college	General level that students are working at	Average no. of students attending classes each week	Age range; average age of students	Gender balance	Majority ethnic mix
Gloscat (both phases)	entry 1 and 2	5	18–52 38 years old	48% M 52% F	95% White British
Gloscat (both phases)	level 1	10	17–65 43 years old	22% M 78% F	95% White British
Hackney (both phases)	level 1–level 2	12	17–47 35 years old	38% M 62% F	72% Black Afro- Caribbean
Slough (both phases)	entry 3–level 1	8	17–64 32 years old	20% M 80% F	45% White British; 20% Asian; 15% Black African

*Total sample: 80 students*

**Table 2. Characteristics of students at the three sites**

There were 80 students in the study who attended one of the four classes over both phases, although not all attended every week. Further information about the location and physical layout of the individual classrooms, including plans, can be found on NRDC's website (appendix F).

A small number of students left courses after a few weeks for a variety of reasons and have not been counted; some also joined classes after 1 March 2003 and these have also not been considered in the project. In addition, Barbara and Elizabeth both interviewed eighteen students from other classes in their respective colleges but, as we do not have such detailed records on these students, they are not included in the following statistical breakdown.

The mean average attendance in all classes over both phases was nine. Out of the 45 learners who attended classes in phase 1, 20 (44 per cent) re-enrolled in September 2003. The average age of the students was 37 (ranging between 17–64) and the gender balance was 68 per cent female and 32 per cent male. While the ethnicity of the majority of learners across all three colleges was White British (59 per cent), and Gloscat was 95 per cent White British, the other two colleges had students with a wide range of ethnic and cultural backgrounds (see table 2). As we have already mentioned, although we do not have exact figures, we know from student records, and from our conversations with them, that very few of the sample came from professional middle-class backgrounds. The *Skills for Life* survey (DfES, 2003b) reports the well-established association between lower levels of academic attainment, and socio-economic deprivation. It also reports that adults living in households in Social Class I are roughly four times as likely as those in Social Class V to reach level 2 or above.

While just over half of the students were studying at levels 1 and 2, 35 of them (44 per cent of the total) form part of the *Skills for Life* survey's (DfES, 2003b) estimated 15 million adults in England classified as having numeracy skills at entry 3 or below. They therefore fall into the category of those having a low functional level of basic skills.

We found a big difference between the students in the three daytime classes and those attending the evening class. The majority of the evening students were either enrolled on

another course, or were in full- or part-time employment (see table 3); they reported experiencing fewer health and social difficulties. Nearly half of the sample had either had a serious accident in the past, and/or had experience of poor health (physical and/or mental) which often affected their ability to learn (table 3). It is noticeable and significant that the greatest majority of these students were in the entry level class.

Just over a quarter of the students attending the Gloscat entry level class appeared to have moderate learning difficulties, and four appeared to have moderate behavioural needs<sup>10</sup>. Half were not fully independent, and during the time of fieldwork either lived with their parents, or were in supported housing. While the majority of all the students in the study at the three colleges were unemployed, those that were in employment generally had jobs which were low-paid, unskilled, and non-standard, that is they were part-time, short-contract, temporary and without training<sup>11</sup>. Over both phases, one student at Gloscat entry level class worked part-time; and in the Gloscat level 1 class one student each worked full-time and one part-time; at Hackney (the evening class) 18 students had some form of employment<sup>12</sup>; and at Slough, three students were in employment at the time fieldwork took place (see table 3).

Name of college	Total number of students in classes over both phases	Percentage of students in full- or part-time employment over both phases	Percentage of students who have had a serious accident or injury; or who had an illness/ impairment (either mental or physical) over both phases
Gloscat entry level class (both phases) day-time	21	5%	80%
Gloscat (level 1 class) (both phases) day-time	16	13%	70%
Hackney (both phases) evening	27	67%	19%
Slough (both phases) day-time	16	19%	25%

**Table 3. Percentage of students in employment or on a course, and/or who have experience of an accident or illness**

10. We are using both these terms cautiously; we did not have access to any records of any formal assessments or medical or other notes. These judgements are based on Jon's observations over a number of visits and conversations with Debbie who sees the students on a regular, usually weekly, basis. On occasions, Jon saw, and read in Debbie's session notes, that the students disrupted lessons by calling out and making loud noises or comments at inappropriate moments. They also appeared to find learning difficult and they sometimes needed information (e.g. on a worksheet, or the rules of a game) to be explained a number of times. Some also have poor memories and forgot work from one week to the next.

11. The range of work undertaken includes factory-work, shelf stackers, cleaners, care assistants, laboratory technicians and classroom assistants.

12. Seven of the other students were attending other educational courses.

### 4.3 Issues around the principles of selection

In all types of research decisions need to be made about the principles of selection that operate throughout the process, and it is the duty of the researchers to make these as visible and unequivocal as possible. Numeracy teaching takes place in a wide variety of learning settings such as community groups, prisons and work settings, and occurs as both specialist (discrete) numeracy provision and in provision where numeracy is offered in conjunction with another area. It is important to emphasise that this relatively small study explored a particular and limited cohort of 80 adult learners attending stand-alone numeracy classes in the FE sector. Moreover, they were students who attended stimulating classes on a voluntary basis, who worked with very good, competent teachers and were generally very well motivated. These factors obviously affect the nature of research and its conclusions, and also have implications for any claims of generalisability (see section 5.6).

There is always a trade-off between richer, in-depth findings from a smaller sample as against general, but possibly more superficial, findings from a wider sample. It would of course have been possible to make a different series of selections. The team could have selected, say, ten colleges or just one; we could have selected students working at one level of numeracy or chosen some de-motivated students cajoled into attending courses, with incompetent teachers delivering boring lessons. However, it would have been difficult to answer the question of what makes numeracy teaching *meaningful* to learners if the students were disinterested, irrespective of the quality of the teaching, or if the teaching itself was of an insufficient quality. One of the crucial decisions was whether the sample size of three teachers and 80 students was sufficiently heterogeneous to allow the researchers to engage with people from a diversity of backgrounds, dispositions to learning and attitudes to numeracy, and with teachers who could provide sufficient variety of teaching approaches to answer the research questions. The research team believe that it is.

To a certain extent, the size of the sample and approach taken by the project was also dictated by the time and resources made available through funding. Lack of time and resources constrained the research team from exploring adults' numerate practice outside the classroom as much as they would have liked to, and researchers had no time to follow up the few students who left their courses. A longitudinal design, covering a longer time span, would have also provided an opportunity to evaluate the durability of the changes in learners' lives in terms of their dispositions and attitudes towards mathematics, and any changes in their employment opportunities resulting from a gain in accreditations. Indeed, this suggests an area for future research.

## 5 Methods and methodology

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This section provides a review of the methods and methodology we used to generate our findings. By 'methods' we mean the techniques and procedures that were used in the data gathering process to enable us to interpret and explain what was happening in the three colleges. The main methods of data collection involved in this project were:

- semi-participant observation;
- TR session notes;
- TR session plans and assignments;
- individual and group interviews;
- student diaries; and
- student photographs.

The approach we chose to use for our research was qualitative, using a combination of ethnography and action research. We feel that this was fit for purpose because the study was about people acting in the natural course of their daily lives and we wanted to engage with deeper levels of experience and meaning. We were not primarily concerned with learners' cognitive processes in working with mathematics, but rather to explore in depth and in detail their values, beliefs and emotions, and their experiences concerning the teaching and learning of mathematics in order to understand what made numeracy teaching meaningful for them. Our data collection focused on describing, discovering, classifying and comparing, and we argue that qualitative research presents the opportunity to learn much more about what the students in the study wanted from their teaching and learning than quantitative techniques using questionnaires and surveys. Although findings might have appeared to be more extensive and therefore more easily generalised (see section 5.6), there is a danger that they might also have been more shallow and superficial. This will be seen, for example, in Section 7.3 on students' initial reasons for enrolling. Students and teachers are placed at the heart of our research and some of the key issues emerging from the study are illustrated by the students' own words; we also recognise that our own voices are part of the research process. We contend that research based upon insider insight and situated knowledge has the potential to produce bottom-up evidence (Appleby, 2004) that is not only useful for individual professional development, but can inform both policy and practice.

Before we discuss in more detail the methods used in this study, we consider ethical issues and the methodology or theory behind the research process.

### 5.1 Ethical considerations

The research team followed the ethical guidelines laid down by BERA (1992, updated in 2003). We wanted students to take part in the project on the basis of what Thorne (1980, p 285) calls for 'consent which is knowledgeable, exercised in a situation of voluntary choice made by individuals who are competent or able to choose freely. Accordingly, a double-sided A5 information sheet about the project, including Jon's contact details, was given to each student. Students were also sent a letter of thanks at the end of the project, with a brief summary of some of our main findings. All interviews were conducted on a voluntary, confidential basis. We asked the students if they minded the interview being taped (no-one did). We stressed that no-one outside the research team (such as a fellow student, or their

teacher) would hear what they said and that no information would be disclosed without being anonymised. However, we recognise that the students could not easily exercise complete freedom of choice on whether or not they wanted to be involved with the project. For example, students' understanding of the whole research project was necessarily limited and it was difficult for students to withdraw from our observations without leaving the course. We nevertheless tried to ensure that their consent was informed as fully as possible.

## 5.2 Process of research: an ethnographic approach with elements of action research

This study uses an ethnographic approach. Although the term 'ethnography' carries a number of meanings we understand it to mean the qualitative, empirical interpretation of the practices of a specific culture in their natural setting. Also, following the symbolic interactionist tradition, an attempt is made to gain an empathetic understanding of the social world under investigation from the point of view of the participants involved (Blumer, 1969), to explore their relationships in everyday life, to discover the ways in which they make meanings, and the ways they make sense of their world.

However, the project also contains elements of action research (Elliot, 1991; Cousin, 2002). While it is not directly interventionist, and there was no intention to assess the effects of any intervention, it still contains many of the features of action research listed by Cohen and Manion (1994). It is certainly *collaborative*, with researchers and teachers working together; it is *participatory* and *empirical*, with team members taking a direct part in implementing the research in actual classrooms; it is *self-evaluative*, with modifications and adjustments to the research design being reflexively evaluated along the way. It also has, as its ultimate objective, the desire to improve the practice of teaching and learning. Stenhouse maintains that action research should not merely influence practice, but provide an opportunity to develop theory which is accessible to other teachers (Stenhouse, 1979). This is indeed one of our aims, and we also hope that our project will have a direct effect on practice, individual professional development and policy making.

## 5.3 Observations and fieldnotes

The descriptions and interpretations in this report are based on two major sources of data: observation and interview, and this section explores our methods of observation. These observations came from both Jon and the TRs. Jon made a total of 43 observational visits to the classes, and in addition, the TRs provided weekly session notes recording those of their lessons that Jon was unable to see.

### 5.3.1 Jon's observations and fieldnotes

In the classroom, Jon was interested in the social relations and practices, which affected the ways that the students were taught and learnt mathematics, and so participant observation played a crucial role. The focus for the observations included: the class ethos/atmosphere; the classroom management<sup>13</sup>; classroom organisation<sup>14</sup>; the use of resources; the pedagogical style; class dynamics (student engagement, student behaviour/motivation,

13. We define 'classroom management' as dealing with people and situations in the classroom.

14. 'Classroom organisation' concerns the arrangement of the classroom as an effective place to work, including seating arrangements, differentiation of work, individual or group work, etc.

student friendships, student interactions); teacher–student relations; teacher–student negotiations (including ILPs); the use of students’ contexts; and forms of assessment.

One way of using field notes is for them to give a voice to those students who do not appear very often in the interview transcripts. This may be due to a number of reasons: they may be reticent, introverted, less articulate, marginalised, uninterested and so on. For these students, field notes are a way of indicating their presence, their actions, and/or their views and opinions. However, there were also some limitations in the use of field notes. Sometimes there were conversations that could not be captured on tape. Although the notes tried to be as near to verbatim as possible, it was not possible to recapture conversations exactly.

### 5.3.2 TRs’ classroom notes

The TRs’ session notes formed an integral part of the research process, providing Jon with a picture of what was happening and helping him keep up-to-date with events. For example, these are the first two paragraphs of Barbara’s first session notes in phase 2:

*Session notes: Barbara*

#### **Week 1: 15th September 2003; Induction: Properties of numbers**

Good attendance: 14 present today.

This was the first lesson of the year. My aim was to first establish a comfortable group atmosphere and set the foundations for building confidence and enthusiasm. I wanted to start everyone off with something that engaged them straight away, that drew on what they already knew, and also pushed the boundaries of that knowledge a bit further. I wanted the students to feel safe with the work, but also intrigued and excited by some new challenges.

I began with introductions and set up discussion focusing first on people’s previous experience of maths, both at school and elsewhere, then drawing it together to look at what they now wanted to achieve and why they had chosen to come to the maths class.

The full version of Barbara’s notes for another session can be seen in appendix G on NRDC’s website, along with an example of Elizabeth’s notes. While the majority of the TRs’ session notes recorded and commented on the mathematical content, they also chronicled various aspects of the social dimension of the classroom, such as the student interactions and particular incidents of behaviour. Avis (2002) points out that there is an assumption in the approach used in *Skills for Life* that all the teacher has to do is to draw upon the correct pedagogic technique and all will be well: the students will learn mathematics. However, educators and researchers (including those interested in the effective teaching of mathematics) have long recognised that learning involves not only cognitive but also affective components (Evans, 2000; Gal, 2002). We viewed the social practices and relations as a vital part of learning mathematics, and we want to show that a mathematics lesson is not just about learning mathematics. Many things go on which may, or may not, affect the classroom ethos, and in turn, influence learning both for the individual and the group. Many events are outside the control of the teacher but still need to be dealt with: certainly, they do not form part of a lesson plan (see Elizabeth’s session notes in appendix G on NRDC’s website).

Also, for part of the project, TRs provided reports of each session which were based on their

lesson plans. These gave the aims and targets for each individual, the activity undertaken, and the resources and methods of assessment used, when appropriate. Many of these session reports also had a note or comment, written retrospectively, on how the activity had gone (for an example of one of these, see appendix H on NRDC's website).

## 5.4 Interviews

During the period of fieldwork, we carried out 73 interviews and interviewed 72 students (see table 4). The numbers are slightly different between the number of students interviewed and the total number of interviews because some students were interviewed more than once (the maximum number of times was three), and some students were interviewed in groups of up to three. The great majority of students were interviewed individually; the average time for interview was about 40 minutes, and all interviews were tape-recorded.

Name of college	Number of students interviewed	Total number of interviews carried out in each college by Jon and the TRs
Gloscat (entry class)	11 by Jon	11 by Jon
Gloscat (level 1 class)	10 by Jon; 5 by Debbie	10 by Jon; 5 by Debbie
Slough	12 by Jon; 8 by Elizabeth	17 by Jon; 8 by Elizabeth
Hackney	16 by Jon; 10 by Barbara	14 by Jon; 8 by Barbara
Total	<b>72</b>	<b>73</b>

**Table 4. Number of students interviewed and total number of interviews**

The students were selected by asking who wanted to be interviewed. We told them that we were trying to understand more about the teaching of adult numeracy in order to improve it, and we felt that the students' views were vitally important in this. Only a few students felt uncomfortable about being interviewed and these were all in the entry level class at Gloscat where, we suspect, issues of confidence and self-esteem may have been involved. Although Jon talked to the students here during class or over coffee there were invariably other people around, which made it more difficult to have an 'open' conversation. In the other classes, the students were very willing to be interviewed. From the beginning, we tried to make sure that the students felt part of the project, and many seemed pleased to be given a voice in the research. Indeed, some made special arrangements in order to arrive for an interview before class.

The interviews were semi-structured, or loosely structured, around a series of questions or areas of interest, which we used as a checklist. Some questions were general and open, while some were more focused and directed to test out emerging theories. Questions were followed in no particular order, and we did not ask every student every question. For an example of our interview schedule, see appendix 2 at the end of this report.

Apart from these more formal interviews, where we explicitly sat down with people with the intention to interview them, we also had countless other informal conversations with the students during, before and after class-time. Burgess (1988, p153) refers to these as conversations with a purpose, and some of these were recorded in our field notes. Far more of these took place between the students and the TRs throughout the year.

A point that we would like to address here is whether the TRs' data has any more or less

validity than the data collected by Jon, with his greater experience in using qualitative methods of research. As the project proceeded, the TRs gained more experience and became more accomplished researchers; it also became noticeable to the whole research team that the quality of the data they gathered from observation and interview steadily improved. As we have already mentioned in section 3.3, the TRs' insider perspective gave them a greater in-depth knowledge of their students' lives and dispositions towards numeracy, which enabled them to ask more searching questions than Jon, who was a comparative outsider. It can, therefore, be argued that the data they collected was often richer than Jon's and that the status and validity of the data were enhanced rather than diminished by being collected by the TRs.

## 5.5 Students' diaries and photographs

One of the ways in which we attempted to access students' numerate practices outside the classroom was to provide them with diaries and disposable cameras. The findings from these methods are discussed in sections 7.6.2 and 7.6.3.

### *Diaries*

At first, students were offered notebooks and we asked them to record a time during the week when they used maths; a time when they wanted to use maths but were unable to; and a time when they used maths that they had learned on their current course. However, this soon proved to be too ambitious; the reaction was disappointing (from our point of view), and only a very few students returned their notebooks to us with anything written in them. From then on, we asked the students just to record examples of when they used maths/numeracy in their lives outside the classroom, but also, if they wanted, to include their feelings towards the mathematics they experienced both inside and outside the class. The results were again mixed. The great majority of the students at both Hackney and Slough told us that they were too busy to write anything in the diaries, and some confessed that they were only doing it to please us. Many students in the entry level class at Gloscat also had literacy difficulties, which made this task too onerous<sup>15</sup>. However, many of the students in Debbie's level 1 class at Gloscat did begin to fill in their diaries, and these provided us with some rich insights into their numerate practices, and their feelings and reflections about maths in general. Indeed, a steady core of about six wrote their diaries on a regular, weekly, basis.

### *Photographs*

We knew that some researchers in the ALL project had given students cameras, and they had taken photographs which were used to describe and analyse literacy practices in their everyday lives. One of the problems with mathematics, though, is that it is far less visible than, say, literacy practices (Noss, 1997)<sup>16</sup>, and so therefore more difficult to access and record. Although we also offered to give the students disposable cameras to record examples of mathematics (or numerate practices) in their lives outside the classroom, once again we only had limited success. The majority of our students told us that they either did not have the time or the inclination to take any photos, and out of the 80 students in the four classes over both phases, only nine students accepted our invitation to take a camera home. These,

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15. In retrospect, perhaps we should have tried giving students tape recorders for audio diaries.

16. Coben (2003) points out that even where people are consciously using numbers and problem solving, the numeracy involved may still be invisible. This is because much calculation goes on inside people's heads, but also because some people may regard the calculations they can do as being a matter of 'common sense', rather than mathematics (Coben, 1997).

nevertheless, provided us with some very interesting data, as we shall see in section 7.6.3.

## 5.6 The possibility of generalisation

A qualitative approach was chosen because the researchers wanted to explore in depth how the students made meanings concerning the learning and teaching of numeracy. In relatively small-scale, interpretive research, there are obvious limits to generalising possibilities, and the study is unable to claim that the findings are representations or representative of a larger population. Indeed, a feature of ethnographic research is that it rarely produces findings that can be generalised beyond the particular study under investigation with any certainty. However, the presentation of findings to many practitioners working in the field of adult numeracy<sup>17</sup>, and the feedback received, suggests that the conclusions in this report may well be representative of a wider sample. Moreover, although this study can only detail a small part of the wider world, it can still be used to paint a picture of the wider society (Williams, 2000, p 211). In other words, the way things happen in the micro world will often happen, relate to, and help us understand the macro world. The team was able to explore the relationship between, say, how people were taught, learned and used mathematics, and to find out how these particular adults made meanings. They could also begin to make sense of adults' motivations, and understand how learning affects their identities. The team, therefore, argues that these experiences can become *moderatum* generalisations (Williams, 2000) that not only can form the basis of wider theories of understanding but also have a direct link to policy and practice.

Speaking at NRDC's conference in March 2005, Ben Levin (the Deputy minister in the Ontario Ministry for Education) made a further point. Although governments like to see lots of numbers in research reports, it is often the individual stories that people come to remember. The research team therefore contends that the narratives in this report have the potential to have a powerful impact on policy. This presentation from the conference can be found on NRDC's web site, [www.nrdc.org.uk/levin](http://www.nrdc.org.uk/levin)

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17. These include conferences, workshops and seminars at NRDC, *Maths4Life* and *Skills4Life*, British Research Association, Adults Learning Maths, LLU+ and an open day at the Institute of Education, London.

## 6 Theoretical positions

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In this section we outline and discuss some of the theoretical positions that have informed our understandings and conclusions.

### 6.1 Theories of identity

As our research unfolded, the construction of people's social identities as adult learners of mathematics began to emerge as central to our understanding of the reasons students have for attending numeracy classes and of what makes numeracy teaching meaningful to them. Issues of identity are a fundamental aspect of learning because people's beliefs about self operate to select, refine and organise their perceptions of the world around them and influence their construction of meaning. As far as mathematics is concerned, identities fashion learners' beliefs about themselves as learners and as potential mathematicians. Theories of identity are concerned with how we view ourselves, who we think we are, and who we think we shall become. In much of the contemporary literature about education and learning it is becoming recognised that people are composites of many, often contradictory, self-understandings and identities (Holland et al. 1998, p 9), and that educators need to recognise how different and changing identities affect individual choices.

Although it is beyond the scope of this report to explain or justify every position that we take, we nevertheless wish to set out a number of our assumptions in order to make our theoretical standpoint clear. We conceptualise identity not as an unalterable and unitary quality that people possess, but as something that is constructed and performed in particular ways in specific contexts. We need to turn away from metaphors of innateness or pre-disposition; identity is not some core part of our personality that pre-exists us, nor is it something that we somehow acquire at a certain age. Holland et al. (1998) write that identities do not come into being without a great deal of work by the person concerned; they also emphasise the importance of the individual's biographical past, and they refer to identities always forming as history-in-person, which gives identities a foundation and durability to improvise and develop. A key point is that identities are unfinished and in process. As Hall (1992) says, identity belongs as much to the future as to the past, for it is a matter of becoming as much as being, and it is also more about individuals having a series of on-going identifications by accepting, negotiating with, contesting and reconstructing meanings through the interactions with others. Thus the nature of self is intrinsically social, developing through the participation in social groups and making comparisons to establish what is like me and what is unlike me.

In FE colleges, adults also construct themselves as students. This is not to say that they abandon other identities – a mother is still a mother, but the identity of student may be foregrounded in a particular context such as the classroom. Indeed, according to Rogers (2003), what often determines the effectiveness of a teaching programme, is how the learner positions him/herself as student in relation to the subject matter and to the teacher, and the corresponding positioning of the teacher in relation to the learner and the subject matter.

## 6.2 Learning and the learning career including structure and agency

We see learning as a profoundly social and cultural phenomenon, and our theories depart from an individualistic model of learning which stresses an individual's cognitive abilities. At its most extreme, this model proposes that learners have an innate aptitude or intelligence for learning and assumes that academic ability is inherent, fixed and differently distributed throughout the population. We recognise that individuals have a wide range of dispositions to learning with respect to confidence, motivation, perseverance and creativity.

In order to further understand changes in learners' dispositions to, and engagement with learning numeracy, we draw on the work of Bloomer and Hodkinson (2000) and Crossan et al. (2003) and use the metaphor of the learning career as a social journey (Ward and Edwards, 2002). Like Crossan et al. we see learning careers as an inextricable aspect of identity formation, situated between the intricate structures which shape people's lives (socio-economic, social class, gender, ethnicity, sexuality, age and so on), the educational institutions (and their policies) which influence the processes of participation and engagement, and the agency of students themselves, whom we view as active, skilled and knowledgeable agents (Giddens, 1984), capable of articulating their experiences and perceptions and acting with intent (see figure 1).

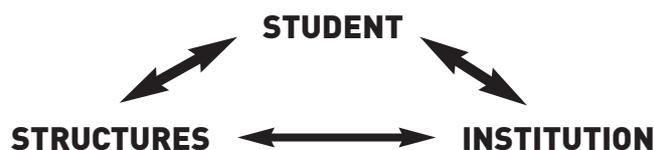


Figure 1. The intersection of students, structures and the institution that affects learning

While students have agency and are not simply the passive subjects of external structural forces, we are also aware that some structural factors have the potential to act as constraints and create barriers to learning, and we have come across many of these in our study. These include students' lack of power and deficiency of economic and socio-cultural resources such as money, educational qualifications and personal networks.

All the students in this study have individual trajectories, yet we see learning careers as being frequently complex, maybe multi-directional, and often vulnerable. Like Crossan et al. we argue that, while learning and participation may be linked to changes in students' identities, this is likely to be contingent on local settings, and these may well be fragile and speculative; they may not lead to any new, stable and coherent set of orientations to learning. Moreover, rather than seeing learning careers as being a linear progression which only goes forward, we are aware that they can also go into reverse, and that this may happen more than once.

## 6.3 Transforming and sustaining

We have also taken note of the findings of Schuller et al. (2002), who use the concept of identity in researching the connections between formal systems of learning and the benefits for individuals. They maintain that the benefits of learning can vary along a dimension between transforming and sustaining, although it is not obvious where sustaining ends and transforming begins. Moreover, learning changes over time and in different contexts. The

*transforming* function of learning numeracy is the more obvious and in section 7 we shall come across students who have changed their identities in terms of their values, interests, dispositions towards learning, and, most significantly, their aspirations. However, we shall also see the *sustaining* function of learning being of equal importance for some students in our study. Although, as Schuller et al. point out, this is difficult to demonstrate without in-depth study, turning up for class on a regular basis may enable some people to sustain the quality of their personal lives or their communities (including their families). This may be in terms of, for example, health and general psychological well-being, even if they do not appear to make a great deal of measurable progress in terms of their level of attainment<sup>18</sup>.

## 6.4 Further influences

In this final section, we want to briefly draw attention to the work of three theorists/researchers, Bourdieu, Dowling and Lave, who have helped us to illuminate the processes of teaching and learning of mathematics/numeracy.

### 6.4.1 Bourdieu

In order to understand more fully how people develop their dispositions towards learning in general, and mathematics in particular, we are drawing on Bourdieu's concepts of habitus (Bourdieu, 1979) and capital (Bourdieu, 1986). Habitus is the combination of taste, style and manners that form and make up an individual's cultural background and identity. As the word suggests, habitus is that which a person has acquired, but which has become incorporated into their cultural identity in the form of permanent dispositions; it also helps to position them in society. Habitus is defined in terms of the way people have developed and internalised ways of approaching, thinking about and acting upon their social world. As their experiences become more consolidated and reinforced, the habitus becomes more durable and internalised, and they *habitualise* the way they think and behave. It thus becomes a normalised part of their life and, progressively, an accepted and legitimised way of interacting with others. The habitus acts unconsciously to organise people's social experiences, and encourages them to think and behave in certain ways. In relation to our study, individuals, over time, may come to believe that they are no good at mathematics, and these feelings are subconsciously internalised and reinforced until they become their accepted way of being and are expressed through interactions with others. It is also likely that if nearly all their friends and family left school at 16 and went to work rather than pursue higher qualifications, this will shape their own experiences and set parameters for their own aspirations. This is not to say that individuals have no agency and that their lives are largely determined. As we shall see in the next section where we present our findings, some adults do appear to change their attitudes and dispositions towards mathematics, although we are unable to say how durable or fragile these are, or how long they are likely to last. We shall also see that some students begin to alter their aspirations as their sense of achievement and level of self-esteem grows.

Capital can be understood as a range of scarce goods and resources. In this study we are drawing on three of Bourdieu's types of capital: *economic capital* (material and financial assets); *cultural capital* (certain skills and knowledge that are perceived to be legitimate knowledge and behaviour – largely acquired through education); and *social capital* (resources gained through relationships/connections with a particular group). The acquisition of one or

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18. Schuller et al. (2002) point out that this can be called a counterfactual problem, in that the effects are difficult to know until education is removed.

more of these types of capital allows people to gain status and power within society, and the majority of students in this study can be said to have relatively low levels of these types of capital.

#### 6.4.2 Dowling

Dowling (1998) argues that the high status of mathematics as a subject is most commonly justified on utilitarian grounds; that is, mathematics is claimed to be useful and have particular use-values when it is applied to diverse economic and domestic practices, and he refers to this as the *myth of participation*. This is opposed to the other principal view of mathematics, which can be described as elitist, and sees mathematics constituted as an intellectual endeavour which is generally isolated from other activities. Thus a division and a hierarchy exist, and have been established between the superior intellectual and the inferior manual or practical.

Dowling (1998, 2001) proposes that these two approaches represent two different interpretative frameworks, or domains, of mathematical activity, which he calls the *public domain* and the *esoteric domain*. School or college mathematics generates both kinds of practice: the production of practical and localised skills and objects (the public domain), and the generation of abstract and generalised skills and objects (esoteric domain). We argue that, for the students in our study, numeracy is in the public domain and mathematics is in the esoteric domain. More specifically, the numeracy that the students in our study begin to learn at entry level is set in the public domain at a practical level<sup>19</sup>. We shall also see that many students in this study aspired to enter the esoteric domain, including many of those studying at entry level.

Dowling (1998) also points out that mathematical knowledge is conceived as a set of tools, stored inside a box in individuals' memories that can be carried around with them and used at the appropriate moment. He points out that a toolbox evokes images of manual work, and so this metaphor further de-intellectualises the intellectual and associates the myth of participation with manual labour. We maintain that the role of the numeracy teacher in *Skills for Life* is seen as providing the toolbox for mainly working class students, and that this pathologises (and confirms the presumed deficit of) would-be learners.

#### 6.4.3 Lave

Lave (1988) points out that the idea that mathematics can be transferred across settings in a straightforward way is based on theories of cognitive psychology which emphasise the stability and continuity of cognitive activity. Knowledge is viewed as being acquired under circumstances that are context-free and can be applied in all other contexts. So once the numerical knowledge and skills (the contents of the toolbox) have been learnt in the classroom, they can be carried away and applied in any situation that calls for calculation.

Lave was one of the first researchers to point out that out-of-school practices should not be regarded as merely the application of school techniques. In her research into adults' activities in their everyday lives (Lave, 1988) she found that calculation was only one element in the everyday lives of the adults in her study and that problems were framed within the activity in

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19. However, although the teacher may begin at the practical level, their ultimate task is to turn it (or translate it) into a series of abstract generalisations. They may be able to create common spaces and begin by using metaphors (e.g. fractions and cakes) but some metaphors can only take the students part of the way, and will eventually have to be abandoned when the abstract is reached. GCSE students have to work at this abstract level if they wish to pass the exam.

hand, for example, in grocery shopping, providing family meals or going to weight-watcher classes, rather than in mathematics. In other words, social relationships, feelings and values structure the ways in which problems are formulated and solved and make them meaningful. Lave thus problematises the idea that learning is transferable from one situation to another and in particular, that mathematics learnt in school, where a mathematics problem is an end in itself, is automatically usable in everyday life outside educational institutions (Lave, 1988)<sup>20</sup>. Other research studies (e.g. Nunes et al. 1993) also demonstrate that the mathematical techniques used in specific everyday life contexts are deeply bound up with, and developed in, the socially organised activities and systems of meaning within that particular community. This work has particular relevance for our study, since it is widely believed that numeracy is taught in order that it can be used in people's everyday lives. For a further discussion of transfer see Coben et al.'s (2003) review of research on the teaching and learning of adult numeracy.

The study now presents its findings, based on the research questions.

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20. A study by Johnston, Baynham, Kelly and Marks in Australia supports this view. They found that in real life situations there is no one satisfactory solution to a problem such as sharing the cost of a pizza between a group of friends; it depends on the individual participant's point of view (Johnston et al. 1997).

## 7 Research findings

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Now that we have explained the theoretical perspectives that underpin our research, we shall present our findings by looking at each research question in turn. In order to answer the main research questions introduced in section 3.2, we found, as the project progressed, that we needed to explore further issues. For instance, students' experiences of schooling and their anxieties on returning to learning (section 7.7) affect their identities, motivations, and dispositions towards learning mathematics. We have also included a section on what students thought makes a good numeracy teacher (section 7.9) as it is the teacher who plays the most important role in making the mathematics for the student meaningful or otherwise. In between sections 7.7 and 7.9 we include case studies of three students, one from each college, whose narratives allow us to exemplify some of our themes and findings (section 7.8).

### 7.1 What makes numeracy teaching meaningful to the students in this study?

Numeracy teaching becomes meaningful when it relates to an individual's purposes in learning; meaningfulness is a feature of the quality of an individual's engagement with learning rather than of the utility of the numeracy content learned.

The word 'meaningful' forms part of the project title and requires some unpacking. In everyday usage it refers to those factors that make something significant, worthwhile or relevant to an individual. In our study, we were concerned to identify and explore those factors which make numeracy teaching meaningful to adult students; thus our primary focus was on teaching, with a secondary focus on the 'numeracy', or mathematical content taught. We found that the individual's interest and engagement with the learning is critical. The role of and approach taken by the teacher, the teacher's relationship with the learner, the content of the mathematics itself, and the context in which the mathematical content is set, are all important also. We found that the teaching and learning of mathematics generally becomes more meaningful to a student when they can see an intrinsic reason for learning; teaching therefore needs to be related to an individual's own purposes and needs for learning, and in this way the meaningfulness of teaching for a student is linked to the student's motivation. Thus, if a person's main purpose for attending a course is to pass an exam, or to help their child at school, that will provide a sense of meaningfulness in the first instance. Once they are in the class, the teaching they encounter may or may not enhance the meaningfulness of the numeracy content for them.

In the literature on the teaching and learning of mathematics it is difficult to avoid expressions concerning the desirability of the mathematics taught relating to the real world or real life, and an initial hypothesis of this project was that it is only possible to make numeracy teaching more meaningful for adult learners if effective connections were made between the mathematics in learners' lives inside and outside the classroom. However, the data from this project suggests that mathematics is not necessarily made any more meaningful or relevant to an adult by making it more applicable to their everyday life. In order to be perceived as meaningful, mathematics does not have to be presented only as functional. As Ainley (2000) argues, what makes a piece of mathematics real or meaningful is the quality of an individual's engagement with a problem, rather than its utility or immediate application. Therefore, pure or abstract problems, or areas of mathematics such as algebra, can be very

meaningful in terms of the interest and engagement they arouse, provided they fit with students' purposes for learning, and intellectual engagement can be its own reward. Indeed, we found that the type of maths the adults requested is usually mainstream school mathematics rather than some form of vocational or utilitarian mathematics specifically linked to aspects of their own daily lives. The students in our study were not particularly interested, for example, in knowing how to read their gas bills.

We have found that students have a number of motivations for wanting to join, and continuing to attend, their numeracy classes, and that these are inextricably linked to their identities. Many students feel excluded from the mathematically-educated community and they want to join up and feel that they belong.

Our data from students suggests that the teacher plays a crucial role in making numeracy teaching meaningful; the quality of teaching is perceived to be at least as important as the mathematical content<sup>21</sup>. The teacher's goal needs to be to help the student learn numeracy (Watson et al. 2003). Students also need to have the goal of learning numeracy. The students in our study want teachers to concentrate on assisting their understanding; focusing on mechanical procedures at the cost of mathematical meaning tends to diminish the learning experience.

The fact that students can find abstract mathematical problems and ideas meaningful does not mean that they do not find it easier to learn new ideas if they are presented in a 'real world' or 'authentic' context. For instance, the meaning of the remainder in a division sum is made more difficult to grasp if division is presented as an abstract algorithm rather than in a contextualised problem. A contextualised problem can show the student that there is a need to learn the skill of division and alert them to the meaning of any remainder, such as finding how many tables, each seating eight people, are needed for a party of 67 people. However, in using real-life contexts to explain an idea, we argue that there is no need for these contexts to be ones that the student has actually met or is likely to meet, as long as they find them sufficiently interesting, can understand the situations and the way mathematics is used in solving the problems. The task for the student is then one of re-contextualisation, ie seeing that a method can be used in solving a new problem.

## 7.2 Contexts of learning, and how they inform teaching

Although students bring their life histories to the class they are generally not interested in bringing specific mathematical contexts.

As we have already mentioned in section 2.2, reports such as Cockcroft (1982)<sup>22</sup> were based on an assumption that both children in school and adults in colleges will find learning mathematics more meaningful when teaching uses everyday applications and so-called realistic situations which include the learner's own context. We have also argued that this approach is related to the learner's social class. The idea is hardly new, of course, and as Harrison et al. (2003) point out, writers from John Dewey to Carl Rogers and Stephen

21. Schuller et al. (2002) also came to a similar conclusion.

22. Tikly and Wolf (2000) argue that the Cockcroft Report (1982) set the tone for mathematics education over the next 20 years or so, particularly with its emphases on practical and 'real-life' applications.

Brookfield have argued for a learner-centred curriculum that takes the lived experience of the learner as the starting point.

The idea in *Skills for Life* is that the curriculum is context-free, the learner brings their context to the classroom (or other learning environment) and the teacher's task is to bring the two together in effective adult numeracy teaching. One problem with this is that the term 'context' is somewhat ambiguous. Although the word 'context' is used widely in academic literature, the concept itself is complex, slippery and difficult to define, and writers in mathematics education tend to use it in a number of different ways. Although Wedege (1999) has offered her own clarification, making a distinction between *task context* and *situational context*, the term still remains rather vague and ill defined in the mathematical literature. In our study we distinguish between two main types of context: the *situational context* and the *biographical context*.

The *situational context*, or *setting*, refers to both the formal (institutional) and informal life setting. This may be in the classroom or at home, work, recreation, leisure, etc, in other words, wherever the mathematical skill is used (see figure 2).<sup>23</sup>

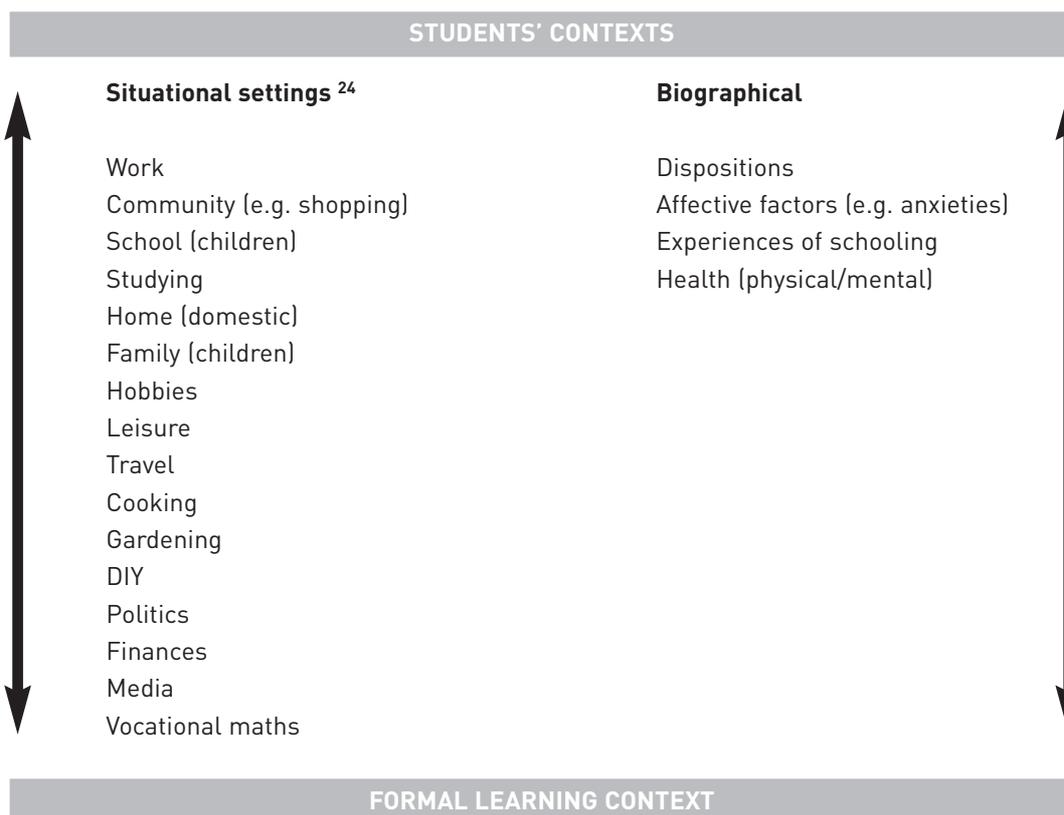


Figure 2. Students' contexts for learning

23. It should also be acknowledged that, sometimes, the person who asks the teacher to help them with the mathematics in a particular setting (for example, photography, home-embroidery) often knows far more about it, and has a deeper understanding of how it works, than the maths teacher.

24. This list is not meant to be exhaustive; its main purpose is to provide examples of where situational contexts may occur.

Over 30 years ago, the sociologist, Basil Bernstein, wrote, 'If the culture of the teacher is to become part of the consciousness of the child, then the culture of the child must first be in the consciousness of the teacher' (Bernstein, 1971, p 65). Although he was referring to schoolchildren, the same approach is apposite to adults. What he is saying is that if teachers are to teach effectively, they need to understand who the learners are, their backgrounds, the contexts they bring with them, and their reasons and purposes for coming to study mathematics. Figure 2, overleaf, therefore also shows the student's *biographical context*. This includes their motivations, their orientations towards learning in general, and the learning of mathematics in particular. These have been formed as part of the student's habitus. These dispositions will have been constructed and formed in their family settings, and at school, and will often have been affected (both positively and negatively) by a number of significant individuals, such as parents, siblings, peers, and, in particular, teachers. This context also includes the student's health, which often has a profound effect on their learning.

Thus, the biographical context is an integral constituent of the student's identity, the history-in-person that Holland et al. (1998) write about, and links closely with students' identities and motivations, which we discuss in sections 7.3 and 7.4. We should like to point out that the arrows in figure 2 travel both ways, indicating that the mathematics in both the informal contexts and the formal classroom relate to and inform each other.

The ANCC (BSA, 2001) appears to use the word 'context' in both these ways (situational and biographical). On page 8 it states:

The learner brings the context that will be the ultimate proving ground for their improved skills; *[and that]*

The learner is sure that the skills and knowledge that they are learning are helping them to use their numeracy in the range of ways that they want.

This has echoes of the utilitarianism propounded by Cockcroft (1982) and Dowling's (1998) tool box analogy, slanted towards the working classes, that we have written about in section 6.4.2. It seems to be saying that the effectiveness of the teaching and learning is to be evaluated when the learner applies it within his own situational context outside the classroom. It also appears to be based on theories of cognitive psychology which emphasise the stability and continuity of cognitive activity across settings that Lave (1988) has so effectively critiqued. Knowledge is viewed as being acquired in circumstances that are context-free and then applied in all other contexts, so once the numerical knowledge and skills have been learnt in the classroom, they can be applied in any situation that calls for calculation<sup>25</sup>. However, on the same page, the document also declares that the learner's context comprises 'the widely differing past experiences that they bring to their learning'.

Our first research question, concerning students' contexts, was divided into three parts, and although there is some overlap between them, the rest of this section addresses each one in turn.

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25. See Lave (1988) for a critique of this position.

*1a To what extent are numeracy teachers able to access information about students' numerate practices in contexts outside the classroom?*

Access to information about students' numerate practices in settings outside the classroom is possible, and as some of these contexts include practices that also provide access to their biography, we feel these are a vital part of getting to know the students, and can inform us about ways of helping them learn. However, although it is relatively easy to elicit information through informal discussions, tactful probing is necessary in conversation with those students who feel ashamed to expose their lack of numeracy skills, or those needing help on sensitive issues such as debt and welfare benefit claims.

One of the earliest opportunities to access students' numerate practices comes at the initial interview where it can be done informally and discreetly. It can then continue throughout informal classroom discussion, and during the more formalised negotiating, reflecting and reviewing of a student's ILP. The ILP is considered by some students to take valuable time away from teaching, and it can seem that the list of targets mapped to the ANCC is more for the benefit and satisfaction of inspectors and managers, than for the teacher and student. However, negotiating the ILP provides a time and space for the student and teacher to meet and uncover a student's strengths and weaknesses; it also has the potential to supply the teacher with important information about how the student functions and copes with practices outside the classroom, and the settings in which these occur. For example, one of Elizabeth's students, Monica (whom we will learn more about in section 7.8), did not realise how useful it was for Elizabeth to know that she goes 'round the houses' and 'cheats' by adjusting numbers to easy ones so she can work out her weekly budget. It told her teacher that she has a very good sense of number and place value, can compartmentalise numbers in her mind, and is able to manipulate them in a very efficient way.

It has been obvious through this project that time spent talking to the students has enabled us to elicit information from them about their dispositions and aspirations and to use it to their advantage in teaching and helping them reach their goals. Finding out more about students' biographical contexts requires a high level of skill because people's lives are complex, and sometimes information is hidden deep within the student's mind. However, we feel that it should be given high importance, particularly for adult learners in basic skills classes, the majority of whom have experienced difficulties with learning. We have found that gaining access to a student's biographical context takes place over a period of time and that students may only reveal aspects of themselves and their dispositions to learning once trust has been established.

In general, catering for students' biographical contexts can best be done by ensuring the right learning environment: one which is non-threatening, friendly and where students feel secure and welcome. An example of this came from another one of Elizabeth's students. Ben was educated in Ireland by the Christian Brothers and went through school in fear of all teachers. He felt threatened by them, would tremble at their very presence and his mind would shut down to any kind of learning, especially mathematics. He left school with no qualifications, hardly able to read or write, but has since taught himself what he needed to know. He is now well read and highly informed but still feels inadequate because of his fear and lack of understanding of maths. It took some weeks before he was able to tell Elizabeth this and it came about because she was standing too close to him in the classroom one day. He told her how, because of her proximity, his mind had shut down again and all those memories had come flooding back. Since then, they have developed a very good working relationship and Elizabeth now has a much better understanding of him and the way he learns.

This deeper understanding of the students by the teacher also helps students to engage in learning and contributes to making it a long lasting and effective experience. In another example from Elizabeth's class, Clare and Della pointed out to her on several occasions that she had taught something in a particular way because she knew the way they thought, and this has enabled them to understand something that they had never understood before. They appreciated that Elizabeth had a good understanding of where they are coming from and that she allowed time for learning to take place.

*1b Are teachers able to relate their teaching to students' contexts, and if so, how do they do this?*

As we have already emphasised in early sections, the students in this project were nearly all very well motivated; they came to class voluntarily, and did not need to be enticed by making the numeracy relevant through using familiar contexts. Although the majority of students were comfortable talking about the mathematics they used in their lives, they had different interpretations of what constituted mathematics, and of what makes a numerate person.

All students bring their biographical context into the classroom, and it is crucial that teachers have time, and see the need, to discover who their students are so that this can better inform their teaching. However, we found that students rarely brought a situational context to our attention, and that if they did it was not their primary reason for attending class. For some, it is not that they do not want to use their own contexts in the classroom but that they do not want to be limited by them. As we shall see in section 7.3, many do not want to use artificially contrived contexts but want to be allowed to explore and experience other contexts, or just to be able to do and understand harder mathematics.

The class in which Jon saw the majority of the students' contexts being incorporated into their maths work was at Gloscat. For example, Joan was interested in decorating her house: she had brought in some measurements of furniture, made by her husband, from home and was learning about measurement and scale by drawing them on to a house plan (not her own). However, to Debbie's knowledge, she has not applied her skills to a real situation. When Debbie conducted her termly reviews in phase 1, she specifically looked at whether her students asked her to incorporate their own contexts into her teaching. In the two classes that were part of our project, only three of the 16 students mentioned contexts outside the classroom. Peter, in the level 1 class, mentioned photography but it was difficult to think of much mathematics that Peter could learn (particularly at his level) that would make him a better photographer. Justin and Trudy in Debbie's entry level class were also interesting. Trudy (see section 7.8) said she wanted to work on recipes and cooking, although we subsequently found out that she does not cook for herself; Jimmy told Debbie that he wanted to improve his ability to calculate his scores in darts. After preparing numerous worksheets around this topic for a number of weeks, he then told Debbie that he had to give up darts some time ago, and besides, the club now had an electronic dartboard that worked out the scores anyway. How much of the teaching is based around the student's situational context will depend on the student group, the nature of the course and importance given to it by the participants. For students on vocational courses, or short courses designed for a specific target group, this is predetermined: for example, courses for Family Learning, aromatherapy, DIY and hairdressing. However, even here, it is debatable how much mathematics is actually needed, or used in, say, a modern hairdressing salon.

In figure 2, we have included vocational courses as part of a student's situational context. The majority of these courses were found at Hackney, and some students in Barbara's class

wanted mathematics to support the vocational courses they were doing, or which they were aiming to do. Vicky was on a nursing course, and Arthur, a plumbing course, and they both wanted to have a secure grounding in maths in order to help them cope with the maths on their course. These are very specific contexts, and occasionally these students bring a specific problem to discuss with the teacher in class, or they make a connection with the topic they are doing. For example, in learning about measurement and metric units, Vicky thought of a range of clinical measurements she needed to know about, and units she would need to use. The rest of the class was interested in this, and wanted to learn how to measure blood pressure, but time constraints and the looming National Tests meant that Barbara did not follow this up. Occasionally, Arthur also brought up a complex question about measurement (e.g. of water pressure) but this was of no interest to anyone else and Barbara dealt with it separately.

Sometimes it is not possible to integrate a student's contexts into the class. For example, one of Elizabeth's students, Chris, was a hospital theatre technician; he wanted to become a specialist technician in intensive care, and needed the mathematics required for his job. Although he passed his exams, most of his learning was done outside the classroom. While it was vital to relate his learning to his context, it was not possible to do this within the particular class he was able to attend, and so Elizabeth had to provide him with relevant work to do at home.

Although it may be possible to use a setting/context particular to an individual, if it is of common interest to the whole group, this was rarely realised in the three classes in this project. Sometimes the situational context is so specific to the student that it is almost impossible to find a common interest. In one of Elizabeth's classes, Tommy wanted to take his caravan on holiday and wanted to be able to make all the arrangements, booking the site, working out expenses and so on. He became totally involved with the topic as it was so important to him. It would be possible to build a whole scheme of work around this but it became Tommy's entire focus and was not one he or the other students wanted to share. As Tikly and Wolf (2000), p 10 point out, one person's motivating and relevant context is another's crashing bore. But, even where the context is more general, it does not necessarily mean that the rest of the group will be motivated to work on the mathematics in this context. For example, Trudy at Gloscat (see section 7.8) was interested in cooking: she wanted to be able to weigh ingredients, make suitable economic purchases using money, and understand supermarket offers such as 'buy one, get one free'. Shopping offers a wide range of practical and life skills involving numeracy and many teachers might think that this could be used as a theme around which to develop practical skills such as weighing using different types of scales, measuring liquids, temperature, etc. However, the majority of students did not appear to see it as a priority in their learning. The students in this study were in mixed-ability classes, had very different backgrounds and experiences, and were simply not interested in working on these areas of maths. At Slough and Gloscat, Debbie and Elizabeth have been encouraged by their managers to do whole-class teaching around themes or topics but this proved to be problematic and unpopular with the students.

Sometimes it is inappropriate to relate the learning to the student's situational context, because the student's skill level is below that needed. For example, at Slough, Tim was interested in electronics but was working at entry 3 and did not have the underpinning skills required; Wesley wanted to understand quite advanced maths around his interest in sports science and this was clearly above level 2 and outside the ANCC. While Elizabeth was happy to help him learn and assist him along his chosen career path, she risked criticism from

inspectors and management for teaching at this level. There is no alternative provision for students who either want to study part-time in order to prepare themselves for another course, or who have a very specialised interest and perhaps limited need.

Whilst we have considered some of the difficulties in teaching around a theme based on students' situational contexts, situational contexts *are* used regularly to assist learning of a concept. It is important to be aware that there is no straightforward packaging of mathematics in contexts of everyday use (Tikly and Wolf, 2000) and that many of these so-called realistic contexts have been re-contextualised from the real world and are actually artificial (Dowling, 1998). Nevertheless, we advocate that teachers should try to find contexts that are interesting and relevant to students' needs. A new idea is still usually best introduced by relating it to a familiar setting, for example, money to help with decimals, using a bank overdraft to explain negative numbers, or mixing concrete to explain ratios. It is generally better to measure real objects and create real data, than always to work from a textbook or worksheet.

*1c To what extent do students' numerate practices outside the classroom inform numeracy teaching?*

As noted in section 2.1, when asked to provide a self-assessment in the *Skills for Life* survey, 85 per cent of people with numeracy skills at entry level 3 or below felt that their maths skills were either very or fairly good. Whether this is because they are unaware of their problems in this area, or that they actually do function quite well already is open to discussion and an area for further research. We found the majority of the students in our study felt that they could cope reasonably well when it came to using mathematics in their day-to-day lives. There were very few times when a student said that they wanted to use a specific mathematical skill but were prevented from doing so because they lacked the know-how. If they met a problem outside class, they said they tended to ask someone else.

When it comes to a work situation, like Nunes et al. (1993), we feel that the best place to learn the particular mathematics skills required is *in situ*, where the individual can see the direct need and purpose of learning, and this is what usually happens. Most of the work undertaken by the students in this project was relatively low skilled, and much of the mathematics involved was basic and procedural. For example, Danny, a baker, said that managing baking temperatures and times were just a matter of following instructions. Karen, who makes wedding cakes, felt she was perfectly competent with the numeracy involved in her work, and Anna who works in a benefits office and has to perform a range of calculations, said that she felt quite comfortable using the mathematics that she needed. However, both women said they wanted to learn mathematics that they had not previously understood, or did not already need or use at work. We shall return to this theme in the following section on students' motivations.

Despite the fact that students are often reluctant to use their situational contexts within the classroom, an awareness of such practices can be beneficial and necessary to inform teaching. It allows the teaching to be placed in a context that is familiar to the student, especially when that context has been the incentive for the student attending the course. The students' numerate practices outside the classroom can also inform teaching, and the teachers in this project valued them, and tried to incorporate and develop them in class whenever it was felt to be appropriate. These everyday practices can also provide insights into self-developed strategies, coping skills and use of non-traditional methods, and are indicative of the way a person learns. They provide indicators of number awareness, problem-solving

skills, reliance on others and avoidance tactics and will involve a combination of the situational and biographical contexts of an individual. We feel that this is highly significant to their understanding of the student and how best they might be able to help them. A skill that has been self-taught, and the way in which it is used outside the classroom, also furnishes clues to a student's ability and potential depth or lack of understanding.

Some teachers may feel restricted about using a student's situational context if it falls outside the skills framework of the ANCC. However, it appears that there is considerable misunderstanding, misinterpretation, or perhaps misuse of the ANCC (see section 8.4). It is often seen as a set of prescribed skills to be taught at each level with insufficient flexibility to allow for horizontal and vertical progression, rather than as a scaffold of skills around which to structure a learning program. Hence contexts requiring skills outside the curriculum, such as skills higher than level 2, or more detailed knowledge and understanding of, say, decimals or geometry and trigonometry are not dealt with. There is also a drive within colleges to meet government and institution targets in order to achieve funded outcomes and avert accusations of low achievement rates. Thus students are pushed through the national tests and teaching is driven by what is needed to pass the test. Some managers seem less willing to welcome students who do not want to take a test and have different goals and contexts, including their reasons for attending college. The teacher may want, and should be able, to meet the student's need but may be prevented from doing so by management constraints.

It would appear, therefore, that the extent to which numerate practices are able to inform teaching is also restricted by time, targets and the push for accreditation. Those students who have had poor educational experiences are once again suffering from the external pressures on providers to cater solely for those who will show achievement by testing/accreditation. There is little regard or value given to the kind of achievement that is not so easily tested or quantified, that is the development of a student's biographical context and feeling of self-worth.

#### *Further discussion*

The incorporation of students' numerate practices in what we term their situational contexts can make numeracy teaching more meaningful to those students, and be extremely useful in informing teachers about students' interests and concerns. However, their use in practice seems limited and, perhaps surprisingly, not of obvious importance to many students. In some cases students talk about wanting to learn how to do the maths, to strip it of the context, which they find masks the essence, clouds the picture and leads to confusion. Often the real context that people bring is a shared feeling that they did not cope very well with something called mathematics at school; they have memories of something that felt hard and perhaps humiliating.

The study has found that in the majority of cases, when students bring a context to the classroom, it is of minimal interest to their fellow students. In addition, whilst it may be possible to access students' numerate practices and deal with specific problems, these are best attended to in one-to-one situations outside the lesson; once dealt with, they cease to be of interest.

Commonly used contexts such as money and life skills, as promoted in the *Skills for Life* agenda, reflect a perception that the population lack the skills they need to cope with in life, and reinforces the feelings potential learners already have of inadequacy and failure. It could be inferred that this large section of the population only need, or want to be able to learn,

skills up to level 2 as prescribed in the ANCC and that this will make them more able to cope. Many adults find this quite insulting; it imposes another label on them which acts as a barrier to their gaining access to more knowledge, self-esteem and confidence. Placing numeracy in an authentic, day-to-day context suggests that this is what students want and/or that it is good enough/sufficient for them. However, listening to the students in this project we know they want a great deal more than this. Perhaps accessing learners' biographical contexts more, and using this insight to inform teaching, will produce adults whose wealth of knowledge, experience and wisdom can be used to allow them to enter the previously forbidden world of those who have achieved academic success. This is what many of them want. It would seem that an awareness and consideration of a student's biographical context, together with appropriate use of situational contexts, is crucial to making numeracy teaching meaningful to the existing generation of adult learners. It is the starting point that will develop active and critical thinkers, who feel more fulfilled, and are more able to contribute to society.

### **7.3 Students' motivations for attending, and continuing to attend, classes**

Students' motivations are varied and complex but few come to study maths because they feel they lack skills in their everyday lives.

We do not regard learning as merely a cognitive exercise, but something that involves the whole person; it therefore involves students' identities and the discussion in this section is linked to, and overlaps with, the following section 7.4. Rogers (2003) maintains that teaching consists of a series of relationships between various identities, and as adults' self-identities affect how they relate to the teacher, and also how they learn, we need to find out who the learners are, what their motivations are, and explore the ways in which learning changes them.

Ecclestone (2003) writes that ideas about motivation remain confused, and that broad distinctions between behaviourist and humanist research has introduced unhelpful but enduring dichotomies between extrinsic and intrinsic motivations, the latter of which most educators regard as inherently desirable. Although the term 'motivations' is similar to reasons, we are regarding reasons as being more straightforward and on the surface, and motivations as deeper and underlying, tending to emerge over time during in-depth interviews. Indeed, our findings would have almost certainly been different if we had used questionnaires or structured interviews. When students are asked in a short, initial, diagnostic interview, for their reasons for wishing to enrol, the TRs have found that students typically respond with answers such as 'so that I can do long division', or 'so that I can learn how to add and subtract fractions'. It is only when the students are given the chance to talk about their reasons/motivations at greater length that other considerations begin to materialise. Moreover, we found that students' motives are generally complex and multiple and are scattered throughout the interviews as different areas of the students' lives are explored. However, this is also because, during the in-depth interviews, we have not only been asking students about their original motivations for joining the course, but why they continue to want to attend every week. This, after all, was the focus of our research question. Again we want to make the point that the students who we have talked to are precisely this group of voluntary learners who generally enjoyed coming to numeracy classes.

Some students were interviewed up to three times, and we became aware that, as well as

their dispositions towards learning, their personal motivations can also shift and change over time as circumstances alter.

Many contemporary writers working in the field of learning in education also stress the role of the unconscious (see, for example Butler, 1990, 1993). We are certainly not denying the importance of the unconscious (with all its emotional subtexts); many of the actions of adults in our study may be driven by their unconscious motivations and desires. However, the focus of our study is to try to *describe what is happening*, rather than to seek out inner psychological or psychoanalytical explanations and reasons behind students' actions.

Writing in the *TES*, in 2004, the director of the Basic Skills Agency, Alan Wells, was quoted as saying that:

My experience over the years is that a lot of people who want to learn numeracy want it for a specific purpose... they've got to do a test to get a job – or something numerical regularly comes up in their job and it didn't used to (Whittaker, 2004).

This is not our experience and runs contrary to the findings of this project. Although students' motives are varied and intricate we find that the three main motivations students have for attending and continuing to attend numeracy classes regularly in this study are as follows:

- to prove that they have the ability to succeed in a subject which they see as being a signifier of intelligence;
- to help their children; and
- for understanding, engagement and enjoyment.

These are in no particular order of importance. For some students, there was the additional utilitarian reason of needing to obtain a particular qualification to get on to a particular course, and also a functional reason, that studying mathematics enables them to cope better with the mathematics they come across in their lives outside the classroom. However, we found that both these were usually comparatively minor incentives to attend classes.

As we have written above, many of the students' motivations for attending classes were found sprinkled throughout the interview as we talked about different areas of their lives. Sometimes, though, they came together, one after another, and the following quotation encapsulates many of the main motivations outlined above:

Iris:           It's just exciting, I enjoy doing it, it helped me with my everyday life because sometimes you go out shopping and if you don't know your maths you can be short changed, which has happened to me many times. As well I've got my young son, I help him a lot and right now thank God it's paying off because he's above average in his maths, you know because I helped him, and most of all for myself so that I understand the different techniques of maths and what I didn't achieve in school. I never completed school, my education, so it's for me, what I didn't gain then I try to make up now.

Altogether, we listed over 30 different motivations that students gave us, and we have listed them as a taxonomy under the three headings of *utility*, *understanding*, and *for self*. These can be seen on the website (see NRDC's website, appendix I).

We now take each of the four main motivations in turn.

*To prove I can study and succeed in mathematics*

We have found that a major reason why students take up classes is that many have failed at mathematics at school and they want to prove that they have the intellectual capacity and durability to succeed in a high status subject.

Selena: I'm not really sure that I can use maths but I just want to learn it for me, it's just something that I want to achieve for myself, that I can do things. I never thought that I might be able to use maths in something, I know dividing you need to but I just want to teach myself something

Jon: Sure, so what, because you feel that you were left out?

Selena: Yeah

Jon: Do you want to prove something to yourself or/

Selena: Yeah that I'm not as stupid

Jon: But you're not stupid because you learnt to speak very good English/

Selena: Yeah

Jon: So is that not enough?

Selena: No I want to learn more. I want to be able to have some sort of qualification that shows me that I've done that because in my life I don't think that I've done anything, apart from growing up and having two babies.

Many students also see mathematics as a signifier of intelligence, and they want to be able to enter, and gain access to, what they see as being an esoteric and privileged practice. In some ways this is an exclusion issue, for they want to be able to open the door and join the mathematicians' club, with its connotations of eliteness. This, of course, resonates with Dowling's *esoteric domain* of mathematics (1998) that we discussed in section 6.4.2. Rather than avoid school maths<sup>26</sup>, they want to do school maths again, but this time succeed in it.

Some students told us that they felt that wanted to work on particular content areas of mathematics that they had either not covered, or had not learnt successfully at school; it was almost as if they saw the curriculum like a jigsaw puzzle:

Sarah: I want to fill in the bits I haven't been taught. To be complete.

Jon: So do you feel you missed out a bit?

Sarah: Yeah. Because it's like, what I should have learned then, I am learning it now.

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26. Ernest points out that many professional mathematicians distinguish 'school maths' as being a different subject rather than a subset of the discipline of mathematics (Ernest, 1995).

One of the most important findings was students' liking of algebra, which some people would find surprising given its apparent lack of applicability to the practical world. However, for many of the students in our study, this was part of the attraction. For many, algebra has the status of being like a foreign language, and with its abstract nature, and (seemingly) mystical codes, it is one of the starkest signifiers of Dowling's esoteric domain. Students in all three colleges told us how they felt a great sense of personal achievement when they began to understand its rules and concepts for the first time. The extracts below come from two different students.

Carrie: When I got to be able to do algebra, it was such a sense of achievement. Because I can do it! And it brought back memories of school when we were doing algebra and I didn't understand what the hell they were on about

Misha: Because maths has had the label of being hard and complicated, if a person feels like – oh I'm stupid – or anything like that, and you sit them down and get them to do an algebra problem and they realise – Oh wow, I can do it. It will make a person feel really good about themselves.

However, a caveat to this is that it depends on how it is taught. The TRs went slowly, broke each concept down, and made algebra interesting.

#### *To help my children*

Another major reason why people came was to help their children. Many students wanted to learn mathematics at college to be able to help their children with their schoolwork, but unlike in the other categories of motivations these were exclusively women. Sometimes they had failed themselves and they did not want this to happen to their own child, and so this was another case of wanting to learn school maths in order to help their child with their school maths. Sometimes, though, students told us that they did not want to feel inadequate and be seen in the eyes of their children as incapable or lacking in know-how. There is also the role of being a teacher. This is not only an important element of being a parent, by helping establish closer bonds between parent and children, it also helps adults with their own learning by making them reflect on their own work in a particular way. For example, I can do this, but how would I explain it to my child; I understand this method, but what if they have a different method at school? Which one is best? How do the other methods work? We can see some of these reasons in the conversation below:

Barbara: Do you feel more confident about your maths now?

Susan: Since I had my daughter, yes

Barbara: What difference has that made to you, having a daughter who is at school?

Susan: Because, as she's started learning maths, and I was helping her, it taught me how to do it. And I practised with her, and what she couldn't do, I'd try and learn so I could teach her

[...]

Barbara: Right, and was that from pretty early on? From once she started school, that you began thinking about your own maths skills?

Susan: I was very worried that once she got to secondary school there was no way I was going to be able to help her. And that made me feel inadequate.

Another by-product of this process is that adults can act as positive role models in their children's own learning. Students would tell us how they would sit down with their children around the table and study together.

Jane: She [*her daughter*] has watched me struggle with it (not very much it has to be said – but work at it) and go from having none to understanding. And she has watched me fall in love with it, get excited, punch the air over it, read books about it. I think it is a virus (a happy one), and she caught it. She seems to realise that it's OK to get things wrong, try again, be brave with it and enjoy it. Her teacher says that she can explain in words what she does with numbers. I think that's pretty smart for a nine-year-old.

*For understanding, engagement and enjoyment*

Almost without exception, the students told us that they wanted to understand the mathematical system, its principles and underlying relationships.

Jon: And are you one of these people who really wants to understand what you are doing?

Sue: I prefer to understand rather than people just give it to me on a plate. Like, if I've got a pain in the leg, there's no point me taking paracetamols if I don't know what's the matter with it. I want to know what the pain is, and then take the paracetamols.

A key point is that a major reason why the students come to classes is the quality of engagement with the activity; this is what makes the mathematics seem real or *meaningful* and worthwhile to them, rather than its supposed usefulness and application in their lives outside the classroom.

Jane: But actually it hasn't been the daily application that has caught me, has got me so... it's beyond the daily application, it's so exciting and I don't think you do have to make it daily, practical, mundane. It doesn't have to be just practical...

Besides, as we have already written, the vast majority of the students in the study felt that they could get by already with the mathematics that they knew; many also wanted to go on to study something a bit more challenging:

Georgia: I know basic maths but I want to be able to do some of the things I've seen with mathematics.

Jon: Such as what?

Georgia: Things they do when you go into uni. Like brain busting stuff.

Jon: Yeah. So you'd like to learn more of those sorts of things.

Georgia: Yeah, I'd like to learn it at a higher level.

They liked to be stretched and made to use their brains:

Jon: Do you see that as a challenge, do you think?

Simon: It is. Because then you are pushing your brain around.

However, it is also important not to neglect the aspect of pure enjoyment which was, perhaps, a far more common reason than we might have supposed. Once students get past their initial anxieties about the course and the subject, they nearly all began to find that they actually liked studying mathematics, and said that as well as being challenging, it could be satisfying and fun; indeed, the enjoyment could be linked to the challenge. Again, though, we must point out that this is dependent on good teachers who make mathematics interesting. Here are some data from two students:

Elizabeth Yes. Sure. So what would you say was your main reason for doing maths?

Viv: [...] It's so interesting. I've been working on the tills all the time and calculating on top of my head, and I think for someone who suffered so much at school, if I put all my years in school I can say for a year. It's just something... it gives you a buzz, it's exciting [...] I think every day, whatever you learn, it's like a bonus.

Jon: So what's the main reason that you're here then?

Levina: I enjoy maths, I really love it, I'm no good at it but I absolutely love it [...] I rave about it to everyone, honestly, I'm in bloom

Levina also told Jon that she sees maths as her hobby and compared it to being 'like my baby'.

Amongst two of the less frequently cited motivations were the desire to get a qualification, and wanting to use numeracy to help in the world outside the classroom.

#### *To gain a qualification*

In contrast to the thoughts of Alan Wells, only a very few students gave a reason for studying numeracy that was related to a perceived need in their current employment. A few students, in the evening class, said that they were studying numeracy in order to get on to an Access course, such as in nursing or teaching, but these were, again, very much in the minority in terms of the whole sample. Moreover, although many recognised that higher qualifications provided greater choice and opportunities, very few said that they were studying numeracy to help them get a better job, in terms of money and interest. This is at variance with the finding of another NRDC project, report on provision and learner engagement with adult literacy, numeracy and ESOL support in rural England (see section 3.4). Rosie Shier and colleagues report that just over 40 per cent of the learners in that project hoped that their course would help them with their employment – either by helping them get a new job, get promotion, become more effective, etc. That research team interviewed 214 learners in 66 classes using a relatively short semi-structured interview schedule. However, their principal aims were to explore levels of literacy, numeracy and ESOL provision in rural England and motivation was only a minor part of the study. Moreover the researchers were principally interested in *initial* reasons for entering provision, and not, like us, in finding out what learners got out of the course, and why they continued to attend on a regular basis. So a different set of learners

(some studying at a higher level than those in our study), a different method and methodology, and a different focus in questioning have produced a different finding. For us, this points out the importance of making the research process as explicit as possible and shows how subtle variations can change conclusions. This should make policy makers and others wary of making comparisons between seemingly similar projects, or projects addressing some similar issues. For a further discussion on findings from other projects, see section 7.6.1.

*To help in the outside world*

A few of our students said that the mathematics they learnt in their numeracy classes has really helped them in their lives outside the classroom, in terms of functioning more easily. This generally refers to transactions involving money: they are able to work out their change, estimate how much they will save in, say, a 50 per cent sale, pay their bills and so on. Some students told us that before they came to classes, they were unsure how much money to hand over when they bought something in a shop, which even meant they sometimes ended up not buying the item they wanted.

Jon: So what would happen before, if you weren't sure which one to pay for, you'd have to give them a fiver or something?

Peter: Yes. I'd either give them too much money, or not enough.

Jon: So you weren't sure how much change, because you weren't sure which figure...

Peter: Yes. So if they were fiddling me I wouldn't know [...] Sometimes I used to put it back. I'd get embarrassed about it. So yeah, you know, to me, this is where you need the maths.

Other students also mentioned how they used to be embarrassed at their lack of mathematical knowledge and skills:

Beryl: I tell you the most embarrassing thing is when I had to send my children to the shop, or they came with me, and I used to say to them (*whispering*)

Jon: How much, right?

Beryl: Yeah, how much have I got to give them? I had to ask them and that's embarrassing for a mother, let alone an adult, asking a seven- to eight-year-old how much money do I give them, how much change do I get back? I'm not so bad now, I can near enough do it but it *was* very embarrassing

Rija: I feel a lot more confident with my maths now, keeping budgets, knowing what bill to pay, amount and how much I will have left. I do it more fluently; I'm not fantastic but a lot better than what I used to be.

The majority of this group of students came from classes working at the lower end of the range in this sample and our findings vary. Some students were like Rija: they felt that they had gained in confidence, their maths had improved, and that they were able to use their skills more effectively than before. Others felt that the mathematics they had been studying had made little impact and they had made little progress. However, progress at this level has

to be measured in smaller steps which may be imperceptible to the individual and not significant enough for them to be able to apply new skills in real situations. Some of these students also have limited opportunities for practising their skills, as everyday tasks are directed or undertaken by carers and parents. Debbie has written a piece about the practical difficulties of teaching a class at entry level (see NRDC's website, appendix J).

#### 7.4 Student identities

Learning maths has the power to change who people think they are.

A large majority of the students in our study felt that they have changed through learning maths. Almost three-quarters of the people interviewed by Jon said that they had changed as a person in some way, and the TRs found a similar response from their interviews with their own students. The changes take different forms, but the most widely reported way is the increase in confidence (86 per cent of Jon's interviewees) which is the most commonly reported effect from similar relevant research (Schuller et al. 2002; Ward and Edwards, 2002). Indeed, it is one of the most fundamental and widespread dividends from learning, and has a series of wider benefits at both an individual and community level. This is likely to have a significant impact on learners' levels of attainment, their attitudes to learning, aspirations and their general social interactions.

Alison: *[Learning]* gives you confidence, because, you know, without confidence you don't do any good to yourself, you see. Because to come to college, it makes you feel so proud of yourself, because you know when you hear other people say things and you think – yes, I have this chance, to do something better. [...] It's just like a power come to you.

Moreover, the increased levels of mathematical knowledge and skills have the potential to empower them to deal with, understand, and take part in situations outside the classroom. There are also perceptions of greater independence and autonomy, and the development of cultural capital, which can be explained as the knowledge, skills and qualifications acquired as a consequence of organised learning (Bourdieu, 1986; Schuller et al. 2002). Our hypothesis is that these changes are more likely to occur when students find the maths meaningful through its teaching. This is shown by a piece of data from Jane, one of Barbara's students, who was studying at level 2, and whom we have already heard from in the previous section:

Jane: You start looking for patterns everywhere. I didn't know patterns existed before. I mean patterns were something you do in art. And I was crap at that as well [...] You know, we've got the elections at the moment, the GLA, the mayor, all that stuff, I used to just read the commentary and leave the maths to someone else. Now I say, how many people were in that constituency and what was the percentage of the turn out? Suddenly I'm using a different level of it, it just opens up a whole new world. It just makes you much more involved. Rather than relying on someone else to provide, to interpret the facts. So you might have an opinion, but you haven't taken any part in compiling the facts, so you're not in control of anything you're just a swallower of other people's facts. It makes you a victim.

For other people, learning also gives them a sense of purpose, participation and belonging to a community (Wenger, 1998). Attending the classes on a regular weekly basis, and engaging in

learning enriches their life and provides a setting where they can develop friendships in a secure environment. For Evan, the thought of the course stopping was obviously traumatic:

Jon: Yeah. OK. Since you've been back to the... you know, come back to learning really, in this institution, do you think you've developed at all as a person?

Evan: Yeah, I do.

Jon: In what way?

Evan: More confidence [...] I call it a bonus.

Jon: Right.

Evan: An absolute bonus. Being in a college environment.

Jon: Yeah.

Evan: And I love it. I really, really, like it.

Jon: Yes. So it's really kind of, in a way, transformed your life.

Evan: It has, yes.

Jon: What would happen if there wasn't this opportunity to come and learn maths? What do you think you'd be doing? Say they didn't run these courses? [...] How would that affect you?

Evan: I would be really quite, well, devastated basically. It would take away all my connections with friends that I've made. It would make my life a lot more boring.

Although Evan was also referring to his literacy, as well as his numeracy class, for others it is the studying of numeracy/mathematics in particular that has changed their outlook. Perhaps in a more profound way, it can affect the way they think, view things and see themselves. This can be seen from another interview conducted with Barbara's student, Jane:

Jane: It's made me see myself very differently, it's made me see my potential very differently, it's made me see my having a potential [...] I've always just assumed that these are my limits and that's it, there's no... that's what those maths lessons have done; they've changed the whole ball game really of the rest of my life. And at the same time that I've completely changed my career, I've completely changed my view of myself in terms of what I can learn.

So, although people may be constrained by their habitus (to varying degrees), it is also important to remember that identities are unfinished and in process (Holland et al. 1998), and can therefore change and develop. Although human agency may be fragile, particularly for those with little power, the students in this study were still able to make decisions that had the potential, at least, to be able to re-direct their lives.

Some students were motivated by wanting to better themselves, and feel that they can succeed:

Roger: I like to come here to try and learn and improve myself [...] [and] Maybe I can start being successful at something.

Others had been spurred into action by seeing their former school friends working in low-skilled jobs and coming to the realisation that they could have higher aspirations, as part of a journey of self-improvement. Georgia had left school a couple of years ago with the intention of setting the world alight but soon came to the conclusion that qualifications gave her more options and opportunities:

Jon: And do you still see your mates who are in dead-end jobs that you were talking about last week, and you think – oh I don't want to end up like that...?

Georgia: I do see a lot of that... a lot of my friends are like a year or so older than me, so they left while I was still at school. And I've seen some of the things they do. And some of them now. And I just think – no. I can better myself. I know I can better myself.

Identity is fashioned through biography, and the self, as Rowan Williams wrote, is what the past is doing now (cited in Pollard and Filer, 1996, p306). However, this next extract illustrates that dispositions towards learning that people incorporate into their habitus and demonstrate in the school context are not necessarily enduring. People's orientations and perceptions are affected by their peer group and can change when they are with another group of people at a different time or in a different setting. Some also recognise that their lives can be divided up into different stages; they may mature emotionally at different rates and are not ready, or motivated to learn, at particular points in their lives. Wesley was studying numeracy to help him with a physical fitness course that he was hoping to enrol on, and his newly found habit of staying in and working on his maths is clearly influenced by this motivation.

Jon: Tell me about your life at school. What sort of pupil were you at school?

Wesley: Erm, a little bit disruptive I guess, not really very interested in the school work, more sort of interested in the social side of it rather than the education.

Jon: So why was that particularly, do you think? Was there a reason for that?

Wesley: Some people are just ready to learn at different stages.

Jon: Absolutely. So you just didn't think you were kind of ready for it/

Wesley: Just wasn't ready, mature enough.

Jon: [...] Since coming to the [numeracy] class do you think you're changing at all as a person? Maybe it's too early to say but/

Wesley: Well yeah because I'll stay in and work on my maths as opposed to going out so that's different.

Jon: You have in a way changed because now you've got that attitude of working.

Wesley: Yeah.

Jon: What brought that about then? Why have you changed from the person you were at school to what you are now?

Wesley: [...] I think I just basically changed what I thought was cool. Now what I think is cool, or what I'm impressed by is different to what I was impressed by when I was younger.

As well as a past, identity formation also incorporates a future. It is an ongoing, lifelong process and students must be given the chance to explore who they are, who they are not, and who they could be. They must be able to understand where they have come from and where they can go (Wenger, 1998, p 272). This next quotation suggests that Danielle is aware that she is engaged in a process of renewing herself. She has now reached the stage where she is no longer satisfied with the frivolous, superficial, side of her life. The world of learning seems to have opened new horizons and she has identifications with the more academic/intellectual, which she equates with the real world; in some ways, she can be said to be entering a new frame of understanding, or what Holland et al. (1998) call a 'figured world'. She has four young children, and although a major part of her identity is still that of a mother, she also has aspirations to change into becoming someone beyond motherhood.

Danielle: Everyone needs something to change. They know they can't stay in the same situation, especially mums. You can't stay in the same situation until what, the children go to university or college, or when they finish when they're 16, you can't just be the mum at home, you have to do something for yourself.

Jon: [...] So what's gone, what's happened now then to make you really keen on maths?

Danielle: What's happened now is that the classical side of who I am, such as the hairdressing or the cosmetic beauty, I could make a wig, you know, pedicuring, manicuring, those sort of things are like, as far as I'm concerned right now, they are like beautification, they're not in the real world, do you get me?

Jon: I do.

Danielle: It's not real world stuff. Real world stuff to me is like academic, you know, you need your maths, you need your English, you need papers to prove you are educated nowadays and to be educated to converse with people, I find, is very important. I find women are just about, can add up nowadays, I find a lot of my friends are not thinking of talking intellectually, they just talk very slangly, they don't want to improve themselves. There's nothing wrong with just being a mum, I love being a mum but at the same time something for myself or self worth now.

For some adults, the identity of being a student was an important one, and as Rogers (2003) writes, how the adult positions him/herself in the teacher-student relationship will have a fundamental effect on their learning. Although some people told us that they considered themselves to be just studying or just coming to classes, others said they were very proud to be called a student, that is someone who is fulfilling an apprenticeship role and who has the desire and capacity to learn. Part of identity formation comes from people telling each other who they are claiming to be:

Elizabeth: Would you describe yourself to other people as a student? You don't mind telling people that you are studying?

Alison: No, I feel very proud. Very proud. If somebody sees me with a bag and they go – what is that for? I say my books. And they look at me and say – you go to college? And I say – yes, what's wrong with that? And they say – oh you must be very clever.

For others, being a student gives them the chance of becoming a successful student. The resulting qualifications and certificates are a visible demonstration of their ability, and this can lead to an inner confidence and change the way they see themselves. For symbolic interactionists, the image people have of themselves is influenced by the reactions of individuals they come into contact with in their everyday lives. So, a person's self-image is a product of the way they think others see and think of them – in effect, I am what I think you think I am. Crucially, this may become incorporated into their habitus. We can see this in the exchange below with Clare and her friend Monica (whom we shall come across again in section 7.8):

Clare: I had one really good moment with the Social. We have to have meetings every now and again, with what we are doing, if we've found jobs, or looking, and all this lot. And I said to her – I'm in college [...] and so she's gone to me – oh what are you doing now? And you could see her thinking – you haven't bothered again. And I said – I have passed some exams. And she goes – yeah? I said – I've brought my certificates down. Would you like to have a look at them? So I've laid them on the desk, I think there's about six of them now. And her face dropped a mile. You could see her thinking – oh, she has done something. You could see it. And after that the whole conversation changed. As if to say – oh yeah, she is doing something.

Jon: Just because you've got a piece of paper. You are exactly the same person.

Clare: Yeah, but it was the certificates that actually proved it and her whole image and attitude changed towards me.

Monica: But then your attitude changes towards people as well, because as you educate yourself, or do something that builds confidence, you now don't allow anybody to treat you with disrespect. I mean, beforehand, because you think you are not good enough you would let somebody talk down to you. Now I would say – excuse me, what do you mean by that? Rather than walk away and feel hurt by whatever they said. And I think that is the difference.

Clare: If somebody says we are stupid, or dumb, like our friends, I say – no we are not, we've got certificates to prove it.

In the next and final exchange, we can see how learning can cause friction in relationships as one partner's identity changes.

Jon: Last year when we were talking about this, you said that learning maths has made you feel more independent from your husband in a way.

Rija: Yeah it has.

- Jon: Because you always had to ask him before?/
- Rija: I did.
- Jon: And now you can do things on your own.
- Rija: He always thought he was better at, he was so good at maths but I find that I'm even better than him now.
- Jon: [...] But now you're actually better than him really, more confident, does that cause friction?
- Rija: If it was his way I wouldn't even be here today and I wouldn't be coming and he's not even no longer living at home, in our family home.
- Jon: Oh I see, but not over the maths learning?
- Rija: It's not over maths itself, it's just with me becoming more and more independent because I'm learning more, I'm educating myself and I'm seeing there's a world out there.
- Jon: So is it about power and control and he hasn't got so much?
- Rija: He's watched me over the last couple of years from being just a mother and a wife to becoming a woman, I could say. I was always a woman but I wouldn't notice probably and now I'm becoming much more independent and eventually want to go in to work. I don't want to be sitting at home forever just because he was working and I should stay that way and I should be at home, I want to be doing something with my life and I feel the only way I can do that, the best way, was to come back and get some education, get some qualifications and maths is a big part of that because I, actually, eventually, as much as I hate maths, want to go into banking or something and I just feel that's what my aim is and I'm going to try and get there. [...]. I feel like I've really moved forward and I've just done something with my life and I can give myself credit for that actually. I feel that if I can do something, you know it makes me feel like a person, you don't feel alienated anymore. I felt like that. When I came back it was a big world for me when I got back out, it's like I'd been in prison maybe all these years, I don't know where I've been, but I got here, I've made friends, I've met new people, I actually enjoyed maths for the first time in my life last year.

We can see that the balance of power relations between Rija and her husband is changing as a result of learning, and it has enabled her to at least begin to escape from his patriarchal dominance. She no longer has to go to her husband and ask help with problems involving mathematics, such as, for example, working out the family budget or paying a bill, and this has created tensions. She has changed from her more subordinated identity of being a wife (in this particular instance) to becoming a woman who feels she is more in charge of her own life<sup>27</sup>. Although we can see Rija as a skilled and knowledgeable agent, able to act with intent, she is

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27. This is also a common finding with Schuller et al. (2004), particularly with women from working-class communities.

nevertheless acting within historically specific bounds of the unacknowledged conditions and unintended consequences of these acts (Giddens, 1982, p 222), and she is still constrained by structures of gender, class, (and possibly her ethnicity). Nevertheless, Rija's perception is that she is making some kind of progress, or at least that her life is changing for the better: she feels more independent, more autonomous and more in control, and considers herself able to make decisions and do things for herself. She has come to college to study numeracy (and also literacy and ICT) and she is making friends and connections. Her aspirations appear to have risen, and she has the chance to gain a qualification that may increase her options and opportunities, and possibly lead to getting a relatively well paid job in banking, although this is far from certain. She says that studying makes her feel like a person, a proper person like everyone else, the norm. In the past she has felt alienated, excluded and trapped, like she had been in prison but has now been liberated. Her feelings towards mathematics are equivocal. Despite the fact that she says she hates maths, she ends up by saying that last year she actually enjoyed it, and later on in the interview she says this is because she has been able to understand it. Many of these changes in her life make her feel good about herself and give her a higher level of self-esteem.

We feel that this extract exemplifies the positive benefits of learning that we found time and time again. Education has the potential to provide increased options and opportunities and it can make a real difference to people's lives and bring about lasting change. Indeed, Wenger (1998) argues that education actually transforms identities. However, although people's identities and/or their identifications probably will change through education, the design of this study means that we are unable to say that these changes or transformations will have the same effect on every person, nor that these changes/transformations will be permanent or durable, nor that they will always be profound in the sense that they will cause a person to act and see the world in a different way. Moreover, in regard to our own area of interest, learning numeracy, we question whether it has any greater effect than learning other subjects or pastimes. Having said this, we can provide examples where the learning of numeracy is part of a learning career and has enabled individuals to change their personal or professional lives, and this is far more likely to happen when they have found the teaching meaningful. Conversely, we can also see cases where a lack of numeracy qualification has limited and/or prevented a person's ability to get on course or secure a particular job. Our data shows that, in some cases, students *are* viewing, and understanding, the world in a different way, and their identities – how they view themselves, who they think they are, and who they wish to become – have changed. This is what Barlett and Holland (2002) refer to a 'modifying *habitus*'. If we ask what provides the engine for this change, the answer seems to be inextricably connected to the student's own motivation(s), although it is important to remind ourselves that agency and scope for change always occur within surrounding structures, and that these can both enable and constrain action (Giddens, 1982).

## 7.5 What do students consider it means to be numerate in today's society?

People have different perceptions and definitions of what being numerate means.

We have already written about the problems that occur when people try and define the terms 'numeracy' and/or 'mathematics' (section 2.3), and as Coben et al. (2003) remind us, numeracy remains a deeply contested concept surrounded by much terminological confusion. It is therefore hardly surprising that the students in this project had just as much difficulty in trying to define what it means to be numerate in today's society as teachers, researchers, managers, policy makers, politicians and academics. At one of our termly TR meetings, the research team attempted, rather unsuccessfully, to come up with a definitive answer of what it means to be numerate today and you can see this on NRDC's website, appendix K. We suggest that a class/group discussion on this question would prove valuable: many students might begin to understand the disputed nature of being numerate and begin to appreciate that numeracy can be regarded as a social practice (see section 7.6).

Some of the questions we asked the students were as follows:

- 1 What do you think people miss out on if they don't know much maths?
- 2 Do you think people use less maths today than they used to?
- 3 Do you think it's embarrassing to admit you are no good at maths? Is there a kind of shame (or stigma) attached to it?

The response to these questions was generally inconclusive. Most students thought that people did miss out if they did not know *some* maths but of course it all depends on what 'some maths' means. Almost everyone thought that people would be seriously disadvantaged if they did not possess any mathematical skills and knowledge, but this was almost exclusively related to simple money transactions. We also asked the students what they thought an innumerate person might be like but many people found the term unfamiliar and difficult to comprehend.

Some argue that, although most people can get by without having or using very much mathematical knowledge, they may be excluded from taking part in decisions that affect their lives; they may be disempowered if they are unable to understand the world around them; and they may make less of a contribution to society. In some ways it is analogous to being in a foreign country without knowing or understanding the language: although a person may generally survive perfectly well, mainly by asking other people who do speak the language, their experience will generally be richer the more words and phrases they know. To some degree we are sympathetic to this viewpoint. In the early part of the 20<sup>th</sup> century H. G. Wells wrote that statistical thinking will become as necessary for efficient citizenship as the ability to read and write (Riddell, 2004). While this may not have happened, we believe that, for example, understanding percentages, the different kinds of average, and knowing the difference between various rates of APR, can (although not necessarily) enhance a person's quality of life.

However, we also believe that the case for knowing and being able to use mathematics can be overstated, such as when claims are made that a greater knowledge of mathematics enables people to understand issues such as whether to choose the MMR vaccine for their child. It seems to us that this decision may be based, not necessarily on knowledge of mathematics, but also on ideological considerations of whether or not people trust the medical

establishment and, ultimately, the government. These kinds of decisions are affected by people's growing distrust, so the fields that they draw on that affect their decisions on MMR are based in cultural, ethical, ideological and political areas, and mathematics may play a very small part. Although mathematics, along with biochemical science, may have played a part in creating the MMR vaccine, most people's knowledge of statistical probability is way below the level needed to enable them to reach an informed decision.

When it came to answering question 2, responses were again rather inconclusive. However, the general consensus was that, although people probably use less mathematics today (for example, because of bar coding at check-outs, and the fact that most shop tills work out the change for you), there is more invisible maths around than before, hidden in such technological products as computers and DVDs, and also in jet-fighters, skyscrapers, etc.<sup>28</sup>

The third question also failed to produce any greater agreement. Most people usually compared conceding they are ineffectual at maths to admitting being unable to read. While some people thought that there was no shame in being incompetent at maths, others saw maths as an essential life skill, and thought that there was a stigma attached if you were not reasonably good at it. A few students thought that some people were frightened to admit they were innumerate to other people they do not know or trust in case they are disparaged and belittled. Perhaps, some people are frightened to even admit it to themselves?

Jon: Do you think it's OK for someone to say they are no good at maths? Or is there a shame attached to that?

Trudy: There's no shame. But they are not sure to tell people about it because they are frightened. They are not sure to say it to anybody in case they are put down. That's the scaredness of it.

[...]

Jon: Too frightened to be honest about?

Trudy: To themselves and to other people a lot of times. They don't want other people to walk all over them, and they don't want people to see what they are.

Jon: OK. So people are very cautious.

Trudy: Yes, because people are very devious. They are very, very, shy and very frightened to tell people. They want to tell people, but they aren't quite sure what the attitude of a person will react to them.

However, nearly all the students agreed that it was easier for a person to cover up their mathematical deficiencies than if they could not read, which fits with the fact that so many mathematical practices are invisible (Coben et al. 2003).

Although some students saw no dissimilarity between the terms 'mathematics' and

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28. Sträßer, R. (2003) points out that much of mathematics is hidden inside modern technologies and is largely invisible to users. Indeed it is only when a machine stops functioning that specialists can be seen needing to use mathematics to fix it.

'numeracy', and used them interchangeably, most drew a clear distinction, saying that numeracy was a lower form, or a more basic type of mathematics. For them, numeracy is very much a sub-set of mathematics, and, as we saw in section 7.3, they aspired to study mathematics.

Della: Numeracy is like the basics, the adding and subtraction and dividing and multiplication.

Jon: And maths, then?

Della: Fractions. Algebra. Equations and things like that.

### **7.6 Adults' numerate practices outside the classroom, and the strategies and resources they draw on**

Students feel that the majority of numerate practices involve money: few use any mathematics they learn in class in their everyday lives.

The practices in the college mathematics classroom are very different from the practices of mathematicians or of those who use mathematics in the work place, and different also from the numerate practice we use in our everyday lives. As Coben et al. (2003) maintain, research on adults' numerate (or numeracy) practices suggests that they are as diverse as the learners themselves, and deeply embedded in the contexts in which they occur. Baker (1998) argues that the National Numeracy Strategy (NNS) presents numeracy as a set of pure skills separate from the contexts in which they may be used. Mathematics in the NNS is both culture- and value-free, decontextualised, abstract and always true. The same may be said of the ANCC, which is hardly surprising since it was modelled on the NNS curriculum. Baker (1998) maintains that it is based on an autonomous model of numeracy, similar to Street's autonomous model of literacy (Street, 1984). Against this view, Baker argues that numeracy should be regarded as a set of practices which individuals engage in a social setting (Baker, 1998, p 41). In other words, numeracy should not be regarded only as an individual's skills or knowledge but as a social practice in which numeracy skills, knowledge and understandings are applied for a particular purpose in specific contexts, while acknowledging the power relations in which these practices are situated.

We have also already referred to the work of Lave (section 6.4.3) who raises fundamental questions about out-of-school practices being seen as merely the application of school techniques. She questions the whole assumption that activities and settings are isolated and context-free, and some forms of knowledge can be universally inserted into any situation. Lave (1988) has shown that in settings such as the supermarket, shoppers use a whole variety of resources, many coming from the elements of the supermarket itself (such as shop assistants, labels, etc.), and these may or may not include mathematics.

As we have pointed out in section 3.2, the resources for this project did not allow us the time to spend with students outside the classroom, and the majority of the data in this section comes from self-reports during interviews, students' diaries or journals, and (to a more limited extent) students' photographs. We have also mentioned that the larger-scale ALL project has been using ethnographic techniques to chart and record adults' numerate practices, and we briefly summarise their findings below.

### 7.6.1 The ALL project: emerging findings

The majority of the research for the ALL project into adults' numerate practices was carried out by two TRs, Kathleen Gilbert and Andrew Hudson.

At Blackburn FE College, Kathleen used a short questionnaire to ask 30 adults the question 'What kind of things do you use maths for in your everyday life?' (see figure 3).

Activity	Number responding
Shopping	29
Budgeting	22
Bills	20
Holidays	18
Cooking	17
Helping children	14
Decorating	12
DIY	11
Work	10
Mobile phone	9
Health / diet	7

Figure 3: Students' common numerate practices outside the classroom

At a Jobcentreplus work-based training programme in Blackburn, Andrew used interviews and cameras with 12 adults and asked them to record the main (mathematical) activities that they engaged in during their everyday lives (including work) but these also included those practices that they avoided, or got someone to do for them.

The following practices were highlighted:

#### *Money*

- checking and calculating costs and comparing situations for value for money;
- checking change and comparing offers found in shops;
- calculating percentages and fractions of amounts;
- calculating unit costs on multiple buys such as 'two for one' or 'three for the price of two';
- checking and understanding bills, pay cheques, bank and credit statements;
- handling money in a work situation, giving change, counting large amounts and recording takings; and
- using spreadsheets (seen as useful in running a small business).

#### *Measures*

- reading and understanding metric measure;
- reading metric length dimensions on instructions or in the description of items;
- measuring length for completing instructions or checking dimensions;
- estimating and measuring weight; and
- converting between metric and imperial measures.

*Time*

- reading bus and train timetables;
- telling the time, 12 and 24 hour clocks, all formats;
- checking opening and closing times;
- timekeeping, estimating time taken for tasks; and
- checking time-intervals; timesheets, journey times, etc.

Before we discuss and comment on these findings, we would like to point out that there are a number of difficulties that occur when comparing data between two studies. For example, the differences in methods and methodology; the socio-cultural settings; and, most importantly, the learners or students themselves, who will have different identities, different motivations and may be attending for a variety of different purposes. We have already written (in section 7.3) how some of the findings from the provision of and learner engagement with adult literacy, numeracy and ESOL support in rural England project were at variance with ours, and we believe that this is likely to be due to some of the reasons mentioned above.

*The questions we asked*

In our project, the main questions we asked the students in order to try and access the numerate practices they used in their everyday lives were as follows:

- 1 Do you use maths in your life?
- 2 Would you say you use maths in your everyday life
  - (a) a lot?
  - (b) a bit?
  - (c) hardly at all?
- 3 Would you describe yourself as someone at the moment who can do maths, can't do maths or can do some maths?
- 4 [*If you do*] what sort of things do you use maths for?
- 5 Do you use any maths that you have learnt on this course in your everyday life?
- 6 In life generally, do you feel you know enough to get by on the whole but avoid things you don't know?

Again, of course, we experienced the same problem that we encountered in the previous section: that is, all the students had different ideas and definitions of what actually constitutes numeracy and/or mathematics. For example, while some students said that using a mobile phone used some maths, others thought that it was just using a mobile phone<sup>29</sup>. However, analysis showed that there was much greater consistency in the students' responses than from the previous questions on what they thought it meant to be a numerate adult. All the students said they used at least some maths in their lives; most of them replied that they used maths a bit; and nearly all said that they would describe themselves as someone at the moment who can do some maths, with some adding that they hoped to be able to do more by the end of their course<sup>30</sup>. There is also the additional problem that we saw in the contexts section 7.2 with Elizabeth's student Monica – people do not always realise they are using maths, although this again begs the question of whether Elizabeth and Monica have different perceptions of what constitutes using mathematics.

29. Anecdotally, we have heard some teachers maintain that reading the numbers, or using them to dial on a mobile phone is more of a literacy than a numerate practice.

30. We used informal interviews, rather than structured interviews or questionnaires, and so we do not have any exact figures available for student responses to these questions.

When it came to question 4, the students' responses were much narrower than those found by the two ALL project researchers. Although shopping and general money transactions were the most common numerate practices, very few mentioned data handling, time or measurement. In common with the findings of the teaching and learning common measures project, very few students regarded measurement as an essential skill: for example, if they cooked, most used pre-prepared meals or repeated recipes that they had used over the years where they estimated amounts; if they wanted to measure a window for a pair of curtains they would either use something like a piece of string or ask someone to do the measurement for them.

For question 5 we found that only a few of the students had actually applied, or felt they had the need to apply, any of the mathematics they had learnt on their current course. Of course, it might also be the case that they were unable to apply the maths. This is not to say that people do not transfer knowledge and skills they have learned in the classroom, but the instances of this with the students in this study were few and far between, apart from when conducting money transactions. Some students mentioned that they felt more confident, and were becoming more proficient in dealings with money such as in budgeting, working out bills, and in shops, particularly with regard to estimating prices of more than one item and working out their change. Overall, though, and in answer to question 6, most students felt that they were able to get by reasonably well and it seemed that they have developed survival strategies for day-to-day competency. This may involve them developing their own individual strategies for common procedures, or using other non-mathematical resources, such as reading labels or, more likely, asking other people.

### 7.6.2 Student diaries

As we have already written in section 5.5, about six students in the level 1 class at Gloscat wrote diaries on a regular basis, and these provided us with a variety of insights into their daily numerate practices, and their feelings and understandings about mathematics in general. The entries below suggest that practice of keeping diaries should be encouraged more widely and we believe that they are beneficial to both teachers and students alike. They help students develop reflective and questioning skills on what they have learnt and understood, and the progress they have made, and they also provide the teacher with vital insights and assessments about the students' dispositions towards learning mathematics, their thinking processes, methods of calculation and how they use and apply maths outside the class.

We have grouped the extracts into four categories:

- 1 Information about how the students use mathematics in their everyday life, including the strategies they use;
- 2 Information about how students think about mathematics and their awareness of numerate practices;
- 3 Information about how the student is feeling in general; and
- 4 Information about how the class runs.

As the last two categories are not directly concerned with students' numerate practices outside the classroom; we shall concentrate in this report on looking at the first two. In the first category of our analysis we have looked at how the students' diaries reveal some of the decisions they make as they apply their mathematical skills and knowledge in their everyday lives outside the classroom.

In the following extracts, the students' original layout of the diary page, and their grammar and spellings, have been left unedited.

**10/4/03**  
 After class today, I went to the Health Store to get some Glucosomine capsuls. As I take 1,500mg per day, and the highest mg sold is 1,000 I had to decide whether to get 1 large bottle of 1,000mg and 1 Large bottle of 500mg. But they had some much smaller bottles of 500mg which were reduced in price, so should I get those.

I need to decide how the smaller bottle contents would work out with the large bottle contents, ie how many and which would be the most economical buy.

Figure 4. Student's diary entry

**19/6/03**  
 Worked out my change for the bus before the driver did – we both ended up with different answers! Worked it out again and had the correct answer.

Working out how much medication I have left for the week and getting it up ready for a repeat prescription to hand in to the doctors.

Also worked out my benefits and how much money I have left to pay off my laptop. (have until July) I will have to be careful next week with the money I have to spend on food – I've taken my 3 last shopping bills and worked out an average amount I've spent (done this by adding three amounts together and dividing by 3 to get the answer).

Figure 5. Student's diary entry

The diaries also show the teacher that some of the students are actually thinking and working with mathematics at higher levels than their classwork might suggest. They also reveal how numerate practices are set in social contexts, and involve skills and strategies of negotiation.

**December 2003**  
 Have see a house I want to rent, Have to save up £200 for a holding deposit, the £575 deposit then £675 for a month in advance then £141 for admin fees so lots of saving up to do!

**January.** – Have managed to save up £1,200 so am now able to put deposit down and get keys for New House. Put deposit down and get Keys for New House. Just have to pay Somebody Some petrol money for moving me.

**9/1/04** Finanally moved!

It took 4 Loads + 2 car loads to move all the Contents of the house. Only had to pay the chap £30 for the use of his Van + petrol. Not bad as all the Van hire Places I checked out you had to pay £80-90 for the Initial hire of the Van + Insurance + bring the Vehicle back with a full tank So I recon I had a bargain!

Figure 6. Student's diary entry

In the second category we looked at how the diaries exhibit how much some students actually think about mathematics, and how aware some are of the numerate practices around them.

**12/6/03**

Missed Maths and went as my mums carer to Weston-Super-Mare. Weston is 62 miles .... 99.785 kilometres from Gloucester. There were 150 people from Shepard House on 3 coaches. 17 wheelchairs. Our coach had 28 passengers. It was a lovely day out the weather was sunny. The journey took 1 hour and 17 mins going down and 1 hour and 23 mins coming back.

Figure 7. Student's diary entry

### 7.6.3 Student photographs

At NRDC's conference in December 2003 we heard Andrew Hudson talk about how he had asked some of his students to take photographs of artefacts or events that involved them using numeracy and we had been struck with the results. Although, as we have mentioned in section 5.5, we were generally disappointed with the photographic end products in our project, nine students took up our offer of using a disposable camera to record examples of what they regarded as showing/being numerate practices. In many ways, we feel that the disappointing number of photographs taken reflects the invisibility of maths in the practices of everyday life (see Coben et al. 2003). The majority of the photographs returned were of shop signs using numbers and mathematical concepts such as 10 per cent reductions, half price sale, or tables showing currency conversions. Some also took photos of mobile phones, cookers, and dashboards in cars. One female student took several photographs of a hydraulic bridge as she wanted to know how it worked. In her diary, she wrote that she knew it involved weight, balance and counterbalance but did not know how.

Another student, Peter, sent Jon an e-mail containing a photograph of a food label (figure 8). We have already come across Peter in the section on students motivations section 7.3, telling Jon how he used to get embarrassed in shops when he did not know how much a particular item cost.



Figure 8: Student's photograph of a food label

When Peter discussed the Cheddar Cheese label with Jon, it soon became clear that he got confused over the pack price and the prices per kg, and was not sure whether he needed £1.64 or £3.96 to pay for it. This was a common theme with a number of other students, such as Trudy, whom we shall meet in the next sections. In fact, the label contains a whole series of numerical information, much of which requires an understanding of mathematics at Level 2 and beyond to be able to appreciate its full meaning. Apart from the pack price and price per kg, it shows the weight (as a decimal fraction of 1kg), and nutritional and energy values (in decimal fractions and kilojoules) which are given for the total pack size and for an average portion, deemed to be 30 grams. In addition, there are numbers contained within bar codes: telephone numbers of Sainsbury's head office, storage information, sell-by dates, and some numbers for which the meaning is unclear, such as the number 3 in the small circle above

the medium sign in the top right hand corner (in fact this denotes the strength of flavour of the cheese). We wonder how many people in the population have a full and comprehensive understanding of all the information given here?

There are two pieces of writing in the appendices on NRDC's website (see appendix L and appendix M) that describe and analyse trips undertaken by the researchers with students outside the classroom. Both students are from Gloscat: the first piece, by Jon, describes a shopping trip; the second, by Debbie, concerns an afternoon at bingo. Although it may be thought that both settings have the potential for the students to use a variety of numerate practices, they show that the strategies and resources they both draw on have very little to do with mathematics.

## 7.7 Experiences of schooling and anxieties on returning to study

### 7.7.1 Schooling

Schooling often has a profound influence on learners' orientations towards mathematics and the education system in general and it comes to form part of their habitus.

Viv: If you spend all your life being told you can't do something, I think it sticks with you after a while.

Jon: Told by whom?

Viv: Well, you get it from... I had it from school you can't do that. And some things stick with you.

Many of the adults in our study who have returned to study numeracy view themselves as failures. They often only have partial understandings of mathematics and carry various types of emotional baggage acquired from the previous failure in school where mathematics was generally characterised by low-level activity, rule following and procedures. Kathleen Gilbert, in the ALL project, writes of students telling her when they reached the brick wall, the point at which learning seemed to come to an abrupt halt. Around two-thirds of the students spoke of their poor experience of schooling, in the sense that they were unhappy, bullied, and/or felt that they were written off by maths teachers, usually at an early stage.

Jon: So would you describe school as an unhappy experience?

Georgia: It was. Yeah. It was. Very unhappy. I was bullied most of the way through school and it got to the point where I just couldn't take anymore.

Jon: Right, OK. You couldn't wait to leave. And what about maths at school? Did you not really like it very much?

Georgia: I did and I didn't. I found that I liked it more, if other people would let me get on with it. So it became a bit of a bore really. I never really got time to do it.

Jon: Did you feel that you fell behind and couldn't really catch up?

Georgia: Yeah, I think it got to the stage where I felt I'd gone to a stage so far and I couldn't move on from that.

Some students have spoken of a key or critical maths moment that happened at school, and although some of these have been positive, a large majority of these experiences are negative and have left deep emotional scars that have affected them in terms of their dispositions towards mathematics and their level of academic attainment.

Beryl: I had a bad experience in school years ago with a maths teacher. He made me stand up in the middle of a class and do something on the board that I didn't understand. It petrified the life out of me and made me feel really stupid and I've been petrified of maths ever since.

Another student spoke of the time when the class was made to stand up in a line and the first one had to recite their tables; if you got one wrong you were sent to the back of the line and this had left him with a deep and visible feeling of failure.

Of course not all of the students were model pupils at school and some recalled how they got in with a bad lot and used to disrupt classes or truant. Interestingly though, very few attached any blame to the school system or the individual teachers.

Jon: You got in with the wrong crowd?

Leslie: No. I'm not blaming anyone else. It was down to me.

Many students contrast their experiences of school with their current experience of maths/numeracy teaching, highlighting the smaller numbers, the amount of individual attention they receive, the relaxed atmosphere, their feelings of security and of not being afraid to make a mistake, the lack of pressure from teachers and peers, the feeling of making progress, and the generally stimulating level of work. They also remind us that they have the choice.

Jon: But you come and study maths because you enjoy it?

Carla: I enjoy it now. Its a completely different set up to when I was at school. When I was at school I had to do it. Here I don't have to do it. Its my choice to do it. And that's the difference. I enjoy doing it and I enjoy coming here.

Jon: And you enjoy the maths, the challenge?

Carla: Oh I do. I do. Last week I struggled all session with one question and couldn't get it at all. And Debbie explained it now, and it's just completely different to when I was at school. When I was at school it was written on the blackboard and if you hadn't got it then, tough. The teacher just went on with something else. Here you've actually got teachers who will sit down and explain it to you. It just makes learning so much more enjoyable.

Jon: Do you think sometimes in maths at school, once you fall behind, you've kind of had it, in a way?

Carla: Well yeah, once you'd fallen behind... I don't know what school's like now. It was the eighties. I fell behind in school in maths and that was it. I got moved down a set and there was nothing to stimulate you because they were still working with

people who were struggling with tables and basic addition and subtraction. There was nothing to stimulate you. But here you feel you are achieving all the time. Every time I come away from this class I feel that I've achieved something.

Like Georgia, many students have spoken of this feeling of reaching a critical point when they fall behind and feel that they are unable to catch up. It is then likely that they will turn to a series of other strategies and resources in order to maintain their peer group status and self-esteem, and these may include performing in front of the class and giving the teacher a hard time.

Jane: If you haven't understood the first bit, you're not going to get the third or the fourth; it's not like East Enders where you can pick it up half way through, is it?

### 7.7.2 Anxieties on returning to study

People often have feelings about it being 'the right time' to return to learning. Not all the students had any worries about returning, and the majority of those in the evening class tended to be more confident and assured. However, many students at the other two colleges spoke of their feelings of anxiety, or even fear, when they first returned to the classroom, which they saw as another institution, similar to school. This feeling was particularly acute for those who had been away from education for some years. There are feelings of inadequacy and comparing yourself to your peers, especially if they were in a younger age group. Also, the subject of mathematics itself may have a bearing with its associations from school of testing, sometimes being put on the spot by teachers, and general memories of failure.

Jon: Is it fair to say that the schooling was quite a bad experience and coming back to a learning setting was, in a way, like coming back to school?

Carmella: It was daunting, it terrified me. It really terrified me but I thought well you can't stay this way because I thought well I want to get out of the rut I'm in, I want my life to change as well.

Carmella is in her late 30s, and she told Jon that when she first walked into the classroom she immediately noticed that, apart from one other woman, the rest of the class looked very young.

Jon: And you felt what, how did you feel?

Carmella: How did I feel? I don't say it much but I tend to think a lot about ... oh what do I think? I think you're too old now, you're past it, that's what I keep telling myself

Jon: But you're not

Carmella: But I'm not because there's older than me in college

Jon: That's right, there are many people older than you. Did you feel at all out of place?

Carmella: I did because of my age [...] I was nervous at the fact that ... a lot of things were going through my mind, like I haven't got much time left and I've got to use this time, like don't waste any more years...

It is also important to point out, though, that, despite, Carmella's anxieties, she shows agency by making the determined effort to get herself out of the rut she saw her life to be in and change her circumstances.

Some students divulged to us that it often takes a lot of courage to even get through the door:

Monica: I'd convinced myself that I'd got to do something. It was a matter of like, things happening, I'd have to go into detail and you'd think I'm weird in the head, but... the first day I was at the college I stood there. And I thought – you are doing this girl. You are going to go through that door. And part of you is like – no ....

Clare: I encouraged you didn't I? I thought it was good.

Monica: And how many years ...? I started to count .... over 20 odd years [*Lots of laughter*]. And after all them years of never being in education and that apart from being in school, and you stand there and think – am I kidding myself?

Clare: I think you get fed up struggling don't you?

Monica: Yeah. Course you do.

[...]

Jon: And you were outside this door and you weren't sure whether to go in. Is that what you are saying? It was that bad.

Monica: You are a stranger and you don't know all these people. And you feel like you've got something there but you are not quite sure because it's confidence isn't it?

Jon: Of course it is. Yeah.

Monica: So you've got that first step which is pushing yourself through that door. And you are going in a room with total strangers and you don't know if you are going to make a complete idiot of yourself...

The data in this section shows that the first contact with the college, and then the teacher, is crucial, and the process of introduction should be made as smooth, welcoming and easy as possible. The data also strongly suggests, perhaps not surprisingly, that the students at Gloscat on average had poorer experiences of schooling, and higher levels of anxiety on returning to learning, than the students in the other two colleges.

## 7.8 Three case studies

This next section looks at three students, one from each college, who we are using as case studies. Although we are aware of the enormous variety in the type of student who attends numeracy classes, and students were too diverse to be categorised in any simple fashion, we nevertheless wish to argue that our case studies are representative of typical students. The three people come from different backgrounds, lead different lives, have different motivations and aspirations, and have different levels of mathematical understanding; what they have in common is that they have all joined a numeracy class in a college of further education, and all get enough out of it to make them want to keep coming back for more.

This biographical approach draws on perspectives from some of the theories outlined in section 6. Although we are not looking to use narratives to provide a formal typology, they will enable us to explore the usefulness of such concepts as the learning career, habitus, capital and the relationship between structure and agency.

In fact we have already come across two of the students, Trudy and Monica, in earlier sections. Trudy is working at about entry level 2; she has memory/retention problems and is making slow progress; she needs to prove something to herself and her mother; and says she does not use much maths in her life. Monica began the research project working at entry level 3 and by the second year progressed to take and pass level 1; she is also learning maths in order to prove to herself that she has ability to succeed after school failings. Like Trudy, she does not appear to use much maths in her everyday life. Carlton is working towards level 2; he is a very keen student who wants to move on to take GCSE and sees higher qualifications leading to more opportunities. Like the other two, he did not do very well at school and left with few academic qualifications. He works part-time as a learning support assistant in another college of education. He reports that he uses maths on a regular basis in his job and in his life in general.

These narratives allow us to exemplify more general themes which are common throughout the report such as students' experiences at school, their motivations for joining and continuing to attend the class, their identities, their approach towards maths in class, their uses of maths outside the classroom, and their future aspirations. In addition, their accounts also help us to show that, although people live within particular socio-cultural and material structures which may constrain them, and they are shaped by other structures such as gender, ethnicity and social class, they are nevertheless capable of being able to exercise a certain amount of free choice or agency (Giddens, 1984).

Most of the information comes from interview and informal conversations during the class. While Monica and Trudy attended the numeracy class in both phases, and were interviewed by Jon on three occasions, Carlton only joined the class in September 2003 and was only interviewed by Jon once<sup>31</sup>. To preserve their anonymity we have removed any references to the students' individual colleges and the names of their teachers.

The students' quotations are italicised.

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31. It was more difficult to find a time to interview people in the evening class: Jon tried not to interview during class time, some people came straight from work, and as the class did not finish till 9.00pm, most people wanted to get off home.

## Trudy

Trudy is in her early 50s. She joined the numeracy group in November 2002 and was assessed as working at entry level 2. She lives alone with her two cats and receives Income Support and a Disability Allowance. In the past she has enrolled on other adult literacy course in other parts of the country, but she first came to this college for a literacy course in 2001. She continues to attend each week although her literacy skills remain quite weak. Trudy has developed a thirst for knowledge: this year, she has started attending another basic skills class in the community; she has also done several LearnDirect Courses and has now started to go to the BBC IT Learning Centre.

From her teacher's perspective, Trudy is quite a difficult character and has a tendency to alienate other students; by her own admission she is also very lonely. Trudy appears to have very low self-esteem: when she does achieve a step in her mathematical learning she tends to dismiss this achievement and concentrate on all the things she still cannot do.

She is very aware of her limitations and is keen to explain that, as a child, she was brain damaged when her father banged her head against a wall. However, she is also quite articulate and very determined. For example, she has argued her case for having money from the student fund for travel and books so persistently that she has probably had more than her entitlement. Moreover, we shall see that many of the following extracts selected from Trudy's interview transcripts show her as having a number of highly perceptive insights.

### Family

Trudy was married but her husband left her in the early 1970s. Her daughter was taken into care at an unspecified time and Trudy has not seen her as an adult for a number of years. She has a destructive relationship with her mother who seems to be embarrassed about what she sees as Trudy's inadequacies. Trudy has frequently told her teacher and Jon that her mother continually puts her down, and that this sometimes happens in public. Her mother also frequently questions why Trudy bothers to go to college at all as she won't be able to learn anything.

### Early life and school

Trudy was brought up on a farm in Wales and at the age of seven she was sent to a boarding school. She said that she cannot remember much about it, and left at 15 without any academic qualifications. She cannot remember learning any mathematics at school at all. Afterwards she had a series of low-skilled factory jobs before getting married.

### Reason for returning to learning

Like many students, Trudy suffered considerable anxiety when she first came back into the classroom:

*People like me used to be scared, terrified to come into an English class, a maths class, or anywhere. You'd be scared stiff and terrified of people putting you down.*

Trudy says that her long-term goal is to pass an exam to prove to her mother that she can do mathematics.

*[I want] to show my mum I have got a brain and I can think of doing something and to say to my mum I can do it and not her putting me down a lot.*

Even then, Trudy is not sure that her mother will accept this as a validation of her ability. She also wants to see if she has the capability to attain a qualification in mathematics for herself, and she has referred to this on a few occasions as taking a chance.

*Why I want to study maths is to find out if I can... in a way to show myself like I can do maths and be sure of sums and things like that. [...] I'm trying to prove in my own mind something I never have a chance in my life to do. And I want to try my best and try and make my mind think.*

This is her continuing motivation to attend the class, although at her review with her teacher in March 2004 she said that she has not had the chance to prove to herself that she could do mathematics because she has not had an opportunity to use it, for example at work. The theme of the educational system giving her another chance is also a common one amongst students throughout this study. Trudy also told Jon that she liked coming to the class because it provided her with a purpose to get out of the flat. In many ways, college is a lifeline for her.

### **Working in class**

Trudy wants to be helpful which may be related to her need to be wanted and appreciated. She copies resources she comes across for other students, looks things up for other people on the internet, and prints information out. She also goes to assist people in the class when they get stuck, even if she is not always able to help.

However, Trudy can also be quite stubborn. She sometimes argues with her teacher that she is doing something correctly because she says she has seen it in a book, even though it is obvious that she has not. As part of her quest to study real mathematics, Trudy spends quite a lot of her time in the local and college library looking at maths textbooks. She has also been known to travel by bus to other libraries in different towns to get books.

This causes her teacher a problem, as a lot of the maths material she asks her to copy and work on is way beyond her current capabilities.

*Yeah with the books I look upstairs, I look at certain books up there and I wanted to do some hard ones but somehow I don't know how this gets in me, I haven't got a clue, it scares me a lot because I can do the hard ones better than the easy ones sometimes, that's why I jump when I'm not allowed to jump.*

However, her teacher has found that because of Trudy's poor literacy skills, and her lack of understanding of many mathematical topics and concepts, although she may think she is doing the exercises correctly, she has actually misunderstood what is needed.

She finds a lot of learning difficult as she has a problem memorising and retaining facts, skills and concepts. For instance, she says that the five times table is the only one she can remember. However, she is keen to understand and does not want to be shown 'tricks':

*I know how to do things but each time I want to do something there's something in my brain [...] It's like blindness. It's my mind, my brain, it's like a person's blind, they can't see. My mind is blocking the... it's blocking it.*

During one of the many conversations she had with Jon, Trudy continually referred back to her brain being damaged in an incident with her father.

### Progress made

Although Trudy told Jon that she could not tell if she had improved, her teacher feels that, in relative terms, Trudy has made excellent progress and shown perseverance with particularly difficult topics. She began her OCN Entry 2 Certificate in Exploring Number in November 2002, and although she found certain concepts very difficult, she has shown a great deal of commitment and gained a certificate in March 2004. For Trudy, this represents a great achievement, and although it may not constitute much progress compared to the majority of other students in the study, this is hardly the point. At the very least, it seems likely that studying at the college has helped Trudy to *sustain* her levels of numeracy and literacy, as well as, possibly, maintaining or improving her general psychological well-being (Schuller et al. 2002).

### Uses of maths outside class

Although Trudy has told Jon that she likes measuring and that she has measured a room for new furniture, further questioning suggests that this does not involve any techniques of measurement learnt in class or use of any formal metric or imperial units. It seems that she hardly uses any mathematics outside the classroom. In June 2003 and June 2004 Jon and Trudy went shopping together at the local supermarket; on both occasions she seemed to have little concept of units in weight. This is written up in on NRDC's website, appendix L.

Although she is aware of how much money she gets from her Income Support and her Disability Allowance, she can find it difficult to budget and has run out of money in the past. Nevertheless, when she pays for things in shops she seems to have a rough idea of how much it will cost (e.g. under £5, etc.), and makes sure she has enough money on her. She told Jon that she never buys new clothes and her largest expenditure each week is on her cats. She does little cooking for herself.

### Changing identity

Trudy is not sure whether or not she would regard herself as a student, but feels that studying is a big part of her life and has begun to plot out a learning career. It has gradually become part of her habitus:

*I see myself as a person to learn.*

Indeed this need to prove something has recently turned into an obsessive quest for knowledge. According to her teacher, Trudy spends more and more time in college – even staying on into the evening – looking things up on the internet and using sites such as FunBrain to practise her skills. She prints/copies masses of stuff; she continuously asks for more work, and spends her money buying books.

Although she still feels inhibited and dominated by her mother, she told Jon that she believes that she has gained a limited amount of confidence from studying. She feels more independent and is able to stand up for herself, although she can still feel uncomfortable mixing in a group. Returning to the classroom took a lot of courage and overcoming this fear has helped her to believe in herself again. We can only speculate what caused her to lose her confidence in the first place, but it seems likely that the break-up of her marriage, and the continual put downs from her mother have taken their toll.

*Finding myself, what I can do that I've never done before. Like I'm not used to being frightened anymore.*

Although the fear is still there, it is not so fierce. She compares facing up to one's fears to overcoming a fear of heights; it opens up and releases potential to achieve more:

*And if you've overcome that fear you can do more which you never thought you could do.*

It seems that Trudy's whole identity is dominated by the powerful presence of her mother. Her mother seems to find fault with almost everything Trudy does.

*When I'm round on my own, doing something around the town, or thinking to go out somewhere, I've got a feeling she's still with me [...] She still doesn't think I've got the brain, or the mind, to do it.*

It may be that Trudy wants to prove that she can achieve something in maths more for her mother than for herself. She certainly appears to feel her mother's presence.

*I've proved to myself a lot, but I still can't take it in. Getting there slowly, but its hard for me to take it all in, because it still nags in my head, what my mum says. People say I can do a lot of things and understand things, but it's saying them and doing them is two different things.*

### **Future plans**

Trudy told Jon that she intends to come back to the class in September, and that she will not give up. She still feels that she needs to prove to herself that she can achieve something worthwhile in mathematics. She plans to work on another OCN area of numeracy, again at entry level 2.

### **Structure and agency**

Trudy has been constrained by the circumstances she has found herself in, and although she has agency, she has often lacked any power to alter her life in any significant way. She has low levels of economic, cultural and social capital. As a child she was sent away to boarding school and her options and opportunities were further reduced when she left with no qualifications. The break-up of her marriage, the removal of her daughter into care, and the domination by her mother seem to have had a profound effect on her self-esteem and levels of confidence. She has little money, which further reduces her options. She does not work and it seems unlikely she will. Overall, her choices appear very limited. She has, though, been able to decide to return to study, and she is articulate and confident enough to argue her case to various authorities.

## Monica

Monica is around 40 years old. She joined the numeracy class in September 2002 and was assessed at working in the middle of the entry level 2 spectrum. She is friendly, outgoing and vocal. She has done various menial jobs whilst being a housewife and mother to her son, who is now approaching his 16th birthday. She is now a single parent, and lives next door to her close friend, Clare, who also attends the class. She has also studied IT and Literacy at the College, and gained a level 1 qualification in English.

### Early life and school

In her interview with Jon she mentioned how she felt in the shadow of her brother. He was much better than her at both English and maths, and she was frequently teased by him. She thinks that society is patriarchal, and in her family women were brought up to fulfil traditional women's roles:

*I was brought up in my family that girls weren't important for education. Boys that grew up... the old fashioned thing of men out at work and women just bred. So I suppose I got married young and did the woman thing, rather than seeking education.*

She went to local junior and secondary schools and left at 15 years of age without any qualifications. Although she enjoyed some of school, and remembers doing quite well at maths, she said she was put in the lower ability sets. Her perception is that the school categorised the people in these sets as being 'thick':

*It's the basic kind of thing they do in schools, where if you are in a lower class they think you haven't got the intelligence for any subject. So if you were put in a lower class because your English was not very good, then you were categorised as being thick.*

### Reason for returning to learning

Monica spent her time bringing up her son and doing a series of dead-end jobs, but shows agency when she realised that she had to do something to break out of the rut she felt herself in. A key moment seems to have been when her husband left her.

*You do get fed up with your life to a certain extent. But I think it's usually a catalyst that makes you stop and think of your life change. [...] I think you have to reach a point where enough's enough; I'm going to do something.*

However, the decision to further her education and return to the classroom was a difficult and brave one (as we saw in the last section, 7.7). A lot of this stemmed from the fact that she had been out of education for about 20 years.

*What I needed to have [was] the strength to get into doing what I want, you know if you've never done education in a very long time, putting it politely, but you're starting, it's like being slung in a big spinning pool and you're thinking oh my God where do I start, who do I ask?*

It was also from the fear of the unknown:

*It's like going to a dentist, the fear of thinking of the unknown.*

At first, Monica enrolled for a basic IT course in June 2002 which she completed in 2003. Having caught the bug for learning she enrolled on a literacy course and then felt she had enough courage to study numeracy as well. Although she has now been in the class for two years, and has made good progress, the feeling of inadequacy still remains underneath the surface:

*I think you find more in yourself and you realise you are not this waste of space, or useless, or whatever, that there is something there, you don't put yourself down as much. But there's still that little frightened bit inside you thinking – are you pushing yourself too much?*

#### **Motivation for continuing to attend class**

A powerful motivation for Monica is that she wants to prove to herself that she has the ability to study maths and succeed. As we have seen (see section 7.3) this is a common finding in our study.

*I want to see how far my brain will go.*

Success gives her a sense of satisfaction and a feeling of self-worth.

*I've always spent years thinking I'm more than what I am. I think it's a case of confidence. Proving to yourself that you are worth something.*

Now she has the chance to try and better herself and fulfil her potential. She is happy to see how far she can go with maths, possibly up to GCSE, and with her literacy classes she has begun to carve out her own learning career. She also thinks that a higher qualification may lead to a better job (in the sense of being more fulfilling and better paid). She told Jon how proud she was to have achieved her pass in her entry level 3 test in 2003, although we feel that even level 1 and 2 qualifications have little serious currency in the labour market.

*It's something people can't take away from you.*

In common with many students in our project, she also thinks that she is setting a good example to her son.

*I want him to see that his mum can do it, so whatever happens he can do it. It's encouraging for the children. I think it's good to do that.*

#### **Progress made**

She took an AQA entry 3 accreditation in June 2003 and a level 1 National Test in May 2004, both of which she passed.

#### **Working in class**

Monica has a very distinctive learning style, and finds it difficult to follow algorithms such as long division and to learn her multiplication tables. However, although she often falls back on her own tried and trusted methods of calculation, she is also prepared to listen and learn from her teacher.

*[It's] What you've relied on for years... so you stick to that because you know that gives you a hundred per cent answer.*

Monica always sits together with her close neighbour and good friend Clare, and another woman called Della. They used to support each other in class but less of this was happening towards the end of the second year. This was because they came to realise that each of them had different ways of learning and working which made it difficult to help each other.

#### Uses of maths outside class

Monica thinks that she has been using mathematics all her life, and that studying maths in class has made her realise how much maths there is all around us. Despite this, Monica is not able to list many areas of mathematics in her life outside the classroom. She is confident in dealings with money, like budgeting and working out change and comparing prices of certain items in different shops. She also uses some measurement, although she says that she does not use any measurement in cooking as she generally cooks using a repertoire of familiar recipes.

#### Changing identity

Monica is aware that she is changing as a person. She sees learning as a journey, or in her word, a road of self-discovery leading to feelings of greater self-worth (Crossan et al. 2003).

*You're alive, you're finding out who you are, maybe who I am [...] It might not just be just this 'cos things change in your life as you get older and certain things happen but doing this has helped to make me feel more like I'm worth it.*

She is proud of her identity as a student, and she feels that her qualification (entry level 3 at the time she spoke to Jon about this) has given her more confidence, a higher status, and helped her overcome her inferiority complex.

*Your attitude changes towards people as well, because as you educate yourself, or do something that builds confidence, you now don't allow anybody to treat you with disrespect. I mean, beforehand, because you think you are not good enough you would let somebody talk down to you. Now I would say – Excuse me, what do you mean by that? Rather than walk away and feel hurt by whatever they said. And I think that is the difference.*

Studying and achieving has also given her a higher self-esteem, a belief in herself, and she is proud for making herself attend the classes when she could easily have walked away.

*I think going to college is one of the steps to prove to yourself that you are not stupid, not thick. Whether you pass or fail the most brave thing is you've had a go.*

As we mentioned earlier, a key moment in Monica's life was when her husband left her. However, this gave her the incentive to return to education and make something of herself. Thus we can see that learning careers are never simply the products of rationally determined choice; they are linked to other changes in people's personal identities and are inextricably linked to other life experiences which can act as critical turning points. Jon asked her what she thought she might be doing now if her husband had not have left?

*Doing the right thing, as they say. Good wife, put up and shut up. Whereas now I look back and I think, I can see their relationship. And he's just swapped one thing for another, and not moved on. Whereas I can see what I've done in the last three years, compared to what he's got now, and he hasn't moved or improved or [...] And you can*

*see sometimes the regret is in his face, and you think – don't even go there. The change. Even if he turned around tomorrow and said he wanted to come back, I couldn't. You've changed that person. I think you've grown, the longer you are away from somebody. [...] Sometimes I feel, and it's horrible to think it, but I'm not what he would need anymore. Does that sound awful to say? ... you could crush him. In the way that I always was too strong in my ways, but wouldn't let the real person out. But now I'm out I refuse to go back to that put up and shut up... And I'm loving it and the longer you go... You are learning to love yourself, because I think nobody can like you until you start liking who you are.*

So we can see that studying has transformed her; she has moved away from her husband and has discovered herself, found herself. I asked her what part studying has played in this?

*You are doing it for yourself. What I'm doing is to improve me, to find me, it's to give to... and by doing that I'm giving to others.*

Although the others are unspecified, it seems likely that it includes her son, to whom she thinks it important to act as a role model. She may also mean society in general, as she can encourage others to go to classes and reap the rewards as she has.

She also acknowledges that education can lead to increased opportunities, although she stresses that the teacher is a key constituent in this:

*With the right keys you can open any door. Depending what teacher you've got.*

### **Future plans**

Monica is not sure what she is going to do in September. In the early spring of this year she talked about doing some voluntary work and wanting to find some other interests, after passing level 1 she has decided to enrol again in order to work towards a level 2 National Test which she hopes will, possibly, lead to a GCSE. After her son's 16<sup>th</sup> birthday she says that she will support him through college.

### **Structure and agency**

Like all of us, Monica does not live in circumstances of her choosing. In her childhood she feels that the girls in her family weren't pushed or bothered with, and were expected to conform to certain subservient roles. In the early part of her marriage, she speaks of it being her duty to have children, to bring up her son, to set him the right example, and try and make her marriage work:

*When you're being a wife, you're being a wife, it's a duty to a certain extent.*

She also recognises that her working class background, lack of money and qualifications (lower forms of economic and cultural capital) have limited her options and opportunities, particularly in terms of getting employment which is interesting and well paid. In one way she sees her life as being a series of events that lead you in a particular direction:

*The right background, starting a job, getting a career. It's just the events that lead you into it.*

If things had been different she would not be in her current class today.

*I wish I had the support that I give my son. No, I wouldn't be sitting here. I'd have a better life.*

And yet, despite of all the disadvantages Monica had had in her life, she remains cheerfully optimistic and there is little hint of either regret or bitterness in her tone. She has a limited amount of agency and power which gives her the opportunity to take a certain amount of control of her life. Unlike Trudy, she has more support from her family and friends. In many ways, she has turned the event of her husband leaving her to her own advantage. Although this could have forced her into a downward spiral it seems to have given her the agency to kick-start her into education where she is engaged in the process of proving to herself that she has the ability to succeed.

*In yourself I think you come to the point where you lose yourself or start fighting back and changing.*

And as she pointed out, this is an individual decision, and for her agency is linked to an individual's own responsibility.

*It's you who chose to come to here, in some ways nobody forced you.*

## Carlton

Carlton is in his late 30s. He joined the numeracy class in September 2003 and was assessed at working at between level 1 and level 2. He is a quiet, rather shy and reflective person. He is single and for the last four years he has been working full-time as a learning support assistant in another FE College, helping in a range of numeracy and ICT classes at Foundation level.

### Early life and school

In his interview with Jon, he did not speak much about his early life. He went to school locally and said that he enjoyed it, although he left without any maths qualifications. It was a time when pupils were divided up into O-Level and CSE groups and Carlton passed 4 CSEs. This effectively meant that he was prevented from taking A-Levels and/or going on to university. He has lived in London all his life.

He fell behind in the maths classes and eventually felt written off.

*Maths was one of those classes I messed about, because if I didn't understand something I was embarrassed to ask the teacher to explain. So I just coasted after a while... opted out. At the time it was taking me longer to understand it. And therefore it was easier just to...*

### Reason for returning to learning

He maintained that he was not worried about returning to study maths. At his initial interview he told his teacher that the main reason he wanted to take maths was to brush up his skills and to then go on to take GCSE. He narrowly failed to get the required mark on the assessment for the GCSE class, and came to his current class instead.

*Well, I've always been weak in maths, and I've always wanted to get better. I liked school but I never really felt I mastered it, and I'm getting older now, so I need to get a hold of it, get to grips with it, and understand it. And of course it helps with my job, and in your everyday life, I think.*

During the year he has found that he really enjoys learning maths. Like Trudy and Monica, a major reason for attending class is that he wants to prove to himself that he has the intellectual/cognitive ability to study and succeed at maths. For Carlton, this means that he needs to pass GCSE with a good grade (at a higher level), and he told Jon that he was determined to give himself the chance.

*It has become a personal challenge for myself.*

### **Working in class**

Carlton is a model student: he never misses a class, is meticulously punctual, is well organised, takes lots of notes, and works extremely hard throughout the session. He likes to be able to mark his work himself, and is good at identifying his own weaknesses. He has excellent reasoning ability and general problem solving skills; he has a very quick, agile mind, picks up new concepts very quickly and races ahead. However, he also likes working with other people, and is very good at explaining and thinking aloud. He is very independent and self-contained, and tends to be able to go further and faster and need more extension work than most others. However, he also says he needs time to consolidate what he has learned, and if he has the choice, he will usually opt to work with a partner. Carlton clearly enjoys the whole experience of the class, including the social interactions.

*The learning is good. The learning is very good and the group is very good as well, very supportive. [My teacher] is very supportive. There's a good group dynamic there. I think everyone is allowed... everyone helps... not that we work too much with each other. Everyone does support... there's no criticism of one another.*

He enjoys the challenge of new work. He feels satisfaction when he is able to see the mathematical patterns and relationships, and he really wants to understand the principles behind it.

*It [maths] causes my brain to tick over, as I'm so unused to doing this. It makes me really think. And I can feel my brain ticking over, three different dimensions, fractions, converting it to fractions and decimals and percentages. I like doing that. You know an old skill, that you haven't used in a while, and you have to use it to get more dextrous at it. I'm enjoying that part of it. And that, in itself [looking at an algebraic equation he is shown] ... algebra I found very interesting because it was just very nice to see how one thing leads to another and it was just very logical, the way it works.*

For Carlton, maths represents knowledge and an entry into the esoteric mathematical community.

*I do like the knowledge. This represents knowledge, and it's nice to learn that.*

### **Progress made**

His teacher feels that Carlton has made excellent progress this year, not only academically, but also in terms of confidence. He sat a National Test level 2 exam in the summer.

### Uses of maths outside class

Unlike Trudy and Monica, Carlton feels that he uses mathematics on a regular basis, and he also has a job which requires knowledge of mathematical knowledge and procedures. In common with nearly all the other students in the project, he uses maths in shopping and for money transactions. However, he also says he uses it for measuring and cites a recent occasion when he needed to measure the dimensions of a room to fit a carpet. He is also into DIY and so is aware of the cost of a tin of paint, and how many tins he needs to buy to paint his walls.

### Changing identity

Like Monica, he is happy to describe himself as a student, that is, someone who receives tuition and guidance.

*I see myself as... well, I don't like to, but I see myself as receiving help. Not knowing all the answers, and therefore having to be directed in how to do this. So that's definitely how I see it.*

Although he feels that learning maths/numeracy has contributed positively to his own self-image, he does not feel that he has changed as a person in any significant way. However, like Monica, he sees himself being involved on a learning journey (Ward and Edwards, 2002) or in a learning career (Crossan et al. 2003) which began at school; he has set himself the goal of achieving a higher grade in GCSE maths, and he regards this as unfinished business.

### Future plans

His longer-term goal is to get a good pass in GCSE Maths, and his teacher's assessment is that he should be able to embark on a GCSE course with real confidence. He was thinking about taking a teaching qualification but has now decided against it.

### Structure and agency

We do not know how Carlton's home circumstances have affected his learning, or how much family support he has received but, like Trudy and Monica it seems likely that his options and opportunities have been limited by lack of material wealth and low resources of social and cultural capital. During this project it struck us that there were a number of students who had gone to school in the 1960s and 1970s and were only allowed to take a CSE qualification rather than O Level (today's GCSE). Although a CSE Grade 1 was supposedly the equivalent of an O Level pass many pupils were effectively prevented from taking an A-Level and the possibility of going on to university. On his teacher's assessment of him, and from Jon's observations, Carlton is a quick, dedicated student who is more than capable of achieving a higher pass at GCSE. However, when Jon asked him about this in interview he appeared quite certain that this had not limited his options and/or opportunities in the job market.

*No, I don't think so. No. I don't believe so. Not at all.*

Interestingly though, he made a comment to Jon that he is grateful that the education system has allowed him another chance (which we also saw with Trudy), the opportunity, to study maths and take a GCSE. The college has given him a chance to fulfil one of his dreams.

## 7.9 What makes a good numeracy teacher? – from the student’s perspective

One of the other questions that we have been interested in is what constitutes effective practice in adult numeracy? Effective or good practice is inextricably linked to good teaching which is likely to make learning more meaningful. We thought that some of the best people to ask what makes a good teacher were the students themselves. The great majority were likely to have received well over a thousand hours of mathematics teaching during their school career, and many had also attended maths/numeracy courses as adults. Thus, they were well placed to compare good and bad practice and were very clear about what qualities they felt a good maths teacher should have. We found many to be highly perceptive and articulate. Although they may not have known much about theories that inform teachers’ practice, many had a very good understanding of pedagogical issues and processes.

Many students were aware that there is more to teaching than instruction; it is about really understanding, and taking account of, the students’ different needs.

Gurpreet: I think a teacher in maths, should understand the background of the student, this is the main thing, if the teacher knows the background he [*or she*] can more go slowly or understand because some students, they never had maths, and you can’t just quickly explain things, so then you have to step back and try to be patient to understand the way how they understand, I think it’s quite important if the teacher understands this, every teacher can teach good but some teachers, they are just teaching, you know.

Like the researchers, students felt that the role of the teacher in the numeracy classroom was critical. Teaching consists of a series of relationships, and good relations between the student and teacher are absolutely crucial if effective learning is going to take place.

Joe: If you don’t like the teacher, you ain’t gonna learn nothing.

Although Jon carried out the majority of the interviews, the TRs also asked their own students questions. We realise, of course, that during interviews, most students are going to praise their own teachers and speak of them in complimentary tones. Few will want to make disparaging remarks to the person who is going to continue to teach them every week and assess their work. To get round this, the TRs often asked their own students to talk in general terms, of what they thought made a good teacher, but they also put the question the other way round: What are the characteristics of a bad teacher? What would they be like and what kinds of things would they do? Below is a summary of the main points which emerged from their conversations with us. Later in this section we shall illustrate some of these points with a selection of interview data.

A good teacher:

- creates a comfortable, non-threatening atmosphere;
- has a positive attitude and high expectations;
- makes learning fun;
- is able to keep students on their toes (provides challenges, keeps them engaged, interested and keeps their attention);
- knows what helps the students learn and what background they come from;
- knows what stage each student is at;

- matches the work to the student's ability (differentiation);
- makes sure students do not fall behind;
- has good subject knowledge and is well prepared;
- teaches for understanding;
- is able to break work down into stages;
- recaps work from previous lesson(s);
- is well prepared;
- communicates well, in different ways, to different people at different levels;
- is able to explain things clearly;
- gives good feedback;
- uses/incorporates real life experiences as opportunities for learning;
- gives the student space and time (is able to stand back and allows the student to think; doesn't ask a question and provide the right answer before the student has had time to think and/or answer);
- does not make the student uncomfortable by crowding them, physically; and
- incorporates collaborative learning with discussion, and gets students to explain concepts to each other.

### 7.9.1 Students' voices

The next section gives a fuller voice to the students' opinions with extracts from interviews. We have come across some of these students before in previous sections.

The students feel that teachers should have a number of key personal qualities: they should be patient, tolerant, friendly, have a sense of humour, be able to offer encouragement and build up trust. They should also be sensitive to students' feelings, treat them as equals, not be patronising or put people down, make them feel stupid or talk down to them.

#### **A good teacher:**

**Creates a comfortable, non-threatening atmosphere; has a positive attitude; makes learning fun; is able to keep them on their toes (provides challenges, keeps learners engaged, interested and keeps their attention)**

Rija: You [*to the teacher*] make the maths that you would want to do it, you give us challenges and we want to do those challenges, it's the way you put the maths in.

Nicola: A good teacher is a person who knows how to keep your attention and knows how to keep you on your toes. But at the same time keeps it fun, because maths can stress you out.

#### **Knows what helps the students learn and what background they come from**

Nicola: A good teacher is basically somebody who can look at a person, know their specific needs and focus on those needs.

Trudy: She gets to know you, I think she realises what you are like and then she will choose words to explain. Like, she gets to learn the students and then she knows what they are capable of.

### **Knows what stage the student is at; matches the work to the students ability**

Nicola: A lot of teachers don't realise that students learn at different paces. And one thing I like about this class is that we are all doing something different. Not all of us are doing the exact same thing. So if you are a little higher than the next person you keep working ahead of that person, but if you are behind another person, you know, you can work at your own pace.

### **Makes sure students do not fall behind; teaches for understanding**

Thelma: I think with Barbara's teaching methods, she makes sure everybody understands. If someone is not quite sure she will ask a question and say – do you understand that? And if you are not quite sure she will go over it. But she makes sure nobody's falling behind. She makes sure everybody understands before she moves on to another topic, which I think is a very good thing.

### **Has good subject knowledge and is well prepared**

Graham: Someone who knows what they are talking about...I think the teacher needs to be very sure of herself. She needs to know the subject. There's no point coming and standing in front of the class who are going to ask a question you don't know. I think you need to have everything at your fingertips, and be able to inspire confidence.

### **Is able to break work down into stages; recaps work from previous lessons**

Jane: Good teaching is checking whether people understand, not taking knowledge for granted, it's doing it slowly, breaking it down step-by-step and being prepared to go back, and start again.

### **Communicates well, in different ways, to different people at different levels; is able to explain things clearly**

Thelma: [*Good teaching is*] actually getting to know the person, understanding their levels. And it's the way you can explain. It's a good quality I found in Barbara, in that she treats everyone the same, but I've noticed how she words things for certain people. She'll think – oh I don't think you'll understand that term. So she uses another term.

### **Uses/incorporates real life experiences as opportunities for learning**

Nicola: [*Teachers should*] make it fun, and incorporate things in every day life. Like, earlier you did something like that, you were like – well, if I lent you £2, you are in the negative balance, and if I lent you another pound, what do you have?

Danielle: I find using every day life experiences would be an asset in the classroom with a teacher because then she's bringing something or he's bringing something which is a reality to everybody. For example, a clock, instead of her just using the numbers and drawing the diagram on the board, asking different people What time do you get up? and then she may pick four people and do four clocks

and everyone would say, Right I get up this time, 08:35 or 08:40 or 09:10, so she is throwing up different areas of the clock angles of the hands, therefore, then she would say, How long does it take you then to get changed? Do you see what I mean. She is using real life people, real life incidents and everyone is involved, everyone is awake, there are no dead people, everything is involved interactively and I find that's very important.

**Gives the student time and space (is able to stand back and allows the learner to think; doesn't ask a question and provide the right answer before the learner has had time to think and/or answer)**

Clare: See Elizabeth does that. She'll go to the board and show us things that are on there that we have to do and then she leaves us alone until we ask, or she'll just come around to check how we are doing.

Maria: You need to say I've given her what she needs to know. I'll back off a minute and let her have some time to think.

On one of Jon's visits to Elizabeth's class, he had been helping a student earlier on, and Monica had noticed that he had been intervening too quickly. This is another example of a student's perceptiveness.

Jon: Do many teacher do this?

Monica: No, not all maths teachers. But I've seen you partly do it with the young lady here. You are so willing to want to help her and wanting her to get the answers, you are literally thinking for her. You can see you are doing it. Instead of – I've given her what she needs to know. I'll back off a minute and let her have some time to think.

Jon: That's a very astute observation. It's true. And I'm certainly guilty of that as a teacher.

Monica: No, you are good in a lot of ways that I've seen, but.../

Jon: The message is give people more space, more time.

**Incorporates collaborative learning with discussion, and gets students to explain concepts to each other**

Nicola: Especially in maths there's not a particular way to do something. So the next person might do it different from you, so you might be able to take their ideas and your ideas and combine it and come up with something completely new to do.

Sam: Working with Freda really helps me. I know she thinks that I'm better... because she said – oh, you are better than me at maths – but there's some things she's done that I missed last year, that she did, that she's helped me a huge amount in.

- Barbara: Can you say why you think it helps to work with somebody? Or to work with other people on maths?
- Sam: Because things you think you know, that are right, when you are listening to someone else and how they've got to that answer, you realise that it's not right, or there's another way to do something.
- Barbara: And do you think it helps you, sometimes, to explain something to another person? Does that...?
- Sam: Yes. That's a brilliant learning process. Because that's how I learnt maths with my daughter.
- Jane: In the adult class we were encouraged to help each other. It was, take this problem away, go and sort it out, do it between you, learn from each other, listen to each other, I think that's really important.

### 7.10 Summary of key findings

- Teaching becomes meaningful when it is linked to an individual's purpose; what makes maths meaningful is the quality of an individual's engagement with a problem rather than its utility; the majority of students do not want to come to learn how to read their gas bills. Thus making maths real for students does not necessarily mean using everyday maths.
- Although students bring their life histories to the class they are generally not interested in bringing specific mathematical contexts.
- Students' motivations are varied and complex but few come to study maths because they feel they lack skills in their everyday lives. The main triggers are to prove that they can succeed in a subject where they have previously experienced failure; to help their children; for understanding, engagement and enjoyment; and to get a qualification for further study.
- Learning maths has the power to change who people think they are; despite being constrained by their surrounding structures, such as social class, they are capable of developing new dispositions to learning and new aspirations.
- People all have different perceptions and definitions of what being numerate means but usually refer to it as the basics.
- Students feel that the majority of numerate practices involve money: few use any mathematics they learn in class in their everyday lives.
- Making the decision to return to formal education can be a daunting experience for many adults; however, when maths is taught well, and once students see that learning maths can be fun, many will become thoroughly engaged.

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## Appendix 1

### The research team: contact details

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## Appendix 2

### Student interview schedule (version 16; 1 November 2003)

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The Q numbers (eg Q 1) refer to the specific research questions

#### **Background**

How long have you lived in [eg *Gloucester*?]  
How long have you been studying at this college?  
What other subjects are you studying at the moment?  
What, if any, has been your most recent paid work?  
If you have worked, was it full-time or part-time?  
Have you got a maths qualification? O'LEVEL/GCSE/CSE/any other certificates?

#### **Q 2 Motivation for learning numeracy**

Can you tell me some of the reasons why you have chosen to study at this College  
And why, in particular, are you learning/studying maths? – What is the main reason?

#### **Adult learning in institutions**

How long have you been coming to adult education classes/vocational courses?  
Have you taken maths classes before as an adult?  
Have you ever dropped out from a maths course? If so, what were the reasons?  
How long had you been away from studying?  
Can you describe some of your feelings when you first came back to study? (were you anxious?)  
What did you expect?  
Did anyone encourage/discourage you?  
What do you think of the Gremlins campaign?

#### **Learning numeracy at school**

Tell me about your life at school.  
What kind of pupil were you?  
What can you remember about learning maths at school?  
– any particular teachers?

#### **Learning numeracy**

How do you feel about maths? – in the past/now?  
Has your learning of maths been enjoyable, rewarding, frustrating? (other adjectives)  
Have you/do you feel any pressure?  
What do you feel you need to know/learn about maths?  
What do you think stops some people from learning/achieving in maths?  
Do you ever enjoy learning or doing maths just for its own sake, your own enjoyment and personal satisfaction? (e.g., a number, or other type of, investigation)  
Do you find/think using apparatus (eg fraction cards, a number line, measuring jugs, scales, etc) helps you learn more easily?

If so, in what kind of ways?

Where else might you have learnt maths, apart from school/college? at home, the community, in a particular job? i.e. involving money, measurement?

Do you ever panic (or get anxious) about maths, or in a particular situation?

Can you give some examples?

Has there been a particular key moment or turning point in your learning of maths? – either something that turned you on or off (can be positive or negative)

What do you think makes a good teacher of maths?

– key characteristics?

And a poor teacher?

Have your feelings towards maths changed during this course?

The immediate context and area of learning

What is the best thing (the thing you most enjoy) about coming to this class?

Is there anything that you don't like about it very much?

Is there anything that you particularly like doing/don't like doing?

Has your attitude changed towards maths since you have been taking this class/course?

How do you feel about coming now?

What do you get out of coming?

Is there anything you like to change?

**Q 1 Is there any maths that you use, or would like to use, in your life outside the classroom that you would like to bring into the classroom to work on and improve (or learn more about). Does this ever happen? If so, can you give me an example?**

What do you do if you meet a problem that you can't do in the class

– ask the teacher, a friend, ignore it?

Do you ever use your own methods when it comes to calculate a particular sum? (as opposed to the ones you've been taught).

Are you happy to use your own methods?

Do you ever feel uncomfortable or uneasy when using your own methods?

Are you happy to just follow the rules that the teacher tells you or do you really want to understand?

Have you got any certificates (or equivalent) for any maths that you've done as an adult?

If so, what do they mean to you?

How does FE teaching/this class compare with what you've done before (at school)?

Do you rely on any particular person to help you with any maths that you are unable to do?

Or: What areas of support for learning maths do you use if you can't do something?

– family, friends, relations, co-students, co-workers?

Do you get asked for help by others? – maybe by your children?/others?

Do you feel that you are making progress? If so, how do you know?

**Q 4 What do the words maths and/or numeracy mean to you?**

**Q 4 The government's definition of numeracy (taken from *A Fresh Start*) is to be able to use mathematics at a level necessary to function at work and in society or life in general.**

– what does this mean to you; what kind of maths do you think this would involve for you?  
Would you describe yourself as someone who can do maths, or can't do maths, or as someone who can do some maths?

OR:

In life generally, do you:

Feel confident to tackle most of the maths you come across?

Feel you know enough to get by on the whole but avoid things you don't know?

Feel you haven't done things because you're worried about the maths?

Do you think that you are born good at maths, or can you learn to be good?

Do you think people use less maths today than they used to?

**Q 5 G. Using maths outside the classroom**

What maths do you think you need in your everyday life?

**Q 5 What maths do you think is really useful?**

**Q 5 Have you used any of the maths you have learned *here* (in this class) in your day-to-day living or at work?**

– can you give an example?

**Q 5 How much maths do you use in your everyday life? Whereabouts, and in what kinds of ways?**

**Q 5 When do you use your maths skills?**

**Q 5 What is the hardest/most difficult bit of maths that you've had to do recently?**

**Q 5 What difficulties do you have in everyday life with maths?**

**Q 5 Have you ever used maths skills in a job, or in our job hunting?**

– What difficulties (if any) have you had?

**Q 5 Do you ever use a calculator or a computer to help you with your maths?**

- if so, how often, for what kinds of things?
- do you ever use the internet?

**Q 3 Identities**

About yourself, outside the class:

What do you like to do in your spare time?

What kind of places do you like to go to?

Have you got any particular interests and/or hobbies?

Have you got any particular tastes in music/fashion/sports games etc?

Have you got any heroes, people that you particularly admire?

– give reasons

What kind of person do you see yourself as? Can you describe yourself in a few words?

Have you got any particular friends in this class?

Have you made these friendships since you have been in this class?

Do you ever see them outside of the college?

Did you know any of them before?

Do you feel that you have any sense of belonging to this class and/or this college?

Does studying (maths)/coming to college give your life a particular/special purpose?

**Q 3 Since coming to this class, or this college to study, would you say that you are changing/developing, or have changed as a person?**

- in terms of confidence, becoming more independent, more self-sufficient?
- less so?

How important do you think having confidence is to learning (things)?

Does studying here give you a certain sense of freedom?

**Q 3 Can you describe yourself in three or four words?**

(PROMPT IF NECESSARY)

(eg confident, shy, a worrier, relaxed, sensitive, hard-working, etc.)

Would you/do you describe yourself as a student to other people? How big a part is studying and being a student in your life at the moment?

Is it more important to you than being a (eg *depending on the person* – a mother, a father, a worker, etc?)

**I. Personal aims and expectations**

What are your aims/aspirations? – at the moment, longer term?

Will this course play a part?

Have you something like a five-year plan

**Qs 5/6. J. Learning and use of numeracy outside the classroom in everyday life; at work; home; in the community**

In your everyday life, what is the hardest/most difficult bit of maths that you've had to do recently?

Do you use a credit card?

Do you use a cash point machine?

Do you have a mobile phone? Do you think it involves using any maths?

– what kinds of decisions did you make when you bought it (offers, deals, type of payment, etc).

If you see a sign saying 10 per cent (50 per cent) off, what does that mean to you?

Could you work out the amount you would save?

(eg 10 per cent off a pair of jeans costing £50?)

Do you understand what inflation is?

Do you know what the current rate of inflation is?

What types of maths do you use at work, in your home, in the community?

How do you use maths at home, workplace, community, etc?

Telling the time, knowing about time?

(eg setting a video recorder, an alarm clock)

Shopping

Helping children with their homework?

Cooking?

DIY/hobbies?

Decorating

Sport?

Health/diet?

Ordering from a catalogue? – clothes, equipment, Christmas cards, etc

Holidays?

Gardening?

Your mobile phone?

Paying bills (eg Council Tax)

Pets? If so, do you know how much you spend on them each week?

What are the main kinds of things that you spend your money on?

Food shopping

Clothes

DIY/hobbies

Rent

Buying cigarettes

Drinks/drinking?

Mobile phones

Music

Do you ever estimate or guess, maybe the cost of things, or the length of something?

Do you have a budget?

Do you know how much you spend on food a week?

Do you know how much you have spent at the end of the week, month?

What about at work? What maths do you use (now, or in the past)?

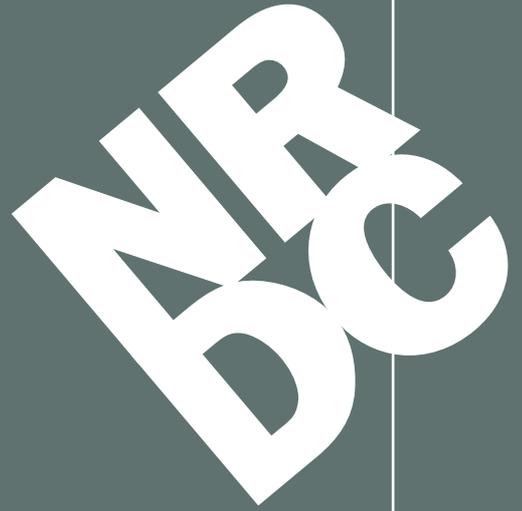
# Glossary

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## Acronyms and abbreviations

ALL	Adult Learners' Lives Project
ALM	Adults Learning Mathematics – A Research Forum
ANCC	Adult Numeracy Core Curriculum
ALI	Adult Learning Inspectorate
CPD	Continuing Professional Development
ESOL	English for Speakers of Other Languages
GCSE	General Certificate of Secondary Education
ICT	Information and Communication Technology
ILP	Individual Learning Plan
NRDC	National Research and Development Centre for adult literacy and numeracy
OCN	Open College Network
PGCE	Post Graduate Certificate in Education
SATs	Standard Assessment Tests taken by pupils at the ages of 7, 11 and 14
SfL	<i>Skills for Life</i>
TES	Times Educational Supplement
TR	Teacher-researcher
VT	Visiting Tutor





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