A willing suspension of disbelief? 'Contexts' and recontextualisation in adult numeracy classrooms

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Abstract

While a substantial body of research suggests that adult numeracy and literacy learners possess funds of knowledge and informal practices, it is not always clear to what extent these might be used in teaching and learning. In this study of linguistic interaction in adult numeracy classrooms, analysis of naturally-occurring student-student collaborative discourse is used to argue that mathematical word problems, even when designed for adults, do not draw on these funds of knowledge and out-of-classroom practices, and instead require a 'willing suspension of disbelief' by learners. Nonetheless, the adult students show a sophisticated level of metacognition and skill in handling the word-problem genre which might indeed be acknowledged as part of their funds of knowledge.

Key words: adult numeracy, word problems, funds of knowledge, peer-peer discourse, discourse analysis

Introduction

> A semblance of truth sufficient to procure for these shadows of imagination that willing suspension of disbelief for the moment (Coleridge, 1817, p. 442)

Mathematical word problems, based on everyday contexts such as the workplace, the home and the community, are the basis of assessment materials for nationally-recognised adult numeracy qualifications in England. This reflects policy discourses which suggest that adult numeracy learning should be functional and lead to increased employability and economic effectiveness (DfES 2001; DIUS 2007; DIUS, 2008). In one strand of my research into peer-peer discourse in adult numeracy classrooms, I was interested in whether the contexts used in such word problems were meaningful to adult learners and what affordances students were given to draw on their own out-of-classroom practices.

My approach involves the audio-recording of naturally-occurring student-student discourse generated during collaborative group work. Analysis of this discourse provides fresh insights into the students' experience of learning, and into the knowledge and practices they bring to the classroom and share with other students.

In this article I draw on two short episodes of talk during which students work together on word problems, and I critically analyse the text of one of these word problems. I use these analyses to consider: the relevance of the word problem genre to adult numeracy students; the extent to which the 'contexts' provided by such word problems may be regarded as meaningful to students; and the metacognitive and interpersonal practices which the students bring to bear on finding a solution.

Background

Skills for life in England

My discussion is located within the context of current policy for adult numeracy education in England; the *Skills for Life* agenda (*Department for Education and Skills [DfES],* 2001) and the new impetus given to it by the recent *World Class Skills* and *Numeracy for Employability* strategies (*Department for Innovation, Universities and Skills* [DIUS], 2007; 2008). Central to these strategies have been core curricula for adult literacy, language and numeracy, and a system of standards and nationally-recognised qualifications (Basic Skills Agency [BSA], 2001; Qualifications and Curriculum Authority [QCA], 2000). Funding is dependent on learners' achievement of these qualifications, and there is a strong focus on skills for employment.

While measures which raise the profile of, and funding for, adult literacy and numeracy provision, are to be welcomed, the strategies have been critiqued for their neo-liberal emphasis on economic effectiveness and workforce development; the deficit view presented of adult learners; and the prioritisation of funding for adults who are close to gaining accreditation rather than those with the greatest need (for example Papen, 2005; *National Institute of Adult Continuing Education* [NIACE], 2007; 2008).

One of the underlying assumptions made by current policy is that numeracy (and literacy) for adults should be functional and relevant to real-life. This is expressed through the core curriculum, with its repeated references to terms such as 'straightforward', 'everyday', 'familiar' and 'practical' to distinguish adult numeracy from more esoteric and higher-status forms of mathematics (Oughton, 2007). It is also reflected – and this is what concerns us here – in many of the learning and assessment materials available to adult learners. Such materials rely greatly on mathematical word problems in supposedly 'real-life' contexts: from the home; from the workplace; and from commerce.

In a strong critique of artificial contexts in adult numeracy classrooms, Evans and Tsatsaroni (2000) warn of the dangers of 'an overly simplified notion of context as a "thin veneer" of applicability, that only *seemed* to make "word problems" in the classroom different from abstract calculations.' (p. 56, emphasis in original).

> A student doing a calculation in shopping, has different purposes and constraints than when they are doing it in the mathematics classroom. The calculations have to be more accurate in the classroom, because that is what is required, or what it takes to keep the teacher happy, and because this is what is a valid answer in school assessment practices (Evans & Tsatsaroni, 2000, p. 59)

The characteristics of mathematical word problems have been extensively critiqued elsewhere (for example: Cooper & Harries 2002; Wyndhamn & Saljo, 1997; Verschaffel, De Corte, & Lasure, 2000). According to Gerofsky (1996; 1999), word problems generally have a three-part structure consisting of a 'set-up' to establish a scenario or minimal story-line, a number of items of information, and one or more question(s). Recurrent features of the genre include an anomalous use of tense, and arbitrary scenarios which have only a general bearing on the information components of the problem.

Dowling (1998) critically analyses a two-tier school mathematics textbook scheme, in which the books intended for higher-achieving pupils invite those pupils into the exclusive, 'esoteric domain' of academic mathematics. By contrast, the books intended for lower-achieving pupils position those pupils as interested in (and presumably destined for) manual, practical, functional numeracy tasks (the 'public domain'). Despite many adult learners' interest in mathematics for its own sake (Swain, Baker, Holder, Newmarch & Coben, 2005; Tomlin, 2002; Oughton, 2008), adult numeracy learners in England seem similarly to be positioned in

the functional domain by the curriculum, standards, and qualifications (BSA, 2001; QCA, 2000).

Over the last two decades, research in many countries has demonstrated that adult learners, including those often positioned as being in 'deficit' by policy-makers, have access to informal numeracy and literacy practices which are not legitimated by academic qualifications (Street, 1984; Gee, 1996; Barton & Hamilton, 1998; Lave, 1988; Saxe, 1988; Nunes, Schliemann & Carraher, 1993; Civil, 2003; Baker & Rhodes, 2007). Official discourse now encourages adult numeracy teachers to 'build on the knowledge learners already have' (Swain, Newmarch & Gormley, 2007, p. 7). A useful framework is Moll, Amanti, Neff, & González 's (1992) concept of 'funds of knowledge', developed in studies of Mexican families in Arizona. Moll et al. (1992, p.134) suggest that the concept provides a 'positive…and realistic view of households as containing ample cultural and cognitive resources with great, potential utility for classroom instruction'. Civil (2003) and Baker and Rhodes (2007) have further explored how a funds of knowledge approach could be used in adult numeracy teaching.

The term has been widened since its original inception, to include interpersonal and metacognitive skills, for example, in Hensley's (2005) categorisation of communication skills as funds of knowledge. It is suggested that metacognitive skills increase during early adulthood to peak in mature adulthood (Bakracevic Vukman, 2005), and this is reflected in Baker and Rhodes' proposal for a broader conception of funds of knowledge for adult numeracy learners, one that I find useful here:

> the learners' knowledge and skills; their histories, identities, dispositions, personal attributes and beliefs; their expectations, motivations, aspirations, and experiences; their relationships to education, learning and to mathematics practices (Baker & Rhodes 2007, p. 2).

Collaborative group work is another development which is gradually gaining acceptance in adult numeracy classrooms. Proponents welcome the opportunity to break with the tradition of teacher-led IRE (initiation-response-evaluation) activity (Mehan, 1979, Swan, 2000, Swain & Swan, 2007). Collaborative approaches are becoming accepted as 'good practice', a view legitimised by the Office for Standards in Education (Ofsted) in England, whose evaluation of mathematics provision for 14-19 year olds found that significant factors in high achievement included:

> teaching that focuses on developing students' understanding of mathematical concepts and enhances their critical thinking and reasoning, together with a spirit of collaborative enquiry that promotes mathematical discussion and debate. (Ofsted, 2006, p. 5)

Classroom discourse as data

> The argument that the facts of greatest value for the study of education are those constituted in classroom interaction, and that they are most readily displayed in classroom talk, provides a persuasive reason for regarding classroom research as 'basic' research and recorded language as its vital evidence. (Edwards & Westgate, 1994, p. 55)

One of the difficulties in researching the numeracy practices of adults is the invisibility of many informal practices, such as calculating in one's head (Coben, 2006). In this study, I have recorded and analysed student-student discourse between adult numeracy learners working collaboratively in small groups to solve mathematical problems. The recordings provide privileged insights into the students' own experiences of learning which would not be available by observing teacher-led interaction.

Nonetheless we need to remember that the language used by students has passed through many filters, such as the vocabulary available to them to express their ideas; and the

social and cultural constraints which affect how they choose to share meaning with others – and this is before taking into account the interpretation of the researcher. Mehan (1984, p. 181) argues that:

> By treating language as a mediating force in people's lives, sociolinguists have pointed out the importance of looking *at* the window of language and not just through it… acts of speaking and listening enable people to make sense of the world. That is, language transforms the world, changing nature into culture (my emphasis).

Traditionally, recording and analysis of classroom data has tended to focus on teacher-led discourse. This reflects not only the predominance, at least until recently, of teacher-led pedagogies, but also the methodological difficulties of obtaining naturalistic student-student discourse (Edwards & Westgate, 1994).

Recording and analysis of official and unofficial peer-peer discourse in secondary schools has been used powerfully in research by, for example, Maybin (2005) and Rampton (2006). Mercer and Sams (2006) investigate the discourse of collaborative mathematical group work in primary schools. However, peer-peer discourse in adult numeracy classrooms has rarely been examined, not least because collaborative group work has been, until recently, a relatively rare approach in such classrooms.

Methodology

I draw on a set of methods and epistemologies which have in recent years been increasingly classified as linguistic ethnography. Linguistic ethnography involves the recording and analysis of naturally-occurring talk (and other interaction) in order to learn about the social settings and structures within which that talk takes place, and the ways in which these structures shape, and are shaped by, discourse. The traditional ethnographer's question: 'What is happening here?' is replaced by a slightly different one: 'What does the participants' language-in-use tell us about what is happening here?'

I also draw on critical discourse analysis of learning materials. Critical discourse analysis relates a 'fine-grained' analysis of written and spoken discourse to wider social structures, and is particularly concerned with exposing inequities and disrupting dominant discourses. There are overlaps and parallels between linguistic ethnography and critical discourse analysis, and the two methodologies may draw on and complement each other (Rampton et al., 2004).

The two episodes described here occurred as part of a larger study of peer-peer discourse in numeracy classrooms in adult community education centres in the north of England. I was particularly interested in what such discourse might reveal about the funds of knowledge brought to classrooms by the students, but also in other themes which might arise from linguistic and content analysis of the data.

The aim was to obtain discourse which was as naturalistic as possible, so the primary data collection method was unobtrusive audio recording (with the students' permission), supported by field observation. Interviewing and focus groups were occasionally used to clarify issues arising from initial analysis of the recordings, but these were kept to a minimum to avoid making subsequent talk less natural. Photographs were also taken of learning resources such as card activities.

Mobile phones were used as recording devices, placed unobtrusively on the classroom tables used for collaborative group work. Since the students also tend to place their own mobile phones on table-tops during classes, they have become 'part of the furniture' in these classrooms and participants tended to ignore them. Labov (1972) also suggests that speakers'

discourse tends to become more natural when they are intensely engaged in the subject under discussion, as the students were in their mathematical problem-solving. Students seemed quickly to forget that they were being recorded, and the data appears to be as naturalistic as can reasonably be expected.

The audio recordings were then transcribed for analysis, using field notes to enrich the transcription, where relevant, with information about students' movements and gestures and the resources used.

Themes emerging from the analysis include: differing roles taken by students within the group during discussion; linguistic devices used to negotiate ideas and express degrees of certainty; use of self-deprecation and humour (there is a lot of laughter in the recordings); the recurring metaphor of mathematical problem solving as a journey; relationships between the students' own learning and that of their children; and the out-of-classroom practices drawn upon by the students. The episodes below have been selected as illustrations of a theme which occurred throughout the study; that students rarely seemed to relate context-based mathematical word problems to life outside the classroom. The first involves mixing drinks in a given ratio; the second involves calculating a percentage using data about industrial fatalities.

All names used in this article are pseudonyms, and ethical approval for the research was obtained from the University of Sheffield, UK.

The classroom, the teacher and the students

The episodes described below occurred during adult numeracy classes in two of the participating centres. All literacy and numeracy classes at these centres are funded by the Learning and Skills Council (LSC), so students are required to work towards a recognised numeracy qualification. This renders a supposedly negotiable curriculum compulsory, as learners must be taught the numeracy skills needed to gain the qualification. Enrolment for these classes is flexible, allowing students to join at any time during the year, and to continue until they have achieved the qualification they need (typically the National Certificate in Adult Numeracy). Opportunities to sit tests for this qualification are offered throughout the year.

The participating teacher, Elizabeth, is the most experienced of the numeracy teachers at these centres and (as a teacher-educator) I consider her to be an exceptionally good teacher. She has a strong subject knowledge, including a first degree in mathematics, and a commitment to a variety of participatory approaches to teaching and learning. I worked with Elizabeth to select those of her classes in which the students had responded well to collaborative group work. The classes chosen were all 'discrete' numeracy classes, in that numeracy learning was not embedded within another subject such as a vocational course.

The students in the classes were predominantly women, white-British and aged between 23 and 50 years old. Although classes are also open to men, the predominance of women is not unusual at these centres, where many of the learners are women 'returners', hoping to gain qualifications in order to return to work or further study as their children grow older. The ethnic homogeneity of the groups is representative of the semi-rural towns in which the adult education centres are based.

I cannot claim that my findings here are generalisable, and indeed the classes were selected as ones likely to generate discourse. The events must therefore be regarded as 'telling' cases, which serve to illuminate our understanding (Mitchell, 1984). As a teacher-educator who has observed many numeracy classrooms, I would suggest that while the students, the learning materials, and the community setting were 'typical'; the teacher – and the emphasis she placed on collaborative learning – were not.

Episode one: Diluting drinks

This episode occurred in a class three weeks before most members of the group were due to sit tests for the National Certificate in Adult Numeracy at Level 1 and Level 2 (Level 2 being the target level for completion of compulsory schooling at age 16 in England). The previous week, Elizabeth had asked the students what they would like to work on next, and the students had chosen 'ratio' as a topic which many of them found difficult.

Six students attended the session, all of whom had attended before. Elizabeth introduced the topic by asking the students how ratio might be used in everyday life. They responded with examples such as: cooking; mixing squash (diluting concentrated drinks); mixing weedkiller; calculating betting odds; and the ratio of boys to girls in classrooms. This was followed by a short but challenging abstract activity in which students practiced expressing ratios in their simplest terms.

Elizabeth then gave out copies of a worksheet with word problems set in a 'real-life' context of diluting concentrated drinks – a situated practice already mentioned by the students in their introductory discussion. An extract from this worksheet, and two of the students' discussion as they attempted to solve a word problem together, are presented and analysed below.

Diluting drinks: Learning materials

The worksheet given out by Elizabeth is from the *Skillsheet* series of books (Henry, 2005), which contain photocopiable numeracy worksheets written for adults and older teenage learners. The worksheet is taken from the *Ratio* book and is themed around dilution instructions for concentrated juice drinks. The page begins with a discussion and explanation of the dilution instructions:

INSTRUCTIONS

Dilute one part orange

with 4 parts water

(Henry, 2005, p. 1)

The author of the sheet appears has attempted to make the context meaningful to adult learners. The dilution instructions are presented as though they are a label on a juice bottle; there is a simplified explanation of what the instructions mean, allowing self-study; and there is a section at the bottom of the page which discusses a weaker dilution for toddlers.

However, the problems on the sheet (discussed by the students in the transcript below) conform to the word problem genre commonly found in school classrooms. The first problem is as follows:

Question 1

Selina is making **diluted** juice in a large jug.

She pours two cups of orange into the jug.

How many cups of water does she need to put in ? _____

(Henry 2005, p. 1, emphasis in original)

This conforms to many of the characteristics of mathematical problems critiqued in the literature reviewed above, including the anomalous use of tense; the three-part structure of set-up, numerical information and question; and the arbitrary nature of the context.

We can further apply the principles of critical discourse analysis (Fairclough, 1989) to relate texts within this genre to wider power structures in adult numeracy education, and to the underlying assumptions about adult numeracy learners which feed into, and are maintained by, such texts. Fairclough suggests that power in written texts is one-sided, and the producers of texts address an 'ideal subject'. Readers must negotiate a relationship with the ideal subject, and will often feel that they should 'fall in' with this subject position, rather than oppose it. The *Skillsheets* promotional website claims that the worksheets 'teach basic maths in a straightforward and understandable way'; that 'topics are presented clearly and methodically with small steps of progression', and that 'where possible familiar contexts are used in sensible real-life situations' (Henry, 2008). The series thus complies with the expectations of policy by positioning adult learners, as the 'ideal reader', firmly in the functional (or 'public') domain.

Diluting drinks: Student talk

The following transcript shows how two students, Jackie and Dawn, worked together to solve the word problem in Question 1 (reproduced above) of the *Diluting Drinks* worksheet.

Note on transcript conventions, which I have kept to a minimum.
(…) indicates indistinct words
[indicates overlapping talk.

1.	Dawn	(reading from worksheet) "Selina is making dilute juice (…) she pours two cups of (…) into the jug. How many cups of water does she need to put in?"
2.		Oh, right so it's … four parts …
3.	Jackie	Just a minute … (reading from worksheet indistinctly)
4.		Sorry, I'm a bit slower than you
5.	Dawn	How many cups of water does she need to put in?
6.		Right, so…
7.		So it'd be four cups, wouldn't it?
8.		Oh no, no, it's eight of water…
9.		(reading) "She pours two cups of orange into the jug…"
10.		Right, so that, that's just for one part…
11.	Jackie	Shall we work it out, on some paper or something…?
12.	Dawn	(…) Here, right, what you got here, it's four, four for one, yeah? That's water.
13.	Jackie	Yeah
14.	Dawn	Yeah, and that's orange
15.	Jackie	Orange is [one
16.	Dawn	[yeah
17.		Right, but she, she puts...
18.	Jackie	Two [cups…
19.	Dawn	[Two
20.	Jackie	Two cups of orange, so that's [eight parts
21.	Dawn	[yeah
22.	Jackie	eight parts water…
23.	Dawn	(encouraging) Yeah?

24.	Jackie	Is that right there?
25.	Dawn	Yeah, eight parts water … to two [parts
26.	Jackie	[to two [parts of orange
27.	Dawn	[Right
28.		So, how many cups of water does she need to put in, so it'd be eight
29.	Jackie	Yeah
30.	Dawn	(quietly, checking answer sheet) I think its eight, is it eight?
31.		(more loudly) Oh no, she's put twelve, oh no, it is eight
32.	Jackie	Did she?
33.	Dawn	Yeah, it's eight.

While transcripts such as these give us tantalising glimpses into many aspects of work, relationships and structures within adult numeracy classrooms, here I focus on Dawn and Jackie's approach to solving the word problem, and the extent to which they related the problem to out-of-classroom practices.

Dawn and Jackie's talk shows their acceptance and familiarity with the word problem genre. They did not refer to any occasion on which they have diluted drinks for themselves or others, nor did they question whether exact measurement is the only satisfactory way to mix the drink. They did not ask each other who 'Selina' might be, nor did they question the anomalous use of the present indicative tense, but continued its use in their own discourse. Their discussion demonstrated their understanding that they are expected to extract numerical information from the arbitrary referents in the problem (which they did in line 12), and to perform a calculation which, if done correctly, will result in the 'right' answer (which they successfully completed in line 20).

On obtaining an answer, Dawn and Jackie's discourse does not reveal any attempt to make sense of their answer, for example by considering whether the resulting total of ten cups might be expected to fit in the 'large jug' referred to in the original question. In fact, they did not talk of having made ten cups worth of diluted drink. Their talk focussed on the 'eight' which they believed to be the 'right' answer, but which they accepted only when they checked it on the answer sheet (line 31).

Dawn and Jackie's acceptance of this word problem interested me, because I suspected that most adults do not measure ratios accurately when diluting drinks. Later I asked students from the same class what methods they used to dilute drinks, particularly when mixing large quantities of drink. Between them, the students listed a wide range of methods, few of which bore any similarity to the one used by 'Selina' on the worksheet. The most commonly mentioned was approximating a quarter by eye or by markers on the squash bottle, but other methods included looking at the colour of the mixed drink, listening to the sound of the liquid filling an (opaque) container, and tasting the drink. All the students denied ever measuring accurately. As one of the students, Charlotte, said: 'I've more important things to do.'

Many of the students mentioned additional social dimensions to diluting drinks. Charlotte acknowledged that she might be more precise if she was 'counting calories'. Denise described the personal taste preferences of her children, and her young daughter's growing independence in choosing to mix squash for herself. Dawn explained how she 'goes mad' at her son because he pours in too much concentrate. Christine referred to a childhood in which money and other resources were scarce:

> I'm thinking back to what my Mum did, because I come from five sisters, and my mum used to keep an eye on everything. So she'd say: Oi, you've had too much and there's not enough for everyone else. So it's like sharing as well.

As they solved the diluting drinks word problem, Dawn and Jackie did not appear to draw on any of these real-life practices or considerations. However, they did appear to draw on broader funds of knowledge in their understanding of what is expected of them when working with word problems of this genre. Although the word problem is presented as 'realistic', they appeared to understand that they must not allow it to become too real. For example, they are not expected to consider whether the people who will be drinking 'Selina's' juice are dieting, or have preferences for stronger or weaker drinks, or concerns about additives and artificial sweeteners. I suggest that this may be regarded as a 'willing suspension of disbelief'.

Episode two: Construction industry fatalities

The second of the two events occurred in the same class two weeks later in the term. Again, six students attended, of whom five participating students, Charlotte, Dawn, Gemma, Jackie and Ruth, were working collaboratively on a sheet of percentages word problems. The session had been intensive, with the students carrying out a range of teacher-led and small group activities involving equivalences between fractions, decimals and percentages.

Elizabeth had also demonstrated methods of calculating percentages without calculators. This was very much focussed on the coming examinations, in which the candidates are not allowed to use calculators. All the students had found these topics very challenging. This extract is taken from near the end of the session; the part of the transcript immediately preceding this episode indicates that the students are getting tired.

Construction industry fatalities: Learning materials

The percentages worksheet used for this activity was chosen by the tutor, Elizabeth, from the *Skillsworkshop* website (2008). It contains ten 'Level 2' percentages word problems, requiring students to find given percentages of amounts, and to find one amount as a percentage of another. The contexts for the word problems are predominantly financial, for example discounts on purchases, but there are also a few other contexts, including the one discussed here:

> Question 4
>
> Over 2004 there were 220 fatal accidents in the Construction Industry.
>
> 55 of them were on building sites.
>
> **What percentage of the total fatal accidents was on building sites?**

(Skillsworkshop, 2007, emphasis in original)

All resources on the *Skillsworkshop* website are contributed and maintained by volunteers. I do not intend to critique this worksheet, but to comment on the students' reactions to it.

The worksheet does not actually specify whether the figures used in the problem are supposed to be for the United Kingdom (UK) or for a different country, but according to the UK's Health and Safety Executive (HSE, 2005), there were 220 fatalities across **all** occupational sectors, and just 72 in the construction industry in the year 2004/5. Thus the figures on the worksheet are around three times higher than the UK figures (and have presumably been chosen to result in a familiar percentage). The same HSE press release reminds us that "behind these figures are enormous personal tragedies involving the unexpected loss of family and friends." (HSE, 2005).

Construction industry fatalities: Student talk

The transcript begins from the point at which the students move on from the previous problem; no other discussion of this problem has taken place.

1.	Ruth	Right, (paraphrasing from worksheet) two hundred and twenty fatal accidents, fifty-five of 'em building sites.
2.		(reading) ["What percentage of the total fatal accidents…?"
3.	Dawn	[right, so you've got two hundred and twenty
4.		Over… fifty-five
5.		No, no, it's the other way round isn't it?
6.	Gemma	Is it the other way round
7.	Dawn	I don't [know
8.	Ruth	["What percentage of the total fatal accidents…?"
9.	Dawn	Yeah, it's – I think it's that way
10.	Jackie	Which way?
11.	Gemma	Is it the other way round, yeah?
12.	Dawn	I think so
13.	Ruth	Fifty-five, yeah, over two hundred and twenty
14.	Dawn	Yeah, so you've got to cancel that down
15.	Ruth	And how d'you do that then
16.	Dawn	Five'll go in to it, won't it?
17.	Ruth	Five, ten, fifteen, twenty (whispered) (…) is eleven
18.	Dawn	Yeah. How many fives into two hundred and [twenty?
19.	Ruth	[Well fifty's ten, a hundred is twenty
20.		(laughing) One hundred and fifty is what, thirty?
21.		Forty, forty-four
22.		Forty-four?
23.	Charlotte	Yes
24.	Ruth	So it's eleven forty-fourths? (laughs)
25.	Jackie	Oh, no
26.	Ruth	We surely can get lower than that
27.	Dawn	Yeah
28.	Charlotte	Because [eleven
29.	Dawn	[Yes, eleven'll go into forty-four So it'll go in one, and four, so it's a quarter
30.	Charlotte	Yeah
31.	Ruth	Hang on a minute, whoa, whoa, whoa
32.		Now you've got me now
33.	Gemma	Do you know your eleven times table?
34.	Ruth	Eleven, twenty-two, thirty-three, forty-four.
35.	Charlotte	Yeah
36.	Dawn	So eleven'll go in -
37.	Ruth	[Hang on, hang on
38.		How do we suddenly -
39.		Because I would have been thinking, what does that, and that, go into?
40.		What goes into both of them?
41.	Dawn	Yeah, [yeah

42. Gemma [Eleven
43. Jackie So it'll just be one, won't it? Because only one eleven goes into eleven.
44. Ruth Yeah, I'm with you, I'm with you
45. The bottom is [forty
46. Dawn [Eleven'll go into itself once
47. And it'll go into the bottom (…)
48. It's a quarter
49. Ruth Yeah I'm with you
50. (…)
51. Charlotte So that's 25%

The students then move on to the next problem on the sheet.

I have purposely included the students' entire discussion on this problem from their first reading of the question through to their obtaining the answer as a percentage, in order again to illustrate a pattern which recurs throughout the data I collected; that the students extract numerical information from the word problem and carry out their calculations, without responding in any way to the context in which this problem is set. We can usefully divide this episode of talk into two parts: lines 1-13 and lines 14-51.

Lines 1-13 are concerned with extracting the relevant numerical data and mathematical relationships from the problem. Although Ruth reads out the emotive word 'fatalities' three times during the episode (lines 1, 2 and 8), the students focus on the numbers, grappling only with the difficulties of which number is the denominator. Although Ruth's paraphrasing of the question in line 1 suggests her understanding of the structure of the problem, she does not reflect aloud on the significance of the context. It seems that the students disregard the context of the word problem here completely, even when the context makes statements that one might expect to provoke concern, shock, or at least a query as to their validity.

From line 14 onwards, the students react to the problem merely as an instruction to find 55 as a percentage of 220. Once Gemma has made her case that 220 should be the denominator rather than the numerator, the students' discussion is solely of arithmetic from line 14 through to the correct solution at line 51, centring largely on the identification of eleven as a common factor. Again the students have 'suspended disbelief' and concentrate on getting the 'right' answer.

Nonetheless, the students' talk again indicates that they draw upon metacognitive and interpersonal funds of knowledge. As before, the students demonstrate their familiarity with the word-problem genre and its conventions of simplified numerical relationships. For example, Ruth recognises (line 26) that 11/44 is an unlikely answer, even though she has not yet spotted the equivalence to a quarter.

Ruth's ready admission that she has not understood how the others have cancelled down the fraction (lines 31, 32 and 37) is typical of these students' willingness to share doubts and uncertainty, and clearly reflects the supportive nature of the group. This is also reflected as the students show patience and a variety of explanatory approaches in ensuring that Ruth eventually comes to understand (lines 33-48). For example, lines 43 and 46 show Jackie and Dawn's alternative attempts to explain the same idea to her.

Discussion: Contexts or recontextualisation?

The word 'context' need not apply only to scenarios in word problems. A wider definition will embrace any site or setting in which numeracy takes place. Bernstein (1996) uses the term *recontextualisation* to describe the way a field is changed as it is transferred from its original site to pedagogical practice. (For example, woodwork as it is taught in school bears little resemblance to the work of a carpenter or joiner). The classification and framing of 'ratio' and 'percentages' as autonomous mathematical topics is a typical example of recontextualisation in classroom mathematics. At higher levels of mathematics, the concepts are merely different ways of describe the quotient of two numbers and would not be regarded as 'topics'.

Recontextualisation, whether of academic mathematics or of situated numeracy practices, opens up a space in which ideology inevitably plays a role in selecting what is to be learnt from the total knowable. In both the episodes I describe, the learning and assessment materials have recontextualised mathematical knowledge into an easily-recognised discourse with which learners can become familiar through intertextuality. Features of the discourse include the emphasis on functional numeracy, the familiar structure of word problems and the expectation of a simplified version of 'real-life'.

Street's (1984) distinction between ideological and autonomous models of literacy may usefully be applied here to numeracy. An ideological approach would take into account students' beliefs, goals and attitudes, and the power structures within which learning takes place. The relevance of mathematical topics to students' lives might be critically reviewed, and contexts which are related to social concerns (such as industrial health and safety figures), might be questioned and discussed. Similar approaches, such as a critical analysis of time and motion study data, are advocated by Frankenstein (1998).

Instead of being given opportunities to draw on their funds of knowledge and out-of classroom practices, students were required to willingly suspend disbelief where the narratives of word problems did not reflect the real world, and to recognise that, despite the superficial appearance of a 'realistic' context, they were not expected to take realism too far.

Nonetheless I contend that, in solving these word problems, the students do use the broader interpersonal and metacognitive funds of knowledge described by Rhodes and Baker (2007). For example, they draw on funds of knowledge about the discourse of mathematical word problems and how to focus efficiently on finding the required solution. When working together, they admit doubt, challenge each other's responses, and support each other in group activities using a variety of approaches to explain and clarify. Even their use of humour, prevalent throughout the recordings, may be regarded as a resource (Baynham, 1996). Other parts of the data show how the students share and pool metacognitive strategies such as eliminating easy possibilities first, and using different forms of visualisation. As Dawn remarked in an earlier session: "We all play teacher".

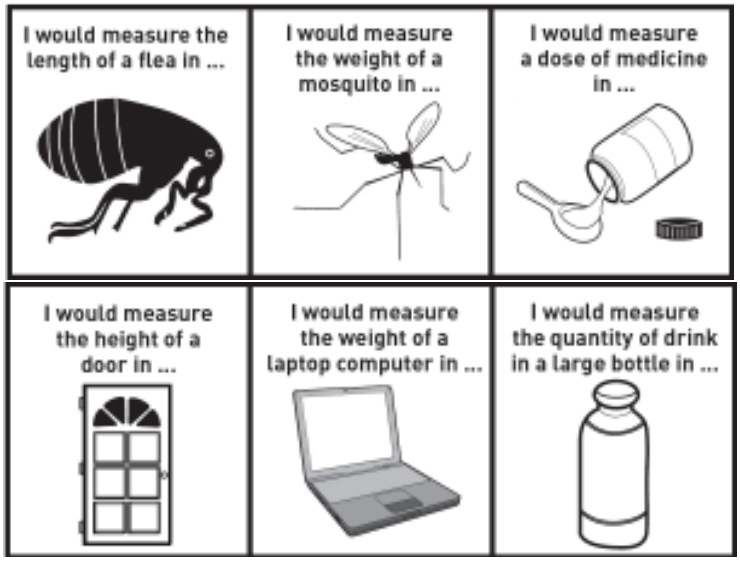
Ultimately, for students needing a numeracy qualification to fulfil career goals, these classroom numeracy skills may be a more valuable type of knowledge for their purposes than out-of-classroom practices, particularly where assessment for qualifications is based on word-problems. Our broader conception of 'context' is useful here in considering the needs of adults whose purpose in doing mathematics is to gain a qualification:

> Context… refers to the framing of those occasions when numeracy is done and the purposes for that use of mathematics. These purposes and contexts depend on the individuals engaged in their numeracy practices. An appropriate context and purpose for one person may not be so for another. (Street et al., 2005, p. 22)

Possible alternatives: A closer match between purpose and context

Not all learning materials and approaches rely on the 'thin veneer' of context. One example is the *Thinking Through Mathematics* project which uses a wide variety of abstract mathematical problem-solving activities to engage and motivate learners (Swain & Swan, 2007). The project does also include activities related to out-of-classroom numeracy practices, but these do not use the fictional narrative devices used by traditional word problems.

For example, the sample below shows six cards from an activity in which learners are required to match 24 such cards to appropriate units of measurement. The text uses the conditional mood to relate the activity directly to the learners' own practices.



(DfES, 2007)

The following extracts are taken from recordings of students working with these cards in another of the adult numeracy groups in my study. Rather than passively accepting contexts for word problems, as in the majority of discussions I recorded, here the students are playfully critical of contexts they don't consider relevant to them. Note how the conditional mood is maintained.

1.	Judith	(reading) "I would measure the weight of a mosquito in…"
2.	Sally	I wouldn't
3.		(extended laughter from group)
4.	Abigail	(grim tone) Depends how much blood he's had
5.		(more laughter)

The same card activity also resulted in some of the very few discussions recorded during my study in which students spontaneously drew on their out-of-classroom funds of knowledge to scaffold their formal learning. The following is one example; other practices discussed during this activity included filling cars with fuel and mixing concrete.

6.	Donna	I tell you what I always struggle with
7.		You know, like **litres**
8.		How many millilitres are there (…) Is it a thousand?
9.	Abigail	Mmm

10.	Donna	I get confused, because you think like 'mil' is a million
11.	Abigail	(showing her water bottle which is on the desk)
12.		Yeah, well, if you think, one of them is five hundred millilitres
13.		So two of them is a litre
14.	Donna	A litre
15.	Abigail	So, like, obviously if you do it in CL it's like, um
16.	Donna	Centilitres… A hundred? No
17.		Is it a cent – centilitre. A hundred, isn't it?
18.	Judith	Forgotten
19.		(laughter)
20.	Abigail	Some of them do have 'CL' on them, most of them have millilitres on
21.	Donna	Wine bottle have centilitre on them, don't they?
22.		(…) centilitres (…)
23.	Judith	A hundred centilitres is a litre, so it's right
24.	Donna	Oh, right. So a thousand millilitres is one litre
25.	Abigail	With water, sometimes you can buy it and it says five hundred mil
26.		Sometimes you buy it and it says centilitres
27.		I think it depends if it's foreign water, or different places measure it in different ways, don't they, like -
28.	Donna	Oh yeah. So, half a litre is fifty centilitres.

While it is not possible to draw generalisable comparisons from a single activity, the difference between the above extract and much of the other data I recorded is so marked as to suggest that this is worth further investigation.

However, given the nature of current formal assessment materials, which in England are based on traditional word problems, such approaches would not prepare students to succeed in gaining numeracy qualifications, even if the activities do help them to develop the numeracy practices they might genuinely need once they progress from the classroom.

If adult learners can develop the metacognitive funds of knowledge required to gain qualifications, does it really matter if the word problems they are expected to solve bear little relation to real life? Clearly it is useful for learners to be competent in the discourses needed for success in their qualifications. However, it seems a sad reflection of assumptions about mathematical learning for adults that they are obliged to be so. If numeracy examinations assess nothing more than the ability of adults to pass those examinations, then we must ask what the point is in such qualifications.

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