NUMERACY AND ESOL IN HEALTH AND SOCIAL CARE WORKPLACES: converting and upgrading numeracy skills for employees whose first language is not English

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Maths4Life, a Skills for Life programme funded by the Department for Education and Skills, was based at NRDC between July 2004 and March 2007. On 1st April 2007 the work to take forward and develop Maths4Life transferred to the National Centre for Excellence in Teaching Mathematics (NCETM). NRDC remains a key partner in NCETM’s further development of the post-16 maths and numeracy work started by Maths4Life. For further details see ncetm.org.uk and maths4life.org.
INTRODUCTION

Working with numbers is especially important in healthcare settings. There seem to be two broad ways that staff work with numbers. The first is what Wedge (1999), cited in Coben et al 2003, calls ‘task-context’. ‘Task–context refers to the wording of the task and the assumptions the learner needs to make in order to solve a problem mathematically.’ Other tasks are what she describes as ‘situation-context’. ‘Situation - context refers to the social, cultural, historical, psychological and other circumstances in which the problem is considered and learning occurs.’ (Colwell, 2003). These contexts were also ones which relied heavily on using verbal language. (e.g. posting a letter for a resident, translating metric weights into imperial). Typically these tasks involved more verbal explanations from the interviewer.

How staff work with numbers has social significance; an elderly person requesting her weight be given in imperial measurements rather than metric involves factors in the relationship and consequently communication as well as number skills.

Hoyles et al (2002), cited by Colwell in a discussion of workplace skills, (in Coben et al 2003) identified common trends in workplace skills. She refers to a study done with nurses and the increasing need for hybrid skills and the ability to communicate information.

In another NRDC report Baynham’s summary concludes that it is the socially -constructed and culturally specific situation which acts as a barrier for ESOL learners achieving in numeracy classrooms. These were also the situations which presented difficulties in understanding for the staff we interviewed. Our development of a communicative based numeracy assessment echoes another of his findings: ‘In the numeracy classroom talk is incidental whereas talk is central to learning in ESOL classrooms.’ (Baynham and Whitfield 2004)

Cognition

Questions of cognition are addressed by researchers in the field of cognitive neuroscience and education and involve technologies of brain imaging that reveal the workings of areas of the brain involved in different activities. Geake cites the example of fractions in primary school arithmetic and elementary algebra in lower secondary school and suggests that 'A better understanding in terms of neurological development and cognitive dynamics of why learning these, in contrast to other areas of mathematics, proves so challenging for so many, would be of considerable interest to mathematics teachers.' (Thematic Review. Cognitive neuroscience and education: two-way traffic or one-way street? Geake. J. Westminster Studies in Education Vol 27, No 1, April 2004. Carfax Publishing).

Employment factors

Another issue is how the different mechanisms for recruiting healthcare workers relate to differences in social class, educational background and access to training and promotion. The economic and social policy issues surrounding recruitment are not explored in this study but they are a factor in the sample. The use of an agency, which screens and selects potential staff overseas is different from recruiting from the locality and possibly illustrative of an emerging trend. The sample could be contrasted with Schellekens (2001) report for the DfES which was concerned with ESOL adults seeking work directly. However, she showed that second language speakers are often employed at a level below their qualifications and experience and this seems to apply to many in our sample.
How the project was set up
ENGLISH FOR HEALTHCARE (EFH) is an independent provider of ESOL in health and social care based in West Kent and works across Kent and Surrey. They work with Care Homes offering English language training, in particular to overseas care assistants. Because of this they felt they should be in a position to gain access to suitable interviewees.

Although the project had the cooperation of a care training provider to supply contacts it was nonetheless difficult to gain entry to a suitable number of workplace settings. This was particularly true of the NHS hospitals whose procedures for facilitating this type of collaborative project proved to be time-consuming. The project approached 13 organisations across Kent (12) and Surrey (1). 6 organisations finally took part: 3 care homes, 2 hospitals and a domiciliary care agency

Research questions
The initial research question was whether ESOL employees in the healthcare sector, have problems dealing with numbers and, if so, do these problems stem from:-

- numeracy problems in their first language?
- language problems?
- both of these?

METHODOLOGY

The research tried to take account of the diverse social groups in the area. Kent has 863 residential and care homes and 135 domiciliary care agencies in both private and public sectors (CSCI in-house data-base at 12/10/05). Kent and Medway SHA has 4 acute hospitals and 14 community hospitals.

Source of map: Kent and Medway Strategic Health Authority website. www.kentandmedway.nhs.uk/local_nhs_services/hospitals.asp
22 employees were interviewed. They included nurses, senior care assistants, care assistants, domiciliary care workers and domestic staff. They were interviewed at their place of work.

The interviews were frequently held before or after a shift and required a minimum of an hour and a half of the individual’s time. (They could only have been done with the cooperation and goodwill of the individual and the organisations.) 6 managers/supervisors were also interviewed to find out their perspective on work involving numbers that their staff are required to perform. The employees however were the focus of the research.

Table 1: Countries of origin

<table>
<thead>
<tr>
<th>Country</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bulgaria</td>
<td>1</td>
</tr>
<tr>
<td>China</td>
<td>2</td>
</tr>
<tr>
<td>India</td>
<td>4</td>
</tr>
<tr>
<td>Nigeria</td>
<td>1</td>
</tr>
<tr>
<td>Philippines</td>
<td>2</td>
</tr>
<tr>
<td>Poland</td>
<td>6</td>
</tr>
<tr>
<td>Romania</td>
<td>1</td>
</tr>
<tr>
<td>Sri Lanka</td>
<td>2</td>
</tr>
<tr>
<td>Uganda</td>
<td>1</td>
</tr>
<tr>
<td>Unknown</td>
<td>2</td>
</tr>
</tbody>
</table>

Table 2: Health- and social care employees interviewed

<table>
<thead>
<tr>
<th>Role</th>
<th>Employer type</th>
<th>Location</th>
<th>Sex</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nurse – 4</td>
<td>Acute hospital</td>
<td>Dartford</td>
<td>F</td>
</tr>
<tr>
<td>Senior carers – 4</td>
<td>Nursing homes</td>
<td>Sevenoaks, Hythe, Oxted</td>
<td>F</td>
</tr>
<tr>
<td>Carers – 9</td>
<td>Nursing homes (7)</td>
<td>Sevenoaks, Hythe, Oxted</td>
<td>F (6), M (3)</td>
</tr>
<tr>
<td></td>
<td>Domiciliary care agency(2)</td>
<td>Sturry (Canterbury)</td>
<td></td>
</tr>
<tr>
<td>Domestic staff – 5</td>
<td>Acute hospital (4)</td>
<td>Ashford</td>
<td>F (1), M (4)</td>
</tr>
<tr>
<td></td>
<td>Nursing home (1)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Our approach was to combine a more formal paper-based assessment with activities that would allow the individual to have their say without being fitted into an existing structure of responses. We used a mixture of paper-based numeracy assessment, semi-structured interviews and communicative numeracy tasks in conversation with the interviewer. The latter was done face to face with the interviewer and was work specific.

**Instruments used in the research**

- Numeracy assessment tool; ‘A study of effective practice in inclusive adult numeracy teaching – Numeracy Booklet (version 2), NRDC.
- Questionnaire for ESOL employees covering educational background, present job, job in country of origin/previous residence, tasks involving numbers in present job, attitudes towards working with numbers.
- ‘Communicative (Interactive) Numeracy Assessment’ – questionnaire designed for the project.
- Questionnaire for supervisor/manager

One of the aims was to find out what the existing numeracy assessment tool would reveal for ESOL speakers – and this was the rationale for using the paper-based tool. The Communicative Numeracy Assessment tool was designed for the research. It included questions to assess the way interviewees were able to verbalise about numbers, quick-fire mental maths questions to test understanding and accuracy of response and to provide a focus for reflection on cognitive processes (e.g. was the individual calculating ‘in English’, in their first language, or ‘just in numbers’) and context-specific questions using visual-aids which were related to the healthcare context. This tool was used in a 1:1 situation and found to reveal information which the paper-based tool could not access.

The rationale for the less formal assessments was a belief that interviewees might reveal more of their abilities in this way. Both the interviewers are experienced ESOL practitioners and this probably influenced the approach in which communication and the learner are central.

How the research was conducted
In most cases the supervisor or line manager was interviewed first, often in the course of the initial contact when times and dates were agreed for meeting ESOL staff. This gave an opportunity to explain the research. These interviews were done by the project director who also managed the project. The researchers returned to meet the employees who had volunteered for the project with the agreement of their manager. The project director did the bulk of the interviews, along with one other researcher, and this was felt to give continuity and cohesion to the research. The interviews lasted about an hour and a half per respondent and consisted of four distinct processes or steps.

Step 1. Interviewees had 25 minutes to complete the numeracy booklet individually.
Step 2. The researcher took the interviewees individually through the background questionnaire for ESOL Employees. The conversations were recorded and notes were taken.
Step 3. The interviewer went through the NRDC booklet (step 1) with interviewees, asking about any difficulties encountered and exploring whether these were due to inadequacy with number work or to language difficulties or any other source of misunderstanding. Conversations were recorded and notes were taken.
Step 4. Interviewer took interviewees through the Communicative Numeracy Assessment. The interview was recorded and notes were taken.

Methods of analysis
Quantifiable data was collated and organised in tables where appropriate. Data from the paper-based assessment tool was entered on a spreadsheet. Information from the background questionnaire was collated and discussed between the researchers. Data from the communicative questionnaire was collated, written up and discussed. At all stages emerging patterns were noted and discussed.
3.3 Notes on data robustness

More than one method of collecting the data was employed. The combination of the two tests (paper-based and communicative), with the feedback session on the paper-based test, and the semi-structured interview gave opportunities for development, verification and cross-checking of responses. This approach allowed the individual’s skills to be seen from a variety of perspectives and gave more opportunities for qualitative data to be collected. Interviews and communicative tests were recorded.

4. Research findings

Mathematical ability

**Numeracy itself did not appear to be felt to be a problem, either by employees or their supervisors**

When numeracy is part of the workplace interaction then variations in accepted usage appear which could give rise to difficulties in communication and misunderstanding. Among the care workers a high proportion held formal mathematics well above the level of those required in the job they were doing. Among the nurses it was found that nurse-training had been in English and many had received secondary schooling in English-medium schools.

In the course of the communicative numeracy assessment it began to emerge that what the research was presented with was not a question of upgrading numeracy skills, even with those workers whose formal education was comparatively brief, and that both workers and employers have, where necessary, developed strategies, the latter mainly in response to health and safety issues to circumvent the need for workers to carry out calculations.

Language

Communicating information that involves numbers often means using a **spoken register** appropriate to the situation of the participants – their role, their status, their setting. An array of language features, including usage, vocabulary and informal language, gives rise to a variety of difficulties in working with numbers in English in both spoken and written communication. Specific skills needs can be identified:

- When numeracy is part of the workplace interaction variations in accepted usage appear which may give rise to difficulties in communication and misunderstanding.
- Reading off scales and conversion tables (it was difficult to ascertain whether the difficulty lay in understanding the task or mathematical weakness).
- Verbalisation of number strings e.g. 14,546 should be spoken as ‘fourteen thousand, five hundred and forty-six’
- Skills with telephone numbers – written and spoken
- Recognition and production of correct terms for units of measurement, e.g. ‘kg’, (often referred to as ‘kay-gee’s’), ‘mg’ etc etc.
- Skills with frequently-used time phrases
- Terminology for symbols e.g. ‘share’, ‘divided by’ etc

This suggests a greater role for oral activities in teaching/training.

ESOL teaching and learning

Working with numbers in English may provide a motivating vehicle for improving other language skills for ESOL workers.
“As ESOL practitioners the researchers have found that ESOL and Numeracy teaching are seldom combined nor are numeracy activities generally embedded into English language courses for nurses.” (Shrubshall and Roberts 2005).

Feedback from interviewees was that the activities in the Communicative Assessment part of their interview engaged their interest on a number of levels. There is arguably a role for ESOL teachers (and training for healthcare workers) to incorporate more numeracy activities into the ESOL curriculum.

Little attention appears to have been given to the question of ESOL and the broad field of working with numbers in UK literature and post-Moser policy documents. For example, few teaching materials exist to help learners with the language aspect of working with numbers – next to none in the ESOL Core Curriculum.

**Assessing numeracy skills for ESOL users**

A review of the assessment tool administered to interviewees revealed considerable complexity of language for some. A particular interviewee with low level (about E1) English was unable to tackle more than 2 questions. He nonetheless showed considerable accuracy in mental maths and quick calculations on paper in the later communicative assessment. Participating in the communicative numeracy assessment gave interviewees the opportunity to display skills and abilities which could sometimes pass unnoticed. It also allowed interviewees to display creativity, e.g. taking real workplace situations and talking about them realistically as well as an opportunity to display knowledge of a wider range of options for expressing e.g. time, measurements etc.

**Working with numbers as motivating wider language-learning**

Interviewees gave responsive feedback reporting that the experience was not ‘a test’, but a rewarding experience.

**Academic literature**

Research literature
The search of academic literature revealed few if any references to the subject in UK literature. Articles of interest were few and from non-UK sources.

**Policy documents.**

Based on familiarity with policy documents produced in recent years little or no reference is made to the combination of numeracy skills and ESOL speakers.

**Teaching materials**

A search carried out of the ESOL core curriculum identified fewer than 5 examples of activities promoting work with numbers and these were at level Entry 1. A search of English language teaching materials websites revealed few activities with numbers.

**Patterns of recruitment**

Patterns of recruitment began to emerge for overseas employees in health and social care which included the use of recruitment agencies, direct recruiting by privately-run groups of
care homes. In the case of ancillary and domestic staff, in these institutions, word-of-mouth is frequently considered the most reliable option. The NHS has its own recruitment procedures for nurses. The research suggested that in many instances staff recruited from overseas, with the possible exception of NHS nurses, are working in posts below or well below their level of qualification in their own country.

Cognitive processes

A significant proportion of the sample showed that they had different ways of working with numbers, moving between English and their first language. Interviewees, reflecting on the way they worked with numbers, gave a variety of comments e.g.:-

- “all in English”
- “In Polish”
- that she did it in Romanian and translated to English
- one was not clear about which language he did it in
- one said he did the one-step mental calculations in English but changed to Polish when there were more than one step.
- one said she sometimes calculated in Polish in her head because she wanted to be sure of her accuracy.
- “only in numbers”
- “in Malayalam”
- “I see the number in my head”

Of those who reported doing numbers in English most but not all had had school education or nurse training in English.

5. Conclusions

Despite its vocational relevance little seems to be known about the broad field of the practical application of mathematical/numeracy activities for adults whose first language is not English. This research suggests that numeracy is not the problem but the associated verbalisation of practical usage may be. Also we simply do not know how the brain processes/ transfers mathematical computations learnt in the first language into a second or subsequent language.

Whilst the research question was initially framed in terms of a ‘problem’ this may have been a mistaken perspective or an unwarranted assumption. The lesson being that practitioners should be prepared to question whether numeracy is problematic for ESOL speakers. In the context of this project, strategies were found to have been developed by healthcare providers, possibly in response to health and safety concerns.

Our research is about recognising gaps in understanding, and questioning practice, as well as suggesting some practical solutions. As ESOL practitioners we can see a role for incorporating numeracy into ESOL work and vice-versa.
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