

Making Meaning of Women's dialogue of mathematical experiences - A Pilot Study

Cathy Beesey

RMIT Faculty of Education

Abstract

This paper reports on a pilot study. The purpose of this study was to determine what mathematics content a group of adult women would like to cover in an adult numeracy class, situated in a community setting, and why this mathematics content is important. It is based on the belief that there is no one set of mathematics content which is appropriate for a group of adults in an adult numeracy class. Therefore, the aim of the study is to develop a process for discovering the selection of mathematics content.

Rational and Background

In 1991 and 1992 I planned and implemented two adult numeracy courses that were situated in a work place setting. The coordinator of the program provided me with a brief outline of the course from the previous year, mathematics tests completed by the participants, and details of interviews she had developed and conducted with participants. I was encouraged to 'meet the needs' of the participants attending the course.

As I began to plan the course I referred to the outline from the previous year and noted that many of the activities related to the number area of mathematics, with a particular emphasis on fractions. As I began to plan I felt a conflict between providing a course which emphasised the number aspect of mathematics and a course which incorporated a broad range of mathematical topics, as stated in A National Statement on Mathematics for Australian Schools (1990), and mathematics which related to

participants everyday and work place experiences.

Information derived from this test was used to assist in the identification of the mathematics content to be covered in the course. I felt confident in using the test for this purpose as it was based on mathematics content established by a person working in the field of adult numeracy. The test also provided some idea of what mathematics the participants could and couldn't do in relation to the mathematics content presented. A concern with using the test was the mathematics content had been defined by someone who would not be taking the course. As I analysed the mathematics participants could and couldn't do there were gaps in the information provided in terms of the mathematics content I was considering covering in the course. Other concerns, related to the types of questions in the test. The content mainly covered skill type questions such as adding numbers, writing equivalent fractions, and converting centimetres to metres. A smaller section of the test included word problems and it was difficult to draw conclusions of participants mathematical knowledge as English was their second language and one of the purposes for being involved in adult literacy and numeracy classes was to improve their English. In general participants attitude to tests was negative. The test did not provide information on participants perceptions of mathematics and what they valued as mathematics, although the importance of mathematics tests to the participants was highlighted during the first week, when participants wanted to know how they went in the test and were ready to

explain that they were 'never any good at tests'.

The main focus of the interview by the program coordinator was (a) to determine participants background in education, including the number of years they went to school and where they went to school; (b) to provide an opportunity for participants to share their reasons for taking part in this course; and (c) to answer any questions related to the course. Participants selecting to do the adult numeracy class mentioned that they wanted to do the class to improve their skills in mathematics. The interview did not include information on what skills in mathematics participants would like to improve, their attitude to and perceptions of mathematics, and their personal and professional goals in improving their understanding of mathematics.

My interpretation of the test and the information from the interviews still left me feeling confused as to what mathematics content to focus on in the first few sessions of the course. As I developed the course for the adult numeracy classes I talked to people who were teaching in the adult numeracy field and I used a range of resource materials to plan my program including *Mathematics a New Beginning* - a resource for teachers of adults returning to study (Marr, & Helme 1987). This resource was selected because it had been developed 'in response to a need for teaching materials that reflect the needs and interests of adult students.' (p. 1)

During the first week of the course I discovered that the participants felt it was the teachers responsibility to select the mathematics to be taught, as this was the teacher's role. As the course continued I began to build up a picture of their perceptions of mathematics through discussion and the presentation of activities which participants defined as being appropriate or inappropriate. Most of the participants stated that they were interested in learning about

fractions and algebra because they had not been able to understand them when they went to school. When participants were presented with activities relating to measurement and location they commented that these tasks were not mathematical. One of the reasons for their view was that they had success in these areas in their everyday lives. They also mentioned that the course was a way for them to improve their command of the English language by understanding mathematical terms in English and it was worthwhile to learn some 'school type' mathematics to enable them to assist children in their immediate and extended family.

As I continued to work with groups of adults in adult numeracy classes I began to question the effectiveness of the classes in terms of the mathematics content I was providing. This experience has led to an interest in the study of mathematics content for an adult numeracy class. Questions such as, 'what mathematics content is important to you?' 'why is this mathematics content important?' seem crucial in providing programs for adults which meet their personal and professional needs.

Pilot Study

The purpose of the pilot study was to explore ways to determine what mathematics content a group of adult women would like to cover in an adult numeracy class and why this content is important. A literature review provided a range of examples which defined and organised mathematics content. A starting place was to consider the presentation of mathematics in *A National Statement on Mathematics for Australian Schools* (1990) and *Mathematics a New Beginning* - a resource for teachers of adults returning to study (Marr, & Helme 1987) which organises mathematics from a curriculum perspective. Both of these documents while providing a comprehensive range of mathematics topics and activities did not provide a process for deciding what

participants would like to cover in an adult numeracy course.

Hence, I furthered my literature review. Alan Bishop (1991) sets mathematics content in a cultural context. 'What is necessary is a scheme which relates mathematics education to its societal environment and mathematics as a cultural phenomenon offers us a way to do this.' (p.16) Bishop defines the areas of mathematics into six broad categories including counting, locating, measuring, designing, playing, and explaining. These categories have been identified as being used in all cultures. Organising mathematics content and labelling the categories in this way provides a sense of the relationship between mathematics and how it is used. For example, 'playing' rather than the term 'probability' gives a sense to the content. The organisation of the mathematics content aligns mathematics with the people that use it rather than viewing the mathematics as something which stands apart from society and culture. Therefore, Bishop's categories of mathematics will be used as an organiser throughout this study. Direct consideration of gender, class, and power relationships are not clearly stated in these categories, however, the incorporation of work by Valerie Walkerdine has addressed these issues.

A consideration of mathematics from a post structuralist perspective is outlined by Valerie Walkerdine (1989). The author discusses 'universals' in mathematics which have been established in our society. One of these 'universals' is, if you don't know or understand mathematics as it is presented in a school setting then you do not know or understand mathematics. Individuals may translate failure in the school setting to all areas of their lives thus, convincing themselves that they are unable to do mathematics. For example, a pass in a mathematics test provides a perception of being good at mathematics, however, organising your

banking, designing an extension, or planning a trip does not provide the same status. When universals are set up, those that don't fit the 'universal' have been set apart as not being right, as not really knowing or understanding. These 'universals' are not effective in defining our world because they set up a situation where there must be 'other'. The ideas Valerie Walkerdine presents clearly support the importance of involving women in the process of defining mathematics from their perspective.

A major difficulty in defining mathematics for a group of women is the perception of mathematics held by society which has narrowed mathematics to a single truth. 'For over two thousand years, mathematics has been dominated by an absolutist paradigm, which views it as a body of infallible and objective truth, far removed from the affairs and values of humanity.' (Ernest, 1991). When organising a structure for defining the process for selecting the mathematics content one needs to consider an individual's perspective of mathematics and their experiences, if effective teaching and learning of mathematics is to take place. We all perceive the world from our own unique perspective which we have developed through our experiences with our families, others, our culture, an education system, and our very being.

Collecting the data

The next phase of this pilot study was to consider ways to collect data to find out what mathematics content a group of adult women would want to cover in an adult numeracy class. I decided to use a pilot study to trial and evaluate a method for collecting data and to increase my confidence and skills as an interviewer. The key aspects I wanted to trial and evaluate were: (a) the value of group interviews; (b) the effectiveness of individual questions in terms of eliciting information; (c) the benefit of responses to photographs set in real life contexts; (d)

the value of a scale marked from 0 to 100 for participants to record their perceptions of mathematical ability before commencing, and where they would like to be at the conclusion of an adult numeracy course; and (e) the process of analysing the transcripts. Other aspects I wanted to evaluate were (a) the number of interviews required; (b) how information could be checked and substantiated; and (c) the value of providing participants with copies of the questions, transcripts and analysis.

The pilot study consisted of a group of mature age, first year, Early Childhood Education students at RMIT, who volunteered to participate in the study because they had not experienced success in mathematics during their schooling. I believed this group would provide an opportunity for me to practice my interview skills in a supportive yet constructive environment.

Interview 1

Lather (1991) states 'Group interviews provide tremendous potential for deeper probing and a reciprocally educative environment.' (p. 22) Group interviews provided an opportunity for participants to feel comfortable in sharing their views and ideas and created a dialogue rather than a question and answer situation. This approach allowed me to focus on the key purpose of the interview and to ask additional questions where required. As I analysed the transcripts I realised that each of the participants did not respond to each of the questions. In future interviews I will set up a sheet to record when each participant responds to a question. I intend to continue with group interviews for the rest of my study because in an area like mathematics everyone has a story to tell, and they enjoy hearing about the experiences of others.

Participants received copies of the questions after the first interview. This provided an opportunity for them to consider comments they may have not mentioned in the original interview.

During the week following the first interview one of the participants dropped in comments her mother had made in response to the questions. At the beginning of the next interview other participants referred to key points from the first interview. I would continue this approach as it provides an opportunity for participants to clarify the points they want to make and to emphasise those statements which they believe are important.

Participants received a copy of the transcript from the first interview. The purpose of this approach was to provide opportunities for participants to record additional ideas, or to clarify comments they had made during the interview. The participants found it difficult to see their words in transcript form and were embarrassed at some of their sayings. I would not use this approach again as no additional information was received in response to the transcripts. The participants commented that they did not have the time or desire to read the whole transcript as it was quite lengthy.

Interview 2

The second interview was divided into two components: (a) the sharing of the analysis of the first transcript; and (b) the use of photographs which presented mathematics in real life contexts. The analysis of the transcript set the scene for the second interview and provided a structure for participants to make additional comments. It would have been more appropriate to provide participants with a written copy of the analysis rather than a detailed description by the interviewer.

Photographs were selected to demonstrate a broad range of mathematical experiences set in real life contexts. The photographs were developed using Bishop's six categories of mathematics. These categories were used to provide a balance of mathematics content and to highlight aspects of mathematics which participants may not have considered. See table 1.

Table 1 Mathematics content presented in the photographs

PHOTOGRAPH <i>Title and brief description</i>	CATEGORIES OF MATHEMATICS <i>(Bishop, 1991)</i>	DETAILS OF EACH CATEGORY
<i>Sewing</i> Someone cutting out a pattern. The material is on the table with the pattern in place. A tape measure is part of the scene.	<i>Measuring</i> <i>Locating</i> <i>Designing</i>	<ul style="list-style-type: none"> • <i>the language of quantifiers, units and measurement systems</i> • <i>estimating</i> • <i>accuracy</i> • <i>symbolise spatial environment</i> • <i>geometrical notions</i> • <i>orientation</i> • <i>manufactured objects</i>

The photographs provided a non-threatening focus for discussion. The participants in the interview were asked to divide the photographs into two groups. One group for those photographs which 'obviously demonstrated mathematics' and the other group for those photographs which 'did not obviously demonstrate mathematics'. The participants were encouraged to discuss their opinions and make a group decision on the placement of each photograph. The discussion was vital in determining why the photographs were placed in a particular group. This approach did not provide a great deal of information about their thoughts on the mathematics demonstrated in the photographs. I then asked the group to look at each of the photographs they had placed in the group where 'mathematics was obviously demonstrated' and to share their thoughts on the mathematics presented. More detailed information was discovered from this approach. The following example is in response to the sewing photograph.

K I can never work out how much material I need. This pattern, you need point of a meter I have never understood that.

M I could work out the back of the pattern, your size, how much material you needed but when it came to actually cutting out the pattern and

putting it together that is what I found really confusing.

The photographs will be used for future interviews. Participants will be asked to respond to each photograph in terms of the mathematics presented and their understanding of this mathematics.

Interview 3

The scales marked from 0-100 were used as a focus for discussion and to validate comments by participants from earlier interviews. As participants completed the scales questions were asked including what the content title meant to them and why they wanted to know more about that particular aspect of mathematics. The selection of the mathematics content for the scales and the terminology used was derived from the first interview. Specific information using the scales was provided from participants as demonstrated in the following section of transcript.

K Timetables (multiplication number facts) I would say I am about, they aren't too bad, sixty. I would probably like to be ninety. "Why?"

K Because they are really where it is all at. There is no point being able to work out a problem if you can't work out the timetables if that is what is holding you back. I think my timetables are efficient, they aren't quick but I know them so that is why I would be better at it if I were a bit quicker because I

think I take too long with working them out.

This activity became repetitive as participants became bored with the idea of filling in scales for each of the mathematics content areas listed. This approach will be used in future interviews, however, I will be more selective in the aspects of mathematics which are included on the scales. Key aspects of mathematics where conflicting information has been noted will be covered using this approach.

Transcript analysis

I began to read the transcripts with no set criteria of categories. As I read I highlighted aspects which I intuitively believed made an important statement. I placed the information into a table and continued to build up and refine the table as I read the transcripts over and over again. I was influenced by the approach taken in *Women's Ways of Knowing: The Development of Self, Voice, and Mind* (1986).

We reassembled the interviews and reread them many times, paying particular attention to the life story. We developed a number of coding categories designed to capture the ways in which women construe their experience of themselves as developing beings and experience their learning environments. (Belenky, Clinchy, Goldberg, & Tarule) p 16

As I analysed the transcripts three distinct categories emerged. The categories are mathematics content, perceptions of mathematics, and perceptions of themselves as learners of mathematics.

The analysis of the mathematics content was organised using the terminology of the participants in the interview. The content was organised into eleven categories: add and multiply, division, formulas, fractions, measurement, money, odds, operations, per cent, spreadsheets, tables, and volume. Table 2 illustrates how the information was organised.

Table 2 *Mathematics content*

MATHEMATICS CONTENT	QUESTION NUMBER	INITIAL OF FIRST NAME	COMMENTS FROM THE TRANSCRIPT IN RELATION TO THE CONTENT
<i>Add & multiply</i>	1	A	<i>... if you asked me to do it my head forget it.</i>
<i>Add & multiply</i>	1	K	<i>... I can add ...</i>
<i>Division</i>	6	M	<i>... like simple things to be out at dinner and you have to divide the bill. I would never volunteer.</i>

Organising the information in this way clearly shows the mathematics content this particular group of adults knew and the type of mathematics they would like to find out about. I had not anticipated that organising the information in this way would also provide contexts for the teaching of the mathematics content. Some examples which participants provided were dividing a bill at a restaurant, and working out interest rates on a Visa card.

The information in the table was then sorted according to (a) the question; (b) the mathematics content; and (c) each participants comments. This sorting process assisted in the selection of questions for future interviews and provided specific details about the mathematics content the group would be interested in as a whole and the mathematics content each individual would be interested in. See table 3 for comments by one of the participants.

Table 3 *One participants comments in terms of the mathematics content*

MATHEMATICS CONTENT	QUESTION NUMBER	INITIAL OF FIRST NAME	COMMENTS FROM THE TRANSCRIPT IN RELATION TO THE CONTENT
Measurement	8	J	<i>... to estimate in my head ... what a certain measurement is ... got no idea what a certain measurement is in the first place ... I would like to be able to visualise ...</i>
Money	1	J	<i>... counting back change. I have to really do that slowly ...</i>
Money	8	J	<i>... a bit mind boggling when I get bank statements I will think it looks okay but I don't go through it because I think too many figures ...</i>

Other comments from the interview which were not directly related to the mathematics content were organised into two categories: (a) perceptions of mathematics (see Table 4); and (b) perceptions of themselves as learners of mathematics (see Table 5).

Table 4 Perceptions of mathematics

CATEGORY	COMMENTS FROM TRANSCRIPTS
<i>basics</i>	<i>I think you know the basics but anything more complicated ...</i>
<i>challenge</i>	<i>It is probably a challenge is what I think of.</i>
<i>confidence</i>	<i>... confidence I think that is what it is. Not having the confidence really and worrying about failing and getting it wrong and how that may make you look.</i>
<i>everyday</i>	<i>I think that on an everyday level I am good at maths...</i>
<i>hard</i>	<i>I will have to work hard at getting answers...</i>
<i>mathematics presented formally</i>	<i>.. when something is presented formally I can't work it out but I think those kind of things are important ...</i>
<i>purpose</i>	<i>... there has to be a purpose for it to be important to me</i>

Table 5 Perceptions of themselves as learners of mathematics

CATEGORY	COMMENTS FROM TRANSCRIPTS
<i>being unable to get help because you can't work out what help you need</i>	<i>It is such a big job for any body to go back and fix it. You almost think it is irreparable.</i>
<i>failure was personalised</i>	<i>I was lazy but my teachers always said that I have got potential</i>
<i>gender</i>	<i>... it was in high school when it really became a gender issue and I think we had male maths teachers ...</i>
<i>memories of mathematics at school</i>	<i>It just brings back awful memories of primary school and high school constantly being told that you are stupid with regards to maths.</i>
<i>not knowing your own abilities</i>	<i>Because I think that I know more than I do ... I wouldn't be able to gauge it (what I knew) ...</i>
<i>not taking an active role in mathematics</i>	<i>... I don't make decisions about how much we will need and I am quite interested in that (renovating) ...</i>

It is important to note that the three categories (a) perceptions of mathematics; (b) perceptions of themselves as learners of mathematics; and (c) mathematics content, were

developed by building up a picture using information from the three interviews.

Conclusion

The next phase of my study will involve interviewing groups of four to six women

who have been involved in adult literacy classes in a community setting. The process for identifying the mathematics content needs to be efficient as participants make a substantial time commitment when involved in an adult numeracy course. The various aspects which have been trialed in the pilot study will be refined to develop a process which will take approximately two hours. The components of the interview will be some key questions, the use of photographs and the use of scales 0 - 100.

The information I have collected and analysed from the pilot study provides much more information about the participants than the mathematics content they would want to cover in an adult numeracy class. It provides information on their perceptions of mathematics and their perceptions of themselves as learners of mathematics. Therefore, the question to be asked in pursuing this study is: How can we use women's dialogue to identify their perceptions of mathematics and their perceptions of themselves as learners of mathematics in order to assist in the development of the selection of mathematics content for adult numeracy classes?

References

- Australian Education Council (1991). *A National Statement on Mathematics for Australian Schools*. Melbourne: Curriculum corporation.
- Bishop, A. J. (1991). *Mathematical Enculturation A Cultural Perspective on Mathematics Education*. The Netherlands: Kluwer Academic Publishers.
- Belenky, M.F., Clinchy, B.M., Goldberg, N.R., & Tarule, J.M. (1986). *Women's Ways of Knowing The Development of Self, Voice, and Mind*. United States of America: Basic Books.
- Ernest, P. (1991). *The Philosophy of Mathematics Education*. Great Britain: Burgess Science Press.
- Lather, P. (1991). *Feminist Research in Education: Within/Against*. Victoria: Deakin University Press.
- Marr, B., & Helme, S. (Eds.). (1987). *Mathematics a new beginning a resource book for teachers of adults returning to study*. Victoria: State Training Board of Victoria.
- Walkerdine, V. & The Girls and Mathematics Unit. *Counting Girls Out*. London: Virago Press.