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MEASUREMENT IN TRIBAL ABORIGINAL COMMUNITIES[#]

(Paper presented at the Second Annual Conference of the Mathematics Education Research Group of Australia (MERGA), May 1978)

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REASON FOR THE STUDY

In October 1975 the Australian Council for Educational Research conducted a national survey aimed at

- a) estimating for each State and Territory in Australia the number of children who were failing to attain the basic skills of literacy and numeracy as assessed by the tests of reading, writing and numeration, and
- b) to specify relationships between various other factors (including, among others, type of community, ethnic origin, and language of home) and the attainment of competence in the basic skills of reading, writing and number work.

In the final report¹ published in 1977 one chapter was devoted to the comparative performances of Aboriginal students².

For the purposes of the report, two groups of Aboriginal students were distinguished and their performances compared to those of the overall Australian population. This paper is concerned only with Group 1, Aborigines who were defined as "Aboriginal students attending Aboriginal schools in the Northern Territory" (Bourke and Parkin 1977).

The present writer had been working with students such as these for the preceding six years and therefor had a special interest in their performance in the survey.

On the basis of the sample used (see Bourke and Parkin 1977, p. 132), the conclusion was drawn that -

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the overall performance of students in Aboriginal schools in the Northern Territory on the tasks set in the Reading and Numeration Tests was very low indeed. (Bourke and Parkin 1977)

Of the test items involving applied number, the only items for which results were presented in the report were problems involving money and telling the time. Table 1 shows some examples of results which have been extracted from the national report. From the five tasks involving money, the highest and lowest performances of Aboriginal students in each age group are shown. There was only one task for each age group in reading the time.

Table 1

*Examples of the performance of Aboriginal students in Aboriginal schools in the Northern Territory on test items involving money and telling the time.

Description of Test Item	% Correct	
	Aboriginal Students Group 1	Australia Overall
<i>MONEY</i>		
<i>Students aged 10 years</i>		
Addition of 5 coins totalling 37¢	17	97
Calculating the cost of 3 articles costing 25¢ each	6	90
<i>Students aged 14 years</i>		
Calculating change from \$1	20	95
Recognizing the lowest cost per article of 5 differently sized packages	2	69
<i>READING THE TIME</i>		
<i>Students aged 10 years</i>		
Write down the time (11.35) shown on a watch face which has Arabic numerals	2	71
<i>Students aged 14 years</i>		
Write down the time (4.40) shown on a watch face that has strokes only	3	89

*Items selected from Tables 8.17, 8.18 and 8.19 in Bourke, S.F. and B. Parkin, *The performance of Aboriginal students. In Bourke and Keeves (Eds.) Australian Studies in School Performance Volume III, the Mastery of Literacy and Numeracy: Final Report*, pp. 148-149).

It can be seen that the best performance of Aboriginal students in the Northern Territory on these selected items was 20% correct, and scores were often well below 10% correct, compared to the overall Australian population where the lowest score on the same items was 69% correct and the highest score was 97% correct.

In discussing these results, the writers of the report noted that the tests had been set on the assumption that the tasks included would have been experienced by all students either in the course of their schooling or their everyday life. They acknowledged that this assumption could not be supported for students at Aboriginal schools in the Northern Territory. For example they commented that the time telling tasks described in Table 1 were "almost certainly outside the experience" of many of the Group 1 Aboriginal students (Bourke and Parkin 1977).

The Aboriginal students in Group 1 mainly live on settlements, missions, and cattle stations in remote localities in varying degrees of isolation from the wider Australian community, and the authors of the report questioned whether such students should be required or would ever desire to lead the kind of life which was assumed in the tests. They suggested that, for some students at least, the requirements of the tests would have been largely irrelevant.

It was the aim of the present writer, in attempting the survey about to be described, to gain some clearer indication of just how relevant or irrelevant some of our primary school mathematics is in remote Aboriginal communities where the children speak an Australian Aboriginal language most of the time, and only learn English as a second language at school.

METHOD

Due to the constraints of distance, time and money there was no alternative but to do the survey by mailed questionnaires, in spite of the known limitations of this technique. The questionnaire design was adapted from one used by Jones in his work at the Educational Research Unit of the University of Papua New Guinea³. It was decided to concentrate on measurement because of the great importance of measurement skills in relation to employment and everyday life.

The approach used was to try to find out how easily certain ideas of measurement expressed in English could be expressed in the Aboriginal vernacular, the assumption being that if the English term (e.g. the abstract term 'length') or the English statement (e.g. 'the car was going at 60 miles an hour') were very difficult to express,

or were expressed very differently in the child's own language, then the child could be expected to have difficulty in learning it in English, a second language which he has not yet mastered.

Most of the questionnaires were sent to linguists rather than teachers, as it usually happens that linguists remain in the same Aboriginal community for a longer time than the average teacher, and, because of the nature of their work, have a deeper knowledge of the language and customs of the Aboriginal people. Almost all the people approached were known to be involved, either directly or indirectly, in a program of education in an Aboriginal school, often as the teacher/linguist or consulting linguist in a program of bilingual education. In most cases the questionnaire was completed in collaboration with one or more Aboriginal persons who spoke the Aboriginal language as their mother tongue.

Eight topics were based on Jones' study and a section on money was added so that nine topics were covered in all. They were Length, Height, Distance, Time, Speed, Weight, Area, Volume and Money, in that order. Throughout the survey and report, the term 'weight' was used in preference to the metric term 'mass', and old units of measure such as feet, ounces, miles, and gallons were also used in questions and examples on the questionnaire. In doing this, the writer was taking into consideration that if, as was suspected, standard units of measure were not frequently used in the communities surveyed, then it was unlikely that the people would be familiar with the new metric terms.

This assumption was validated by the fact that nearly all respondents used the old Imperial units in their written comments and examples of what people actually say. The outdated measurement terms used in this paper are those which were actually used by the writer and the respondents in acknowledgement of the different situation which applies in remote Aboriginal communities.

For speed of completion and ease of analysis the basic questions only required the respondents to circle the answer they chose, which was either Yes or No, or a difficulty rating ranging from 1 to 7. A rating of 1 indicated that it was thought to be easy to express the meaning of the English stimulus sentence in the Aboriginal language, and a rating of 7 indicated that it was thought to be almost impossible to convey the meaning of the English stimulus sentence in the Aboriginal language. In addition to the basic Yes/No and rating questions, there were additional supplementary questions in the 'Comments' column which were designed to stimulate and direct additional written comment from the respondents.

RESULTS

Of the 28 questionnaires sent out, 22 were returned completed, and these covered 20 different Aboriginal languages spoken in widely separated communities in the Northern Territory, Queensland, Western Australia and the far north of South Australia. This represents a considerable amount of data, and in order to do justice to the aspects covered in this paper, it has been decided to present results for only four of the eight standard question types, rather than cover them all in insufficient detail.

The first four question types cover three main aspects of the survey as shown below. Examples of each question type are given. These examples are taken from the Length topic, which served as a prototype for other topics. Similarly worded questions were included in the other topics where appropriate.

- 1) Availability and use of *abstract terms* such as 'length' and 'weight'.
Type 1 questions, e.g.
L1 Does the language have an abstract term equivalent to the English word 'length' as in a sentence beginning "The length of the rope is...?" Yes/No
- 2) Availability and use of *local units* of measure.
Type 2 and 3 questions, e.g.
L2 Are there any local units for measuring length which are in general use, for example, hand spans, spear-lengths, or specific lengths of rope? Yes/No

L3 The length of the piece of ground; rope; cloth is (a number of local units of measure). 1 2 3 4 5 6 7
- 3) Understanding and use of *standard units* of measure
Type 4 questions, e.g.
L4 The (rope; spear) is *(2 metres) long 1 2 3 4 5 6 7

*or any other length involving a standard unit, e.g. 3 feet.

AVAILABILITY AND USE OF ABSTRACT TERMS

With the exception of Time and Money, the Type 1 questions about the availability of abstract terms brought an almost completely negative response. Seven respondents reported a word equivalent to 'time', and in every language covered there was a general term for money. In answer to the question under the other topics, most respondents merely circled 'No' and made no comment.

This negative response should be taken at face value. It simply means that, according to this survey, Aboriginal languages do not seem to have abstract terms equivalent to English terms such as 'length' and 'weight'.

This statement does not imply that Aborigines are therefore unable to discuss length, height, weight, etc. They merely do it in a different way. For example, Nyangumarta, spoken near Port Hedland, has no abstract term equivalent to the English term 'weight', but it expresses the idea with a word meaning to 'weigh down' or 'prevent rising'. In Wik Munkan, spoken at Aurukun the traditional term translated 'time' can also mean 'place' or 'location'. In Kuuk Thaayorre, spoken at Edward River in Queensland, the same word, *raak*, can refer to time, place, or things, according to the context.

In regard to terms for money, more than half the respondents reported the use of a word meaning 'stone'. Others used terms meaning 'shell' or 'metal' for coins, and the name of a paperbark tree for paper money. Terms introduced by the Macassans are also used. It is worthy of note that very few of the terms used to refer to specific coins and notes give any indication of the value of the coin or note. It seems that in many places the copper coins are either referred to by colour ('the brown ones') or grouped with the 5¢ coin and referred to by size ('the small round ones'). The silver coins are either referred to jointly as 'the white ones' or, excluding the 5¢ coin, as 'the big round ones'. In Maung, spoken at Goulburn Island, the 50¢ coin is referred to by a term meaning 'tractor wheel'.

Notes may be referred to by an adaptation of their English name, or by their colour, or by something pictured on them, for example, a \$2 note may be called 'jirramadala' (two dollars) by a Warlpiri speaker, and 'wheat' by a Maung speaker. Furthermore, 1¢ and 2¢ coins are almost unknown to many Aboriginal children, as they are usually thrown away. Small wonder, then, that teachers in Aboriginal schools complain that it is difficult for their pupils to understand, for example, that one hundred cents are equal to one dollar.

AVAILABILITY AND USE OF LOCAL UNITS OF MEASURE

There was an almost totally negative response to the questions about availability of local units of measure in Aboriginal communities, and the few reported uses of arbitrary units of measure were more often in connection with work introduced by Europeans, than with traditional activities.

The most interesting report of local units of measure was of a system of weight measures used in mining in the Port Hedland district, where fruit tins are referred to as 'fruits' and used as the basic unit of measure. One fruit tin weighs about 5 pounds; 14 'fruits' equal one bag, and 18 bags equal one 44 gallon drum of mineral.

In regard to length, or size generally, one respondent answered that Aborigines measure by means of a mental picture, or 'by eye', and that they rarely make mistakes. Other replies indicated that a thing is nearly always measured by comparing it to something else or to what would normally be expected or appropriate in the situation, e.g. "It is very tall (for that sort of tree)". English measurement terminology may also be used as a comparison, e.g. "The pencil is short, like 4 inches", or "The tree is tall, like 20 feet".

UNDERSTANDING AND USE OF STANDARD UNITS OF MEASURE

The answers to Type 4 questions suggested that, with few exceptions, standard units of measure are infrequently used and poorly understood in most remote Aboriginal communities. Where they are used, it is usually in relation to employment or other activities directed by Europeans, and it appears that very often measurement terms are used in speech without the speaker really understanding what they mean. For example, it was reported that a man on a cattle station near Fitzroy Crossing (Walmatjari language) may use the term 'yards' in relation to a hole he is digging, and 'inches' when talking about the size of nails, but it is doubtful whether he understands the terms, or could accurately measure to check his estimation of 20 yards of fencing wire, or to see if his hole were really 5 feet deep.

At Groote Eylandt an Anindilyakwa speaker would probably use terms such as 15 feet or 20 feet if necessary when talking about boats, and guess roughly how long that is, but for practical purposes, hands would often be used to measure length or height. The height of the pole for the mast would be measured against the width of the sail, and it would seem obvious to measure the height of a forked stick to build a shelter against the height of the man who will live in the shelter.

Even in the shop it is very often not necessary to be familiar with standard weights and measures. It was reported, for example, that in the Aboriginal community at Strelley (near Port Hedland) dress materials are bought in 'worth', that is, \$1 worth makes a skirt, and \$1.50 worth is sufficient for a small dress.

In the local store at Fitzroy Crossing where potatoes and onions are traditionally weighed and sold by the pound, the Aboriginal shop assistant fills a certain sized bag as his measure. The Gugu-Yalanji speaker (near Cooktown, Queensland) only has to ask for the 'big bag' or 'little bag' to get the amount of flour or sugar that he wants.

The physical as well as the cultural environment has a strong influence on the use of standard measures. For example, in reply to the question about measuring speed of travel, the teacher/linguist at Numbulwar, (Eastern Arnhem Land) answered that they only have one or two very short gravel roads, and terminology for speed consists of 'fast' 'very fast', and 'hot rod'. These are sufficient for their needs.

CONCLUSION

In the light of the results described in the author's major study⁴, the conclusion was drawn that a measurement program prepared for white English speaking school children living in an urban situation is unlikely to be appropriate for introducing the study of measurement to Aboriginal children living in remote tribal communities because:

- a) in many instances the way of expressing the concept in the child's first language will be quite different from the way it is expressed in English (the medium of instruction), thus causing confusion with vocabulary and terminology,
- b) in some cases the concept will be totally foreign to the child's culture and there will be no concise way of explaining it in the child's own language. Thus the child will be required to learn new vocabulary and a new concept, both at the same time, and to do so in a second language,
- c) many of the concepts introduced will not be reinforced outside of the school because they are either not used in the Aboriginal community, or are in conflict with established custom,

- d) the concepts presented will assume prior knowledge and experiences that the Aboriginal child does not have, while ignoring the different set of knowledge and experiences that the Aboriginal child does have, and because,
- e) failing to take account of the Aboriginal child's different cultural milieu, such a program will also fail to observe the fundamental principle that teaching must always begin with that which is known and proceed from the known to the unknown.

REFERENCES

- ¹ Bourke, S.F. and J.P. Keeves (Eds) *Australian Studies in School Performance Volume III, The Mastery of Literacy and Numeracy; Final Report*. Australian Government Publishing Service, Canberra, 1977
- ² Bourke, S.F. and B. Parkin, The performance of Aboriginal students. In Bourke and Keeves (Eds) *Australian Studies in School Performance Volume III, The Mastery of Literacy and Numeracy; Final Report*, 1977, pp.131-155.
- ³ Jones, J. *Classification Systems, Vernaculars, and Education in Papua New Guinea*. E.R.U. Research Report No.12. University of Papua New Guinea, September, 1974.
- ⁴ Harris, P.J., *Measurement in Tribal Aboriginal Communities*. Unpublished report of an independent project for the Degree of Bachelor of Special Education, Monash University, Melbourne, September, 1977.

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House of Representatives Standing Committee Inquiry into Aboriginal Education - Submissions to be forwarded by early July, to :

The Clerk to the Committee

House of Representatives Standing Committee on Aboriginal Affairs,
Parliament House, Canberra, A.C.T. 2600.

For further information regarding the inquiry or the preparation of submissions, contact Acting Clerk to the Committee, at above address or telephone Canberra (062) 726770