

## CHAPTER 1

### MATHEMATICS IN ABORIGINAL SOCIETY

When people talk about the mathematical ability of the Australian Aborigines they almost always focus attention on the ability to count and calculate using the four operations and, as Aborigines generally have not performed well on these types of tasks in comparison with white Australians, the conclusion has frequently been drawn that Aborigines generally lack mathematical ability.

This results from a very narrow definition of mathematics, especially as it relates to school learning. Rarely has attention been drawn to other areas of mathematics in which the ability of the Australian Aborigines is not only equal to that of white Australians, but in some respects far superior.

#### Mathematical instinct

An outback schoolteacher, Mary Montgomerie Bennett, was greatly impressed by what she referred to as the "mathematical instinct" of her Aboriginal pupils. "The most remarkable thing", she wrote, "is the ability of the children to grasp a new conception of numbers as our arithmetic is to them" (Bennett, 1957, p.46). Mrs Bennett, who taught first at Ernabella in the far north of South Australia, and later at Mt. Margaret in Western Australia, took Aboriginal children around the country to demonstrate their mathematical skills, using what she called a "bullboard", a large blackboard with numbers which were struck by sticks which had coloured ball ends, the different colours symbolising different mathematical processes (Douglas, 1976).

It was not only her pupils' ability to grasp new ideas of number that impressed her. She saw mathematics in their traditional life, too. To her, a boomerang in the hands of an Aborigine was "manual mathematics" (p.47), and she quotes Oswald Spangler who wrote:

The Australian natives . . . possess a mathematical instinct (or, what amounts to the same thing, a power of thinking in numbers which is not communicable by signs or words) that as regards the interpretation of pure space is far superior to that of the Greeks. Their discovery of the boomerang can only be attributed to their having a sure feeling for numbers of a class that we should refer to the higher geometry (Cited in Bennett, 1957, p.47).

#### Spatial ability

Another remarkable skill of Aborigines is their ability to orientate themselves in relation to their environment, a skill which is poorly developed among white Australians. An Aborigine is never lost,

and after a circuitous kangaroo chase, always heads directly back to the waiting vehicle. Lewis (1976), in a fascinating and well documented article on route finding and spatial orientation among Aborigines of the Western Desert region, gives the following example:

The place was ... featureless and flat, with moderately open mulga and spear grass, devoid of sandhills, creek beds, escarpments, tall trees or other references. Visibility through the evenly-spaced mulga was a hundred metres at most.

A kangaroo, wounded by a .22 bullet, was hunted on foot for half an hour. After it had finally been killed, Jeffrey and Yapa Yapa headed without hesitation directly back towards the Landrover, that had been invisible since the first minutes of the chase.

*Question:* "How do you know we are heading straight towards the Landrover?"

*Answer:* Jeffrey taps his forehead. "Malu (Kangaroo) swing round this way, then this", indicating with sweeps of his arm. "We take short cut".

*Question:* "Are you using the sun?"

*Answer:* "No".

The Landrover duly appeared ahead through the mulga in about a quarter of an hour. Jeffrey then repeated his explanation, illustrating by gestures and by drawing in the sand the *malu's* track and our own 'short cut' home. (Lewis, 1976, p.262)

Lewis hypothesised an explanation of this ability in terms of a continually updated image or "mental map".

It would appear then, that the essential psychophysical mechanism was some kind of *dynamic image* or *mental 'map'* which was *continually updated* in terms of time, distance and bearing, and more radically *realigned at each change of direction*, so that the hunters remained *at all times* aware of the precise direction of their *base and/or objective*. (Lewis, 1976, p.262).

This hypothesis was supported by the Aborigines' own explanations; for example, Jeffrey Tjangala's explanation of how he knew his way in the featureless stony desert country in which they were travelling:

Jeffrey drew a cross in the sand to represent north, south, east and west (I confirmed by the stars that his directions were accurate).

He said: "North, south, east and west are like this in my head. I know them because we were travelling west and circled back south until we were heading south-east when we made camp, so I know where the directions are". (Lewis, 1976, p.264)

As another Aborigine, Wintinna Mick, said: "Aborigines knew north, south, east and west before the white man's compass" (p.265).

### Counting

Unfortunately for the Aborigines, the mainstream of Australian education is more concerned with counting and computations than it is with route finding in the desert or throwing boomerangs, and it has long been a part of Australian folklore that Aborigines cannot count beyond four or five.

As early as 1904, Howitt, in his *Native Tribes of South-East Australia*, sought to discount this view. He described how an Aboriginal messenger would enumerate the days or stages of a journey by successively naming points on his body, starting from the little finger and going up his arm until on the fifteenth count he reached the crown of his head. From there the count went down the other side of the body, naming corresponding places. Howitt concluded:

This method of counting seems to do away with the often-repeated statement that the Australian Aborigines are unable to count beyond four or at the most five. By the above manner of counting they are able to reckon up to thirty, with names for each place (p.698).

### Lack of numerals - a "gap" that can easily be filled

Although such examples of body counting can be found, it is nevertheless true that almost all Australian languages contain only two or three cardinal numerals. Wurm (1972), in his book *Languages of Australia and Tasmania*, says that "to a limited extent, higher numerals can be formed by combinations of the two or three numerals available, and in a few isolated instances, through the utilisation of terms indicating 'hand', 'foot', and 'person'". Exceptions are the two languages of eastern Arnhem Land which have developed "regular quinary systems of numerals which seem to extend indefinitely upwards" (pp.63-64).

Hale (n.d.) has some pertinent things to say about the lack of numerals in Aboriginal languages. He argues that although numerals are for the most part lacking, "counting itself is not lacking, in the sense that the principle of addition which underlies the activity of exact enumeration is everywhere present". In this sense, he suggests counting is universal, "and whether or not a conventionalised inventory of numerals exists in a given language depends upon the extent to which exact enumeration is of a practical use or necessity to the people who speak the language". He regards the lack of conventionalised numerals as being simply a "gap in the inventory of cultural items", and considers that, since the principle which underlies counting is present, "filling the gap is a rather trivial matter". In his opinion this view is entirely

compatible with his own observation that the English counting system is almost instantaneously mastered by Warlpiris who enter into situations where the use of money is important (p.3). The Warlpiri are a large tribe in Central Australia with whom Professor Hale has had a long and close association.

#### One point of view excludes other points of view

It is a fact of life that the moment a people adopt one form of classification or espouse a particular point of view, they inevitably reject alternative classifications or points of view. Where Western mathematics, in keeping with the Western European world view, emphasises many calculations with large numbers, the Aborigines have always been intimately concerned with individuals and small numbers, and this is reflected in the languages. Judith Stokes (1976) refers to the "specialisation of small numbers" in Anindilyakwa, a language of eastern Arnhem Land. "In English", she writes, "we think of either one thing (singular) or a lot of things (plural), i.e. there are two categories. In Anindilyakwa the classification is more complex and there are four possible categories:

Singular	-	one
Dual	-	two
Trial	-	three
Plural	-	four or more

Subject, verb and object all repeat the details of number". (Stokes, 1976, p.3)

The white Australian often fails to appreciate the Aborigines' concern for detail regarding small numbers, and finds it difficult or impossible to comprehend their lack of concern for larger numbers and calculations which are such an important part of the Western lifestyle. As Vaszolyi, in his book introducing the study of Australian Aboriginal linguistics, says:

We count, measure and weigh everything. Our principle idols, such as money and machines, all rest on a pedestal made of figures and calculations. For an Aboriginal hunter, however, figures and counting are irrelevant. (Vaszolyi, 1976, p.36).

He notes that Australian Aborigines do not stand alone with their reluctance to worship figures as we do, and cites other hunting-gathering tribes in America, Africa, and Asia who are, or were, "similarly unconcerned with arithmetic" (p.36).

#### Influence of social context

Vaszolyi devotes several pages to the topic of numerals. He points out that while the restricted number of numerals no doubt creates difficulties in learning arithmetic, this linguistic limitation does not indicate that Aboriginal people are incapable of learning or handling figures. He refers to Robinson and Yu's (1975) observations of the ease

with which Aboriginal players handle the computations and money calculations required by games like *Kuns*, an Aboriginal card game. Their skill in these games is in contrast to the apparent inability of Aborigines to handle computations and money calculations in such situations as the school, the store and at work. (It should be noted that these are all activities which were introduced by Europeans.) The conclusion is drawn that the social context of an activity has an influence on the degree of mathematical skill shown in each situation.

#### Mathematics in card playing

The anthropologist, Berndt (1946), also writes of the Aboriginal people's skill in card-playing. He describes two games commonly played by Aborigines in the Northern Territory, and notes that "both games . . . involve much quickness of perception and mathematical calculation - thus serving further to refute the common fallacy that the Australian Aborigines cannot count to any high figure" (p.250).

On the other hand, Holm and Japanangka (1976), in their article on the mathematics of card playing in an Aboriginal community, are more concerned that the type of calculations used in the card games may interfere with school learning of mathematics in some ways. For example, they say that teachers should be aware that in the card game described there is no practical difference between 10, 20 and 30, all simply being referred to as "a ten". Also, for the purposes of the card game there is no difference between 2 and 12; and 7 is regarded as being of greater value than 16 (p.21). The card games have their rules, and the mathematics taught at school has its rules, but the rules are sometimes different.

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