

A Different System: Notions of Education and Ways of Mathematizing in Fijian Society

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Ethnomathematics considers the parallels between traditional indigenous mathematics perspectives and western ones. Generally shared truths are revealed, but notable differences also emerge. This paper, drawn from research in progress, examines Fijian notions of education and in particular ways of mathematizing which are embedded in our cultural and everyday activities. The data show that Fijian systems for identifying, naming and classifying are coherent and adaptable. They are distinct from, but complementary to, western methods.

Introduction

Our people have a rich foundation of cultural values and experiences that are well adapted for their purposes and have been persistent and stable over generations. From their experience living amongst the people, missionaries Williams (1982) and Hocart (1929) write of, among other things, the Fijians' remarkable attention to agriculture, their taste for the fine arts and their exceptional mental capacity. While over time culture has evolved, and language has developed and transformed its meanings, our people are fortunate to have retained a language and stable traditional base. Today, Fijians make up about 50% of Fiji's population, 61% of whom live a communal existence in rural areas.

Contemporary Fijian society is a traditional hierarchy, that is, "a rigid model, composed of universally defined groups uniting together to form other groups of increasing inclusiveness, and ultimately a social structure of pyramidal form" (Routledge, 1985). *I tokatoka* (extended family), *mataqali* (clan), and *yavusa* (tribe) are the essential social strata to which every Fijian belongs, and are also the basic landowning units under which we are registered at birth. The units are identified and named by specific ceremonial functions that members perform for the equilibrium and viability of the whole organisation. So there are *mataisau* (traditional carpenter) and *gonedau* (traditional fishermen) clans whose knowledge and skill is unmatched by any outside it, just as there are chiefs, priests, and others. It is the specialist knowledge and skills of functional clans that I analyse for Fijian notions of education and ways of mathematizing.

Research Questions

In my study, the following research questions are addressed:

- What is the knowledge base of the ritual and ceremonial function of clans ?
- What mathematical ideas exist in the cultural everyday experiences of people ?
- What are the Fijian concepts for the ideas identified ?

Methodology

Fifteen weeks field work was carried out in Fiji. For the historical and cultural information needed, I used a qualitative approach wherein I *talked with* and *watched* people, and *reviewed* archival material. For people's data, there were two main groups of informants: elders and members of chiefs, fishermen, and carpenters clans, and an urban group of senior educators, retired administrators, and church leaders. With the former I used group interaction, with the latter, individual representations. There were eight groups altogether: two of fisherman (F), four of carpenters (C), and one each of women at matweaving (W1) and tapa making (W2). The only individuals from the village group

were two chiefs (T). The urban group comprised ten men and six women. It included five educationalists (E), nine retired administrators (R), and two church leaders (CH) of denominations that most Fijians belong to. All interaction was in Fijian. The different locations and experiences of the two groups of informants necessitated two forms of asking. These were:

- Oral Testimonies (McMillan & Schumacher, 1993), for the village group, and
- Unstructured Interviews (Drew, Hartman & Hart, 1996), for the urban group.

Analysis and Discussion

The data from both the informants and records in government archives are equally important and used concurrently. In this paper, the Fijian people's data is an English translation that is my interpretation of the Fijian originals. I take responsibility for any misrepresentation. Analysis is in two parts: first I examine Fijian educational ideas, and then I identify mathematical ideas in cultural and everyday socialisation.

Fijian Notions of Education

The participation of the young in various tribal activities constituted what we would call schooling in Fijian society. Most of these activities concerned the immediate needs of, or duties of the social unit, hence the training was direct, realistic and purposeful as well as exacting. Each social function, each activity, was an opportunity for the uninitiated to learn and acquire the skills and knowledge of the federation.

(Lewis-Jones, 1957, p.110)

This is a reasonable summary of traditional learning. It suggests a learning that is a preparation for life. Its primary aim, as suggested, is to teach an understanding of, and conformity to, customs and traditions. There are no new ideas, only old ones of history. As one of the carpenters said,

Everything that we know and practice, our forefathers gave to us. Their carving technique is the same we follow today. We have not brought much else ourselves.

In an oral tradition like ours, the significance of history and the past gives status to elders who represent the past in the present. Lewis-Jones's statement recognises other facets of traditional learning: I attend to some of these.

Oral Tradition

In society, authority is still in the spoken word and there appears no need for the written. In all levels of society there are tellers and listeners, the roles defined by age and experience. While elders are duty-bound to pass on tradition to the young, the latter know their education is gained by keeping alongside people of quality. They listen and do, knowing that in their time they will become transmitters of culture and perpetuators of the system. An elder of a renowned carpenter clan heard about plans by educated members to document their tribal heritage, the argument being that documenting will preserve knowledge, prevent erosion, and be beneficial to urban children with little access to the village-context. The plan did not impress the elder; he was ambivalent about the exercise and said,

It's impossible to condense everything into a book; there is so much. Things will be left out, and that's not right. It would kill tradition. I will have no purpose to my clan.

Cooperative Effort and Interdependence

Dependence upon chiefs and elders plays a large part in the Fijian character. Chiefs are believed to be "of God" (Fijian Bible translation, Rom 13:1) and should be obeyed. They are gifted to lead and are looked up to for appraisal, judgement and direction. As head of the hierarchy, they administer to hold the commune together. For their part, people esteem a strong hand and are implicitly submissive to the word of elders and chiefs. As Lewis-Jones (1957) observed,

Living in a commune, related to everyone, cared for and under the nurturing care of almost every adult, teaches the young the values of relationships and obligations. By participating in group activities, they learn the value of team-work and cooperation. His interests and sentiments are reconciled to those of his society, and he thrives to maintain, foremost, the honour and interests of his community.

Everyone of my informants, including those interviewed individually, talked of *keitou / keimami* (we) and *neitou / neimami* (ours) more than the singular *au* (I) or *noqu* (mine). This is suggestive of a collective partaking both in decision-making and action, as well as in property ownership (to which further reference is made later). A Fijian set to work on his own easily loses heart and becomes lackadaisical and without interest in the task. He becomes immediately enthusiastic and energetic when with company.

Significance of the Past

The continual reference to *i liu / i mada* (before, the past) and the tendency to introduce stories with phrases of the form: *our forefathers used to say ...* is significant. In one recording alone, there were at least twelve references to *matua i mada* (the elders of the past) and *tubui keitou* (our grandfather). It seems that elders and their achievements *then* are the point of reference for today, and the instruction now is *to do as it was done then*. When I enquired whether these achievements could be equalled or bettered, the response was affirmative *but* quickly followed by excuses suggesting the contrary.

Spiritualism

Our people acknowledge many gods since we are both spiritual and superstitious. The idea of a deity and supernatural powers have featured prominently even before christianity. Today, there are ancestral gods of clans and tribes, there are spirits of the dead, Jehovah the christian god, and others. In people's lives, there seems an indefinable merging of religious beliefs of traditional and christian gods. People attribute all phenomena either to gods and spirits, or to witchcraft. This gives a reason for everything, answers all questions, and leaves nothing to chance. A fisherman's comments reflect this perspective,

Our fishing task is not dependent on weather. Whatever the conditions, as long as protocol is observed, there will be fish aplenty. Fish is 'given' to us. We go to collect.

Learning Actively in Situ

Not one of my informants said they were taught by anyone even though they learnt things by listening, watching and imitating. Young people know there is no formal schooling for things-Fijian but that they actively grow into knowledge in situ. As one of the fishermen explained,

My first job was as bale-out boy, then I was steering when I could hold a steering pole, then I was helping to hold the net. But I loved to stand at the

helm with my father, looking out and finding fish as they came up with the swells.

The point is further illustrated by one of the tapa-weaving women,

While collecting tapa stalks, we may cut some big ones for my mother and small ones for me. Or using only big stalks, my mother would cut off the end tips for me. Then together we'd make masi, both of us looking and listening to the other for direction.

Fijian Concepts of Education

As culture has evolved so has language developed and meanings transformed through social changes. An analysis of the morphology of Fijian words and concepts of education indicate what traditional society attends to as important at any point in time. A case in point about Fijian sentence structure is that the order of elements is different from English, with the verb phrase coming before the noun phrase.

Child

There is no word for baby in Fijian, only *gone* for child. To differentiate small *gone* from the big, the descriptors *tawa vakayalo* (without spirit) for 0-5 year olds and *yalowai* (of watery spirit) for 5-9 year olds are common terms used to excuse children's mistakes and justify the firm hand of adults'. They are also the reason for Fijian parents' indifference to kindergarten and pre-schools, the belief being that it is useless to teach children anything until their spirit has become stable. Yet, as one of the carpenters said,

I was always around my father's workplace from when I was little. I had my own little hammer that he made for me and I did whatever he did. Today, my son is eight months old, and he is already at my side where I work. I'm doing as my father did.

If Fijian children, like this carpenter and his son, are learning at home from their parents (girls from mothers and grandmothers, and boys from fathers and grandfathers) and relatives very early, even as they are still *watery-souled*, then the descriptors cannot be about traditional learning. They can only be related to the perceived stress and anxiety that people believe come with school learning, that is *away from living and reality*, and in a new environment. All the same, readiness even then is still a measure of *yalo* or spirit.

'Vuli'

This is the root word which can be verb, noun and adjective. From *vuli*, words for 'learn', 'teach', and 'school' have developed. It is a difficult word that attends to the total education process. Its derivative *vuli-ca* is a verb, and is freely used for both 'learn' and 'teach'. The dual meaning in 'teach' and 'learn' in the words *vuli* and *vulica* is indicative of the traditional learning context which is not separate from, but part of, everyday living. There are no specific instructions as there is no designation of teacher or student roles. There are only mothers, fathers, children and family living their culture and demonstrating as a matter of behaviour and performance. Today though, *vuli* has developed to take account of defined roles and actions in formal schooling.

'Yalomatua'

The concept of attaining and becoming in Fijian society is described in *yalo-matua* (mature spirit). It is suggestive of an intense spiritual being that "was required and necessary to help people apply the various skills, knowledge, and attitudes that they had learnt from the elders through the various activities" (Baba, 1993, p.4). It is differentiated from *kila* (know) which is a mental capacity, and normally associated with school. A related term is *mana* described by one of the chiefs as "a thing which was from the beginning". *Mana* is like the stamp of approval bestowed by the gods on one who has

attained. It is *mana* when something succeeds or comes to pass.

Fijian Way of Mathematising

Defining mathematics as a social construct, Bishop (1988) identifies six activities - counting, measuring, locating, designing, playing, explaining - as those that conceptualise and define the field of mathematics developed in any culture. That framework provided a starting point for my search and analysis. I have since modified it to accentuate those features our people attend to more. For this paper I draw upon and discuss three elements that are closely related in Fijian society: counting, traditional economy and exchange, and kinship.

Counting

Our people quantify, but differently from western societies. Preoccupation with counting in the sense 'to calculate' or 'to be precise' is not part of the fabric of Fijian society, and the use of numbers is limited to small values. This does not mean an inability to count, only that we count as desired. Our engagement in mathematical and other activities has to be culturally appropriate. To this end, preference is given to qualitative evaluations that result in a rich register of qualitative evaluative terms in the language. For counting objects, pronouns show the difference between *dua* (one), *rua* (two), *tolu* (three), and *ira* (more than three) items. While in English 'they' and 'their' can be used for two, three, and more than three, in Fijian (meaning the lingua franca) the terms *rau* (them two), *iratou* (them three), and *ira* (them more than three) are distinct. Counting with these pronouns is used for objects, whereas people are addressed using polite and respectful conversation forms. For this, the prefix *kemu*, makes *kemu-drau* (you two persons), *kemu-dou* (you three persons), and *kemu-ni* (you all). Of these three, the greater plural *kemu-ni* is the most preferred, while *iko* (you) is impolite. Living in a commune where people share and are interrelated, there is no reason to count. Counting suggests a calculating inclination and precision that we do not need. Perhaps to outsiders, what we bring to counting tasks seems beyond logic and reason, but to Fijians it makes good sense. The following comments come from a chief, an educationalist and a retired administrator respectively.

In society people are identified with their clans, tribes and many other groupings, rarely as individuals. Every task, or allocation and distribution, is done using one of many group types, never individually. We avoid calling individual by their names.

If 8 people are required for a job, we see no problem with sending 10 or 12. After all that's only a few more, and shouldn't be any problem.

In counting one normally points with the index finger. We do not do that; we take exception to pointing at a person's forehead, and it's taboo. The five digits of the hand have Fijian names according to the functions they perform. The index finger is "the chief's pointing finger" and they alone can point..

There is, however, a *Fijian Counting System* that counts goods normally used in traditional presentations, including foodstuffs and traditional prized goods. These are counted in units of term, whereby a special term is given to tens of the goods counted. The more abundant goods like coconut and taro, which are normally presented in large quantities, are counted also in groups of a hundred and thousand. Some of these are shown in Figure 1.

The practice of counting in tens, as one of the retired administrators explained, is qualified in the following way:

It makes counting easier. Presentations are usually big and it's difficult to count the items individually. It's easier to use smaller numbers.

10 pigs = 1 <i>rara</i> (village green) pigs	10 turtles = 1 <i>bi</i> turtles
10 mats = 1 <i>sasa</i> (underlay) mats	100 coconuts = 1 <i>koro</i> (village)
64 mats = 6 <i>sasa</i> and 4 mats	1000 coconuts = 1 <i>selavo</i>
10 salt baskets = 1 <i>wai</i>	Taro: not counted but piled high - makes 1 <i>duludulumata</i> (tired eye)

Figure 1: Fijian counting system

One of the chiefs also commented,

Ceremonies are not meant to be competitive. They are about strengthening ties and relationships. It is the custom to underrate and depreciate one's presentation no matter how big it really is. It's being modest about yourself and respectful of the other party.

Three modes of *tallying* were given to me, namely of the widow in mourning, of planting clumps of yams, and that of the traditional messenger.

The smallest finger called the "mourning finger for the chief" is often that cut off a widow's hand at the death of her husband. Mourning lasts 100 nights. To keep tally, the widow goes through a "knotting" exercise where a string is hung around her neck and she successively ties a knot each night until the 100th. The knots, normally using maybe 10 coloured strings successively, are easier to count, because we only look at colours.

When our ancestors planted yam or cassava, they dig and plant in individual clumps. On a morning's work they might plant a hillside of several clumps. To keep a rough count for comparing notes later, they would plant with one hand, while on the other they hold a small branch with leaves that he plucks off and places on each clump planted, as he moves on. It's the branch of a local plant that everybody uses. In the end they deal only with branches, usually less than five.

In his mission as a traditional messenger, the ambassador carries in his pouch several sticks of varying length, each mnemonic to a thought. Arriving at his destination, he lays each stick in front of his kneeling posture, then delivers the messages exactly, and in the exact order.

Traditional Economy and Exchange

As Ravuvu (1985) suggests, the Fijian way of life "emphasises the expending of material things for social and communal goals" (p. 17). Wealth to the Fijian is not in terms of a bank-balance; nor does it have the same value as it does to others. If 'wealth' is taken to mean 'an abundance in possession', Fijian *i yau*, measured in terms of goods such as mats, tapa, and whales teeth, is different, because they are not kept as possession. A retired administrator explained,

For us, 'i yau' is kept for in individual homes, or for clans and tribes by its head, and every member has a certain lien upon it. But it is only kept until the next presentation.

Redistribution reveals the Fijians' regard for the world. *Reciprocity* is the rule. There seems no need to amass wealth because the natural world surrounding us also sustains us.

There is no accumulation, but always movement of goods across people and groups. Movement is either through the channels of ceremonial presentations between groups, or as direct gifting between people in the tradition of *kerekere*. Either way it is direct and controlled, and of a different character to a monetary economy.

Solevu: This is a public ceremonial exchange of goods between groups, normally pre-planned months ahead. Traditionally the networks existed across regions on a needs basis. The exchange would be of what group A has in abundance that group B needs, for something group A needs that group B can supply. An example would be an exchange between people of the highlands with those from the coast. Today the ceremonies are extended to numerous forms. Whatever the reason behind the exchange, Derrick (1957) is quite clear that,

it was never the object of trade to make a profit in the commercial sense. The important thing is not that the exchange is trade, but that the framework within which it takes place is primarily social, not economic.

Kerekere: This term has been misunderstood and misrepresented as borrowing, requesting, begging, and soliciting. None of these defines what *kerekere* means to the Fijian. There is no shame or stigma attached to the act because, as a church leader and fisherman explained respectively,

We do not 'kerekere' haphazardly but only to special kinsfolk. Both parties know the rights to 'kerekere'.

I cannot refuse anything of my sisters and their children because they're sacred to me. Whatever they want I get for them, and always the best.

One's right to *kerekere* of the other is demonstrated in the latter giving *more than* what is asked. The prefix *vei* meaning 'with' implies that the transaction is not a right exercised only by one party on the other, but is dual and the roles interchange. However, people do not keep records of 'I owe you', as it is a social obligation.

Locating: Kinship

The concept of relations, concerned with specific properties that link pairs of objects, is basic to many ideas in mathematics. Just as 'greater than' (>), and 'square' (x^2) are relations that will link sets of numbers, the relation 'capital city of' will link pairs like Suva and Fiji, and Wellington and New Zealand. In the same way, a family tree diagram or geneological table with standard symbols, Δ , o, and =, denoting sexes and marriage pairs, can create several relation patterns. Some others may be "sister of", "aunt", and "cousin". The interesting aspect of kinship is that they are different for different groups of people. Ascher (1991) quite rightly makes the point that, "...to understand the kinship system of a culture is to understand much about the culture" (p. 69). There is a variety of kinship systems to be found throughout Fiji and kinship terminology varies considerably with locality (Nayacakalou, 1955). Although the strong dichotomy of cultures and languages would suggest two main groups, the basic principles underlying the kinship structure is the same (ibid). What has become generally accepted as Fijian culture and language is that of the eastern tribes, in particular of the leading Bau tribe who were first contacted by Europeans. Nayacakalou identifies "common descent" that binds together members of a lineage group and "common parentage" which binds together members of a sibling group, as the two unifying principles within Fijian totaki kinship structure. However, "distinction of sex within sibling group" is the most fundamental differentiation. Hocart (1929, p.33) defines the system in this way:

If a man is related in any way to another man, he will be related in exactly the same way to that other man's brother, but not to his sister. If he is related in any way to a woman, he is related in the same way to that woman's sister, but not to her brother.

In addition, the *classificatory principle* of kinship terminology (Radcliffe-Brown, 1950) extends the principle of common parentage and therefore of a sibling group to include, "...all members of each generation within the lineage group to be classified together as siblings" (Nayacakalou, 1955, p.46). Take the simple case of 'father':

I have many fathers, whom I may address as small father, big father, or just father. There is my biological father, but all his male siblings are also 'my fathers'. In addition, in the same way that my biological father gains 'many fathers' (in his biological father's male siblings), he will gain more 'brothers', and I, more fathers. The children of all my fathers and all my mothers are my brothers and sisters.

To complicate matters further and bring in still more fathers, the principle of *unity of the sibling group* allows unity in a sibling group "for a person outside it and connected with it by specific relation to one of its members" (p. 47). Suffice to say that, having numerous parents, brothers and sisters, and progeny, is a special trait of Fijian kinship. *Cousins* in Fijian kinship terms, are the siblings of cross relatives. In other words, my cousins are my father's sisters' children and my mother's brothers' children. For us, the distinction of *lineal* and *cross* relations creates a special level of relationship in *familiar* and *taboo* relations respectively. Taboo relations, like brother and sister, do not talk, and generally avoid each other, while familiar relations are the 'marriageable' partners. Identifying one's *taboo* or *familiar* relations is crucial for proper conduct, and respectability.

Conclusion

It is not my intention to take anything away from Fijian culture or the practices therein, only to identify the 'hidden' or implicit mathematical heritage that can be seen to be part of the socialisation processes of all cultural groups. It has to be recorded for two reasons: firstly to make the case that we do mathematise, and secondly, that we do so differently from western ways. The work gives our children pride in themselves and their culture, and allows them a broader implementation of the knowledge.

The work has important implications for classroom practice. The mathematical ideas may be able to be used as stepping stones and as critical pathways to making sense of the more formal and difficult concepts of school mathematics. Further, knowing that Fijian children come from a society where quantification is normally in qualitative terms, and that they are likely to have a less developed number sense than normally assumed, should enable teachers to structure learning to address these differences. With respect to Fijian knowledge, however, it must be emphasised that the ideas are meaningful in context, and that decontextualising them would deprive us of the *mana* and holistic nature of that knowledge.

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