

# **Coping in multicultural and multilingual mathematics classes**

**By Salanieta Bakalevu, The University of the South Pacific**

---

## ***Abstract***

The diversity in student population in Fiji's schools reflect the diverse backgrounds that students come from. Schools are the training grounds for tomorrow's populace. It must set up structures that acknowledge the multicultural and multiethnic mix of the population. Our differences, be they cultural, ethnic, gender, or socioeconomic have the potential to enrich learning if they are celebrated. Equitable learning environments where all students have the opportunities to learn effectively and experience success are important.

Mathematics education is a site of continual contestation, where many students particularly indigenous Fijians have faced learning difficulties and continuous underachievement. This is cause for concern as it limits their options for further study and employment. International research points to the western culture of mathematics and schools as inhibiting factors for non-western students like the Fijians' understanding in mathematics. My work with trainee teachers attempts to bring into classroom learning the practices and ideas in my own culture that have mathematical underpinnings by token of the functions they perform. The structures, practices and activities are known to students and form the best basis for building mathematical learning and knowledge. The identifications and discussions will assist educators who teach Fijian students in schools and tertiary institutions. They can also inspire others to make further investigations.

The Fijian Mathematics Vocabulary project is an attempt to develop a Fijian mathematics vocabulary. That the Fijian language is generally perceived as an expressive language with a comprehensive grammar, and that it has the capacity for expressing fine distinctions between similar objects and expressing minute variations, showed have made our task easy. This did not happen when the context is mathematics. The project is continuing but our experience confirmed again that mathematics is indeed a powerful and unique language of communication.

## **Contents**

1. The Background
2. Fiji Demographics
3. History of segregated Schooling
4. Multicultural education in Fiji
5. Multicultural mathematics education
6. Vernacular in Mathematics Learning
7. Conclusion
8. References

## 1.0 THE BACKGROUND

Fijian children faced immense difficulties in mathematics learning and continued to underachieve in mathematics examinations. Records showed that they performed comparably with other races in English and the Social Sciences but have not done well in Science and Mathematics. Ministry of Education statistics (Annual Report, 1993-1996) showed that overall mathematics results were comparable through primary and early secondary, but the disparity began at sixth form level and widened further at the seventh form. High failure rate at sixth form has been recorded for all groups but the situation was more extreme (over 80%) in the case of Fijian students. The implications of this for seventh form, tertiary studies particularly in mathematics and mathematics-related courses and programmes as well as job opportunities is of great concern.

As a Fijian who came through the system, my experiences as a mathematics student, mathematics teacher and now teacher educator have led me to believe that a strong underlying cause of our students' difficulty in mathematics is a cultural mismatch in mathematics classes and schools generally. In my project "Fijian Perspectives in Mathematics Education" (Bakalevu, 1998), I equated the plight of Fijian students with that of other non-Western groups like Maori (Knight, 1994) and African-Americans (Secada, 1992; Tate, 1994; Ladson-Billings, 1997) who have been reported to face similar systematic under-representation in studies and careers that required mathematics and scientific knowledge. Studies have pointed to discontinuity, cultural alienation, and linguistic mismatch in content and learning style between the students' homes and the mathematics classroom as possible contributing factors for poor performance. I know that culture is a major variable that affects students' educational experience, and students face difficulties when schools and the mathematics curriculum do not acknowledge this factor (Howard, 1995). This paper discusses attempts to incorporate a multilingual and multicultural mathematics in our multicultural and multilingual schools.

## 2.0 FIJI DEMOGRAPHIC TRENDS

The two major ethnic groups in Fiji are the Fijians and Indo-Fijians, and the smaller groups normally classified as 'Others' include Chinese, Europeans, and other Pacific Islanders. Population Census figures in table 1 give a clearer picture of the ethnic mix.

**Table 1: Population Census 1970 – 2007**

<b>Ethnicity</b>	<b>1970</b>	<b>1996</b>	<b>2007</b>
Fijians	43%	393, 575 (50.8%)	473, 983 (57.2%)
Indo-Fijians	51%	338, 818 (43.7%)	311, 591 (37.6%)
Others	6%	42, 684 (5.5%)	42, 326 (5.1%)
<b>TOTAL</b>		<b>775, 077</b>	<b>827, 900</b>

Source: 1970, 1996, 2007 Census of Fiji, Bureau of Statistics

There are distinct differences, both cultural and linguistic, between the Fijians and Indo-Fijians, as well as between the other minority groups. There are also significant internal differences within each of the groups. The Fijians, for example, are divided into various distinct tribal groups as well as fourteen provincial lines. The Fijian language comprises at least 300 communalects many of them so clearly different that they can be considered as different languages. The Indo-Fijians do not comprise a homogenous community either (Subramani, 2000a) and the group is itself multicultural, multireligious, and multilingual. Subramani identified distinct cultural groups that follow different religions including Hindustani, Islam, Sikhism, and Christianity. Also, the people speak different languages (Hindi, Urdu, Tamil and Gujerati) and have roots in different parts of India.

### **3.0 HISTORY OF SEGREGATED SCHOOLING**

The early schools in Fiji were introduced by the Christian missionaries whose teachers themselves learnt the vernacular and taught in it. In fact, the first record of mathematics being taught in the Fijian language is that of the Methodist missionaries. The Indo-Fijian community, made up mainly of the Hindus and Muslims, established their own schools to meet their special needs. Schools for Europeans were set up by two companies aligned to the colonial government, the Colonial Sugar Refining and the Emperor Gold Mining. When the colonial government took on greater responsibility in education after the Deed of Cession (1874), one of its early initiatives was the start of government schools exclusively for the Fijians. So schooling in Fiji was berthed strongly polarized along racial and religious lines.

The concept of multiracial schools was not readily accepted by the major ethnic groups. European opposition to it in 1929 was because it was considered too controversial and too early for Fiji. Forty years later the Fijian leaders opposed it with concerns that it would lead to a loss in Fijian culture and identity. Likewise the Indo-Fijians strongly guarded their identity against intrusion. Those attitudes remained throughout the next decades and there was little effort by either of the two major races to integrate by intermarriage or by economic and social cooperation (Whitehead, 1981; 148). Race and ethnicity reared their ugly heads in 1980s and began a prolonged period of political turmoil that was primarily about the challenges of building and sustaining a multicultural society. This has resulted in attempts at greater integration especially in the schools. A significant trend is that of Fijian students flocking to traditional Indian schools because of perceived academic success of those institutions.

#### **Fiji's Multilingual Society**

In Fiji, 'vernaculars' refer to the standardised varieties of Fijian and Hindi used in the schools. Yet these vernaculars are not that spoken widely by the people. As highlighted earlier, this is because of a certain amount of internal diversity in both Fijian and Hindi (Mugler, 1996). Dialect diversity is a major feature of the Fijian language. The smallest dialectical unit is the 'communalect', which is understood simply as "a variety spoken by people who claim they use the same speech" (Geraghty, 1983; 18). Geraghty estimates

about 300 known communalects of Fijian language. As an example, the Eastern and Western communalects are so clearly different that they can be considered as two different languages. Speakers of Eastern varieties have difficulty understanding the Western variations (Mugler, 1996). In the face of this diversity, the colonial government decided on a standard Fijian to be the Fijian vernacular. The colloquial Fijian is related to the standard Bauan dialect, Bau being the paramount chiefdom of the time. That only around 20 percent of Fijians speaks this standard Fijian as home language while the large majority speaks their own communalect as home language was of no consequence.

The situation with Hindi is also problematic. There are two main varieties of Hindi in Fiji, Fiji Hindi and Standard Hindi. Nearly all Indo-Fijians speak Fiji Hindi, which is a combination of a number of dialects of various parts of India, plus a Pidgin Hindustani and include borrowings from English and Fijian (Mugler, 1996). By comparison, Standard Hindi or *Shudh Hindi* is the formal language of study that is used in the schools. This though is like a second-language to most Indo-Fijians. Standard Hindi and Fiji Hindi are different and this creates difficulties for the people.

#### **4.0 MULTICULTURAL EDUCATION IN FIJI**

The role of education as a vehicle of social change and liberation (Freire, 1970) is a useful site for the development of inter-group and multi-ethnic co-operation. Multiracial schools where students are enabled to move way from narrow, limited, ethnocentric views towards celebrating diversity are not enough on their own. What is needed is a multicultural curriculum that recognizes the practices, perceptions and the language of learners as the basis on which to build learning. These are the cornerstones for equitable learning environments where all students are given equal opportunities to learn effectively. The Education for All (EFA) initiatives geared towards a fair and harmonious society is in line with this.

##### **Language Policies**

The 1926 Education Commission established a policy that replaced the vernaculars with English after the first three years of primary school. Over the years this has been a major debilitating factor in our students' learning. Most of them meet with English for the first time in school and for them it is either their second, third or fourth language. That some school rules have prohibited the use of vernacular on the school compound and allowed only English has been both frightening and demoralizing for them. Things changed slightly in 1997 when a constitutional review acknowledged that Fiji is a multilingual state and gave equal status to English, Fijian, and Hindustani. However, the reality is that English is used extensively as the official language of communication in government, business, the media, and education. It appears to be accepted without question that English be the preferred language of communication and the major lingua franca for the country's varied population.

The current education policy is that the language of instruction for the first three years of schooling is the vernacular of the majority of the pupils and the school society. Mixed populations like those of the urban schools use English from the start and it is regarded as their vernacular. In Class one, there may be a little oral and spoken English, mostly rhyme and similar facets simply to familiarise children to the sounds of English. In class Two, English is introduced as a second language. Cross-cultural programmes are introduced at Class Five where students of one ethnic group learn the other language in context. Otherwise, English takes over as the main medium of instruction in Class Four and the vernaculars like Standard Fijian, Rotuman, Standard Hindi and Urdu, become subjects of study up to Form Seven.

## **5.0 MULTICULTURAL MATHEMATICS EDUCATION**

“Equity in mathematics education implies fairness, justice, and equality for all students so that they may achieve their full potential” (Croom, 1997; 2). In place of the “alien, dry and abstract” mathematical (Fasheh, 1991; 58), Croom proposed a multicultural approach to teaching mathematics that is “organised around historical and cultural perspectives”. I know from experience that historical items like the ancient systems of computation fascinate most students and make mathematics come alive. This mathematics is interesting and illuminating to conjecture about (Gerkhe, 1994). The cultural perspective, like the historical, “reaffirms the centrality of people in education, and demonstrates that mathematical knowledge is constructed, interpreted and shaped by people” (Bishop, 1992; 186-87). It situates knowledge in specific contexts and calls into question any ideas of mathematics and mathematics education as culturally neutral. The historical and cultural perspectives give mathematics a human face.

In my own project (Bakalevu, 1998) the cultural perspective presents the faces and experiences of my own people. The ideas contained in my thesis are slowly trickling into mathematics classes, not through the mathematics curriculum but through individual teachers’ initiative and creativity. My “multicultural frame of reference” (Bishop, 1992; 178) is concerned with culturally responsive teaching. I tell my teacher trainees that we do not have to wait for the next revised curriculum. Even if the Fiji Curriculum Framework is not yet responsive and content remains specified, the context is open and teachers can create meaningful learning. Let me share some of our ways of coping.

### **Reflection as tool for Change**

When I became involved in teacher training as a mathematics educator, I encouraged ongoing discussion and debate about traditional mathematics classes. I challenged my trainees re-examine and reflect on the ideas they bring to their education for teaching. In every lecture we take time to discuss either as a class or in small groups our thoughts on how certain practices affected our learning. The exercises, though time consuming, were critical in the way they made students take charge of the situations, recognized the problems and deficiencies and sought to change (Jaworski & Gellert, 2003). Trainees’ own experiences became the impetus for change; they worked through the change

processes themselves and agreed on the form that change should take. The discussions and debates were carried out as part of the topics of the lectures. Reflective assignments helped trainees to reconstruct and recapture what happened and the underlying reasons, generate alternatives for change, and consider the moral implications of those teaching events (Sebren, 1994; 23). I wanted them to consider ideas of fun, challenge and reality in their mathematics.

## **History**

Using history in mathematics has been easier than anticipated. History appeals to my trainees for two main reasons: that it is about people and that it is told like a story or *talanoa*. The medium of *talanoa* or oral testimony is common place in Fijian society and is the traditional medium of learning. Our elders and knowledgeable informants use the medium to share information and perpetuate tradition. People love *talanoa* because it is about the feats of people they know and adventures that hold meaning for them.

In the mathematics classroom, informing trainees of how early civilizations solved problems and the related inventions fascinate mathematics graduates whose learning up to now has been about mathematical truths and facts. How the Egyptians arrived at the first lunar calendar, the Babylonian use of base 60 number system, the Indian story behind the number zero, and the ancient Egyptian method of duplation and mediation for multiplication are different. Relating stories about famous mathematicians like Gauss, Pythagoras, Fibonacci and Descartes are similarly appealing because they give faces to that difficult mathematical rules and methods. Glimpses of the life of famous Indian mathematicians like Ramanujan and Shakuntala Devi as well as the development of the Number system in India are important for our Indo-Fijian students who are third generation descendants of *Girmitaya* who were brought from India in 1879.

## **Cultural Perspectives**

The view that mathematics is not related to culture is irrelevant. Multicultural mathematics generally and ethnomathematics in particular, is a response to that view (D'Ambrosio, 1997). To build knowledge on the practices and perceptions of learners is not only empowering but important in seeing mathematics as a cultural product and that mathematical activity is contextual (Bishop, 1988). My doctorate project "Fijian perspectives in mathematics education" (Bakalevu, 1998) looked into my own culture for mathematical ideas, activities and processes. In my classes and workshops with teacher trainees and various educational forums that I am invited to, I have used ideas from my thesis to inform trainees, assist educators who teach Fijian students in school and at tertiary institutions, and inspire investigation into other cultures where learners' cultures and languages are non-western.

### **(i) Counting system**

Two important items arise from this activity. Firstly, that our people are averse to counting considering it improper. The Fijian economic system and way of life that is based on sharing and redistribution do not fit with precision. In place of numerical

classifiers we use qualitative evaluations, gesture terms and phrases. This could suggest that Fijian students may have a limited mental map of the world of numbers and operations, and a less developed number sense. On the other hand, we have system of counting items of foodstuffs (like yams and coconut) and wealth (like mats and whale's teeth) that we use for traditional presentations. The counts of 10, 100 and 1000 of each item are denoted a specific noun. We have used this method of counting interchangeably with Place value and it makes perfect sense.

(ii) Dinau (Credit-buying)

This is not traditional practice but it is commonly practiced by everyone. All children know the transactions involved in *dinau*: that they get services including goods from the shop simply by presenting a notebook. No cash exchanges hands; the shopkeeper just makes the necessary entries. It suggest a weekly circulation where, from Monday through to Friday, people but on credit in the village, go to market on Saturday, pay all or some of the debt and dues on return, and begin the cycle again the next Monday. Two important points of consideration arise in such trading. (i) many Fijian children, especially in the islands and the rural areas, are not likely to have handled much, let alone large sums; (ii) the cycle of trading will be moving more on the negative end on the scale of numbers. In fact *dinau* weekly transactions show a movement to and fro between the larger negative and smaller positive end of the number line.

(iii) Measurement by body parts

Measurement is a human activity and the way early Babylonians, Egyptians and our own people experienced measurement needs help students to develop a 'feel' for it. Traditionally Fijian people measure using body parts, specifically mainly the arms and legs. The commonly used length units are the hand span, arm span, arms span and stride. Students understand the units. A woman may use hand span to measure single mat weaves or complete mats, and there are different kinds and categories of Fijian mats. She may use an arm span(s) to measure fabric and other materials, and the tape measure is a rarity. The men use *kalawa* or stride and occasionally arm span in building and farming. I know that rural Indo-Fijian families also use body part measures. For example, farmers use hand span to measure the distance between rice shoots. Wading through water-logged paddocks, farmers hold new rice shoots in one hand and use the other hand to space out the shoots by hand span and planting. The informal body parts measures are practical and meaningful. In the classroom, they are used to introduce the formal standard units and also reinforce them. They are the units that many of use as referents for estimating lengths and distances.

(v) Geometry in Fijian structures

Two traditional buildings stand out amongst all the buildings at this university. The Fijian *bure* that is pictured below has been a hallmark for many years while the more rounded Samoan *fale* is more recent. They are traditional structures of distinct cultures and represent the knowledge and skills of the people. They generate important geometric representations. The other pictures of a woman weaving a mat as well as those of a Fijian octagonal basket and a spiral tray are artifacts with geometrical underpinnings.





All the representations come with historical references that humanize the curriculum (Bishop, 1992) and make mathematics real for students.

## 6.0 VERNACULAR FOR MULTILINGUAL MATHEMATICS LEARNING

Mathematics education relies a lot on language. “Mathematics education begins and proceeds in language, it advances and stumbles because of language, and its outcomes are often assessed in language (Durkin and Shire, 1991; 3)

Many Fijian primary teachers encountered difficulties teaching in English and frequently reverted to the Fijian language particularly when trying to explain science and mathematics concepts. While the unique register and special written forms of mathematical language causes difficulties for most students, for second-language learners keeping abreast of content subject while trying to make headway in English (Clarkson, 1991; Cummins and Swain, 1986) poses two separate problems. Howard’s (1995) proposal that indigenous students coming from their own cultural background face heavier challenges than those from the culture of the mathematics classroom is reasonable. Howard suggested that our students not only have to adjust to the culture of the school and develop their knowledge of school language (in our case, Standard Hindi and Standard Fijian), they also have to become conversant in English and learn the language of mathematics which incorporates words and symbols.

### **The Fijian Mathematics Vocabulary Project**

In 2007 I formed a team of three comprising of a Fijian language specialist from the university, the mathematics educator another institution and myself to coordinator a project involving five working groups of Fijian teachers from across the country to develop a Fijian Mathematics Vocabulary. We were aware of the problems associated with development that related to moving a language, such as Fijian toward English modes and conventions (Barton, Fairhall, & Trinick, 1998). We did not want to corrupt our language nor ‘dilute’ mathematics. The work on the Maori mathematics vocabulary called *Nga Kupu Tikanga Pangarau* (1991) was an important guide. We adopted some of the methods employed in that project. The plan is two use three procedures - using an equivalent term, using the term commonly used in the community, and using a Fijian term with an added meaning. Where none of the methods provide what is required, we may consider coining new terms after wide consultation.

The team generated a database of over 800 mathematical terms from the primary mathematics texts together with simple definitions for each term. The lists were given to the five groups with the plan that they work on a group of words each time. We were open to any dialectical variations. My team of three visited the groups for consultation and consolidation. The meetings listened to the ideas of the group visited, my team would share what other groups had submitted, and then we discussed usage in mathematical contexts, and try to find agreement on the forms to be accepted. The use of diagrams and images has facilitated the work. Images of traditional artifacts such as the inside and outside of the Fijian *bure* (inside and outside views) as well as natural objects like coconut palms that are associated with the people’s activities and way of life were useful in the search.

“Mathematics is a powerful language system of making meaning and provides a powerful and concise means of communication (Mousley and Marks, 1991). The Fijian language is an expressive language with a comprehensive grammar. It has the capacity for expressing fine distinctions between similar objects and expressing minute variations. Geraghty (1994) identified Fijian pronouns that showed more variety than in English.

In our search for Fijian translations we continually hit the brick wall. The properties that defined this Fijian language were not apparent to articulate many mathematical meanings nor could we find terms to discriminate colloquial from mathematical meanings. The method of direct translations did not help as many translations were inappropriate. As the work unfolded in the first year, we shifted from alphabetical listing to various word clusters. Taking ANGLE as an example, we had one group of different types, another on position or location of angles, and a third on angle rotations. The choice of clusters depended on what lead words were available. This step moved the work forward and also alerted us to the inferred meanings in some Fijian words already in use. For example, subtract in Fijian is *veikerei* which means “to borrow from”. That is also the common subtraction method used in primary classes. We tied this meaning to “finding the difference between” and also stressed *kauta tani mai* or “take way from”. Many translations are like the given example, are not single words but two or three together. It has also become evident that the more abstract terms not associated normally with people’s everyday activities will not be easy to translate. For these, the English words will suffice. The project has been fun and empowering. The work is midway through.

## 7.0 CONCLUSION

Whilst traditionally mathematics was defined as the study for exceptional students who will pursue high status careers in medicine, engineering and technology, the new agenda is that all students deserve to develop their full mathematical potential so they live successful lives. After all, mathematics is a sequential and functional subject that is important in other subjects as well as a wide range of employment and life skills. The Fijian ethnomathematical ideas including the language are culturally reaffirming (Barton, 1996) for Fijian students and educators. I can attest to their usefulness in many ways. I have always conceptualised (mathematical) activities in the traditional sense. I do that in many instance and feel comfortable doing so. I straddle between two mathematical traditions which are equally important for me. Using the ideas from my culture in my workshops has prompted trainees to look within their own cultures also.

Indo-Fijian pre-service trainees are the largest groups in my classes. Initially they did not show much excitement in culturalising the curriculum and seemed uncomfortable about analyzing the ideas from their own culture. Their in-service counterparts were more enthusiastic and readily shared personal knowledge and experience. Their contributions included the mathematical analysis of traditional Indian dance moves, Rangoli patterns popular during the Hindu Diwali festival, and traditional Indians dress designs and pattern. Teaching mathematics in a multicultural classroom is not easy but the challenge harvests great reward.

## REFERENCES

- Bakalevu, S. L. (1998) *Fijian Perspectives in Mathematics Education*. Unpublished PhD Thesis. University of Waikato, NZ.
- Bakalevu, S. L. (2001) Ways of mathematising in Fijian culture. In K. H. Thaman and C. Benson (Ed) *Pacific Culture in the Teacher Education Curriculum. Module 5*. IOE, USP.
- Barton, B. (1996) Making sense of mathematics: Ethnomathematics is making sense. *Educational Studies in Mathematics* 31, 210-233.
- Barton, B., Fairhall, U., & Trinick, T. (1998). Tikanga Reo Takai: Issues in the Development of a Maori Mathematics Register. *For the Learning of Mathematics*, 18(1), 1-11.
- Bishop, A. (1992) Cultural issues in the intended, implemented and attained curriculum. In G. Leder (Ed) *Assessment and Learning of Mathematics*. ACER. 169-189.
- Bishop, A. (1988) Mathematics education in its cultural context. *Educational Studies in Mathematics* 19(2), 179-191.
- Croom, L. (1997) Mathematics for all students: access, excellence, and equity. In J. Trentacosta & M. Kenney (Eds) *Multicultural and Gender Equity in the Mathematics Classroom: The gift of diversity*. NCTM. 1-9.
- Clarkson, P. (1991) Mathematics in a multilingual society. In K. Durkin and B. Shire (Eds) *Language in Mathematics Education: Research and Practice*. Milton Keynes: Open University Press. 237-246.
- Cummins, J. and Swain, M. (1986) *Bilingualism in Education*. London: Longman.
- D'Ambrosio, U. (1997) Diversity, equity, and peace: from dream to reality. In J. Trentacosta & M. Kenney (Eds) *Multicultural and Gender Equity in the Mathematics Classroom: The gift of diversity*. NCTM. 243-248.
- Durkin, K. and Shire, B. (1991) Lexical ambiguity in mathematical concepts. In K. Durkin and B. Shire (Eds) *Language in Mathematics Education: Research and Practice*. Milton Keynes: Open University Press. 71-84.
- Fasheh, M. (1991) Mathematics in a social context: Math within education as praxis versus Math within education as hegemony. In M. Harris (Ed) *Schools, Mathematics and Work*. London: Falmer Press. 57-61.

- Freire, P. (1973) *Pedagogy of the Oppressed*. Leicester, UK: NIACE
- Genner, H. (1988) Mathematics in a multicultural context. In D. Pimm (Ed) *Mathematics, Teachers and Children*. London: Hodder and Stoughton. 72-81.
- Geraghty, P. (1994) *Fijian Phrasebook*. Hawthorne: Lonely Planet.
- Geraghty, P. (1983) The history of the Fijian language. *Linguistics Special Publication No 19*. Hawaii: University of Hawaii Press.
- Gerkhe, J. (1994) The place of history of mathematics in the teaching of mathematics. In J. Neyland (Ed) *Mathematics Enculturation: A handbook for teachers. Vol 1*. Wellington: Wellington College of Education. 358-366.
- Howard, P. (1995) mathematics in multicultural Australia: a focus on indigenous students. *Paper presented at 'History and Pedagogy of Mathematics' conference. Cairns, Australia*
- Knight, G. (1994) Mathematics and Maori students: an example of alienation? In J. Neyland (Ed) *Mathematics Enculturation: A handbook for teachers. Vol 1*. Wellington: Wellington College of Education. 284-290.
- Ladson- Billings, G. (1997) It doesn't add up: African American students' mathematics achievement. *Journal for Research in Mathematics Education 18(6)*, 697-708.
- Mousley, J. & Marks, G. (1991) *Discourses in Mathematics*. Geelong: Deaking University Press.
- Mugler, F. (1996) 'Vernacular' language teaching in Fiji. In F. Mugler & J. Lynch (Eds) *Pacific Languages in Education*. Suva: IPS, USP, 273-287.
- Secada, W. G. (1992) Race, ethnicity, social class, language, and achievement in mathematics. In D. A. Grouws (Ed) *Handbook of Research on Mathematics Teaching and Learning*. NY: Macmillan. 623-660.
- Subramani (2000a) Living in diversity: the Multicultural Curriculum. In *Learning to live Together: Directions for Education in the Fiji Islands*. Report of the Fiji islands Education Commission. Suva: Government Printing Press. 302-310.
- Subramani (2000b) Learning languages together. In *Learning to Live Together: Directions for Education in the Fiji Islands*. Report of the Fiji islands Education Commission. Suva: Government Printing Press. 302-310.
- Tate, W. F. (1994) Race, retrenchment, and the reform of school mathematics. *Phi Delta Kappan 75*, 477-485.

Whitehead, C. (1981) *Education in Fiji since independence: a study of government policy*. Wellington: NZCER.