

# Exploring the mathematical funds of knowledge of young Pacific people using Tivaevae research methodology

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# Background

- Limited studies in New Zealand and the Pacific specifically investigating Pacific funds of knowledge/identity in mathematics.
- ‘Funds of knowledge’ theoretical framing recognises that all people and cultures have bodies of knowledge and skills which are historically accumulated, culturally developed, and support individual/household functioning and well-being.

# Research focus

- To provide ways in which to document and value the mathematical funds of knowledge and identity of young Pacific people.
- Explore the culturally embedded ways of knowing and successful mathematical experiences of Pacific learners outside of school, in their everyday settings
- Draw on innovative ways to recognize funds of knowledge and identity



## Research design

- Students aged between 9 years and 14 years old participated in the study with their families.
- Three schools including two in South Auckland and one in Niue.
  - 28 children from South Auckland school (20 family groups)
  - 17 children from Niue (17 family groups)

## Research design

Tivaevae model (Futter-Puati & Maua-Hodges, 2019; Te Ava & Page, 2020)

Koikoi—gathering of the patterns;  
Experiences and activities involving  
mathematics documented through photographs.  
Determined by the participants and shared  
through photo-voice



## Research design

Tuitui—sewing the pattern onto the blank canvas

Interactions and story-telling to facilitate connections and relationship building. Analysis by the research team in relation to funds of knowledge and mathematics and the explicit connections to mathematics that the participants themselves acknowledged represent a key aspect of tuitui.

## Research design

Akairianga—evaluating and offering of the tivaevae to the community

Gift of metaphorical tivaevae created from participants' stories of mathematics in their homes and community. Potential to challenge and disrupt deficit perceptions and offer opportunities for educators to develop their understanding of the mathematical funds of knowledge of Pacific people.

# Research design

Umbrella code	Explanation of umbrella code	Sub-codes
<b>Family</b>	Activities and experiences which students undertook with their families	Chores, cooking/food, financial situations, celebrations/culture, play, arts, construction, physical activity, trips/transport, shopping, education, entertainment
<b>Community</b>	Activities and experiences which students undertook within their local community	Events, church, Covid-19, service
<b>Peer</b>	Activities and experiences which students undertook with their peers	Celebration, organised group, play, shopping, sports
<b>Identity</b>	Personal life experiences which students referred to in relation to their identity	Artefacts, culture, school, arts, sport, toys, electronic games

## Findings

# Family funds of knowledge

South Auckland	Niue
Cooking/food	Chores/household tasks
Cultural artefacts	Cooking/food
Chores/household tasks	Financial situation
Games	Arts
Financial situations	Physical activity
Physical activity	Culture
Arts	Games

## Preparing food (South Auckland)

*“You know the measurement. The ingredients are milk, sugar and water and watermelon and faina (pineapple). So you just hele (knife) the meleni (watermelon) and then you take off the kili (skin of fruit, or other food) the like the green part, and then you put it in and then and then you get the thing, like you go like that and then you make it like a line. It’s yummy and then you put it in the big bowl and then um, and then you just take those little things out the black, the round things. Yeah the seeds and then and then after that you um after that you get the sugar, milk, um water*



## Findings

- Spear fishing on the reef with father (Niue)



*“there is a big gun and then it has a hook and then you just hold it back and you press the trigger when you see a fish...sometimes the fish are down there [indicates far from the reef] and you have to walk a bit closer and then [indicates moving the spear gun to a different angle]. Like this is the fish and this is the human [using hands to show positions and angles] but the fish is not that big, it’s a small one [uses hand to show a different angle].*



Links to maths and science in regards to sustainability for the environment and the use of natural materials for everyday life.

*Niu, the coconuts, I'd have to teka (hook for coconuts) them and I have to collect them...husking it was difficult because if they were young coconuts and you'd husk them, you have to husk them carefully in case one would pop. Then I use the husk for compost, put it around the tree and I think it was around about five husks on one coconut, that's the average but if the coconut was really big I guess it would be seven depending on the width of each husk. It doesn't matter how many you have as long as it covers the stem of the tree.*

*Once you grab one of them, you have to grab the next, if they don't have enough support on the tree, they fall and pop. Also if the tree is overgrown, the weight of the coconuts will break with the wind.*

Embedded application of measurement and ratio concepts. Connections across mathematics including probability, geometry, and measurement related to selecting which coconut to first take from a specific tree, the positions to catch the coconuts based on the angle in which they fall, and measurement concepts related to height, space, and force.



## Cultural items (South Auckland)

### Kiekie

*“you tuitui the flowers outside and then when you finish tuitui that one you tuitui that one again.*

*Yeah, you tuitui with that black string you keep tuitui until is already done up there and then you get that thing (top part) and then you ha’i around”*



## Findings

Descriptions of traditional craft-work including quilts, weaving baskets and making fou fou (traditional headbands) and kahoa maile (leaf necklaces). These examples highlight the strong background of mathematics within Pacific heritage including geometry, algebra, and measurement. The repeating and growing patterns and motifs which are seen across craftwork, tattoo and clothing are generated from nature and have been handed down through families over an extended period of time. This was explicitly acknowledged by one of the participants in Niue: “our ancestors wore them for dancing”.



## Findings

Hair cutting and ear piercing

*“you have to see how many taros you have to give out to other people. You put the taros in bundles and put them in rows for the number of people”.*



*“then we had to look at the money, see who has the most money for paying back... he had the most money so he gets like the most feed”.*

Rich mathematics including measurement, multiplicative thinking, and proportionality.



## Overall findings

The funds of knowledge and identity of Pasifika students in New Zealand was significantly different than those in Niue.

Attending to funds of knowledge a way of highlighting the dynamic complexities of peoples' lives by evidencing that there are many ways to be part of a cultural group.



## Widening a view of maths

I thought it was going to be a bit hard because everything just seemed normal but once you think, have a mind-set of looking for maths it's actually more. It's more common than you think.

Now I see maths as everything and everywhere in the world.