

**Perspectives of Lower Primary Teachers Implementing New Numeracy
Strategies in Maritime Schools in Fiji**

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Abstract

In Fiji, concerns about the quality of education and low standards of achievement, particularly salient in numeracy, have led to reform initiatives requiring teacher pedagogical shifts to more evidence-based and learner-centred approaches. Despite previously unsuccessful reforms, the capacity of maritime teachers to successfully adapt curricula in their geographically constrained environments has never been considered, despite them forming a significant proportion of the primary teaching force.

This interpretative qualitative study examines the implementation of a recent reform-based numeracy strategy in lower primary mathematics classrooms of maritime schools. Specifically, teachers' perspectives on the implementation process, their experiences with the new strategies, associated challenges, and maritime context-specific barriers have been investigated.

Data were collected through two in-context focus group interviews with 13 participants and 62 returned questionnaires. The findings of the study reveal that teachers' perceptions and receptivity to the new numeracy strategies were strongly influenced by factors such as past experiences with reforms and increased expectations. While teachers understood key ideas underlying the reform to improve student's mathematical knowledge and were inclined to alter pedagogical practices, most teachers felt a disconnect in terms of not being supported well enough to fully incorporate the new strategies. Teachers identified the need for a contextually-relevant supportive network and structures, both professional and personal, as essential to overcoming numerous challenges they encountered while living and working in maritime areas of Fiji.

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Chapter 1: Introduction and Overview

1.1 Introduction and Rationale

This inquiry focuses on a recent numeracy reform effort in Fiji and the perspectives of a particular group of teachers responsible for implementing it.

An issue that has been bothering our Ministry for some time is poor numeracy standards of the children in our school system. It is in this regard that our Ministry has been working closely with [the] Access to Quality Education Program (AQEP) to examine strategies for delivery as well as improving content for improving the numeracy outcomes of all children. It is vital that children in the early years of school learn the foundational skills of numeracy. They need to know and understand numbers and numeration to efficiently complete maths operations by the time they leave Year 4. (Ministry of Education [MOE], 2017a, p.1)

The above quote echoes concerns about low numeracy achievement in Fiji and indicates why this small Pacific Island nation is focusing its resources to improve numeracy. Currently, Fiji is in the process of implementing new strategies for delivery of the current mathematics curriculum in lower primary classes. However, consecutive curriculum changes, reforms, and initiatives mark the journey of Fiji's education system following the Fiji Islands Education Commission Report 2000, an extensive review that reported challenges pertaining to curriculum related issues of relevance, resource, teaching and learning methods, teacher quality, and infrastructure. Numerous submissions to the 2000 Education Commission had raised concerns about the nature of education delivery and the system's outcomes measured through examinations (MOE, 2000).

In 2001, the Australian government was approached for assistance which resulted in the Fiji Education Sector Programme, an agreement for the development of the National Curriculum Framework (NCF). The period between 2003-2008 focused on the development and implementation of the NCF, adapted from the Western Australian outcomes-based education model (Koya, 2008). The NCF was not entirely implemented in Fiji, despite much investment, before it was abandoned due to socioeconomic and political factors (Crossley et al., 2017). The outcomes-based approach was followed with a period involving the reduction of three major examinations and the implementation of class-based assessments.

Crossley et al. (2017) describe this phase as a “content-full, resource-empty system” which had on a superficial level removed the pressure of national examinations, but on the other replaced them with a series of multiple subject-based internal assessment tasks.

The plummeting standard of students’ achievements, especially in numeracy, in the remote outer island schools became noticeable, and a major cause of concern. To “reiterate the need for a responsive curriculum” the second edition of the NCF, the 2013 Fiji National Curriculum Framework (2013 FNCF) was designed (MOE, 2013). Recognising the changing and diverse learning needs of students in the 21st century, the 2013 FNCF prescribed a ‘social constructivist approach which emphasises the importance of culture and social context for cognitive development’ (MOE, 2013, p.14). Teachers once again realigned their teaching and assessment practices to meet the expectations of this document. This process was in its early stages when two months after the September 2014 elections, the newly appointed Minister for Education made the announcement that two of the national examinations that had been cancelled would be reintroduced in Years 6 and 10 as benchmark assessments (Soveraki, 2014). The poor results of the reinstated 2015 examinations, especially in numeracy, raised questions about the design, delivery, and management of education in Fiji. The Year 1 to 4 curriculum, with the incorporation of new strategies was therefore improved ‘with the help of experts from outside Fiji to bring it to par with the curriculum of schools in Australia, New Zealand and India’ (MOE, 2015b, p.1), by means of a strong focus on literacy and numeracy strategies.

Additionally, Fijian education policies on access, efficiency, equity, identity, quality, and relevance continue to evolve and inform the current curriculum practices of teachers. Publications by the local institutions and scholars highlight issues surrounding Fijian education. Current educational change is now more focused than in the past, on instilling knowledge, skills and values that empower the cultural identity of the people (McLaughlin, 2018). While there is increasing recognition of the changing role of teachers, their actual participation in this change, remains inconspicuous, particularly, those who are, by their situation, difficult to access and therefore poorly represented, i.e., the teachers working in remote maritime (sea-going) schools whose lenses are the focus of this study. Fijian maritime teachers usually live and manage in on-site accommodations provided by the school

management and have limited access to services such as transportation, health, shopping centres etc.

Despite the issues and concerns above, the knowledge, practices, and professional learning experiences of maritime school teachers regarding their interaction with new curricula and teaching of mathematics have not been investigated. It is hoped that exploring the perceptions of these teachers regarding the new numeracy curriculum will provide the understanding needed to inform policies and plan appropriately for improving numeracy outcomes in remote contexts.

1.2 The Context of the Study

1.2.1 Personal background

A Fijian of Indian descent, I was brought up and schooled in a rural, multi-racial community in Fiji. The earliest memory of my math learning revolves around bundles of sticks, a collection of stones, and a multiplication times table handwritten by my mum on a piece of cardboard. Our math class was always about 'problem-solving' from the blackboard or the textbook, and daily repetition of 'the times table.' It was our way of learning, and we learnt it well. Teachers set goals for the math concept that we all 'mastered' by the end of the week. At that time, our parents were proud of us. Even more when we were selected to stand and present to them or any visitor to the school. So young, so well taught. Our abilities to read and do the math of the next level was always encouraged.

Few changes in community and parental thinking about what and how children should be learning in remote locations have occurred. From my experiences of primary school teaching, it seems the physical, structural, and pedagogical systems of rural, remote, and maritime schools remain embedded in the past despite the innovations of a 21st century curriculum. I worked 14 years in remote mainland schools and two years in a very remote maritime school dealing with curriculum changes or reforms, and from my perspective, the curriculum itself seems unable to bring about any significant changes in practice. An interesting situation I encountered when posted to the maritime school was this community's expectations that as a non-Indigenous teacher in an Indigenous school, I would be applying for transfer soon. I observed that a norm in these remote locations was

Indigenous teachers remaining longer while non-Indigenous teachers usually left as soon as possible for various reasons such as cultural and language differences.

In my experience, rural, remote, and maritime contexts are often at the bottom of the priorities in curriculum reforms, and it seems this may have been the case in the new numeracy strategies (NNS), as this context was last to receive professional development (PD) for teachers. These issues and concerns have led me to this research to gain a better understanding of the implementation of the NNS, which is concurrently being implemented with the new literacy strategies.

According to Begg, Bakalevu, and Havea (2018), one challenge is to have teachers interpret rather than follow the curriculum or textbook (a commercial curriculum), and a second is to ensure that the emphasis on preparing students for examinations does not replace “developing broad and contextual understanding”. My own experiences in teaching mathematics and personal reflections over the demands of mandatory curriculum changes over the years has deepened my interest in this topic. The expectations stemming from reform philosophies collectively with my observations of teacher attitudes arising from increasing workloads further stimulated my interest in this numeracy reform. I wanted to do this research because I believe we need evidence of teachers’, in remote maritime schools, perspectives on curriculum implementation to fill an important gap in our knowledge.

1.2.2 The Fijian context

Fiji is regarded as the hub of the South Pacific, boasting the largest international airport connecting the region to the world. It is described as an upper middle-income country consisting of 333 small islands, of which 110 are inhabited. Several ethnic groups, Indigenous Fijians and Indo-Fijians being the most prominent, make up the population of 884,887 (Fiji Bureau of Statistics, 2018). The geographical distribution of Fiji results in schools being scattered which poses unique challenges to the education system. Fiji was a British colony for nearly 100 years and even after gaining independence in 1970, most of the colonial policies, practices, and structures in the education system remained in place. Post-independence, New Zealand curriculum content, textbooks, and national examinations were used until the 1990s when a local national curriculum was developed and implemented in the Fijian schools. The Ministry of Education, Heritage and Arts is the central authority that

controls, manages, and oversees the curriculum and assessments in schools. Literature extensively describes the role of aid and various policy actors that have and still continue to contribute and define the shape of educational policies in developing small Pacific Island countries such as Fiji. The education sector is one of the most targeted areas of aid and Fiji's education system presently is the result.

The NCF, as described above, has undergone a series of initiatives and reforms that currently make its position unclear. While the NCF is perceived to be a move towards student-centred pedagogies (Koya, 2015) and is still the official primary guiding policy framework, a reinstatement of national examinations and related practices contradict it and have resulted in inconsistent educational outcomes. Assessments of student learning have become a major tool to inform policies and practices in Fiji. The minimum standards not being met by students and their low achievements in Literacy and Numeracy Assessment (LANA) administered to Year 4, 6, and 8 students have led to the newest reform in Year 1 to 4, an introduction of literacy and numeracy strategies. The groundwork for the NNS was carried out by the Australian funded Access to Quality Education Program Fiji (AQEP) as phase 2 of a five-year programme aimed at 'reducing the barriers for children to accessing education in Fiji' (AusAid, 2010). It was developed and piloted in lower primary classrooms of 85 schools (MOE, 2017a, 2017b). A comparative study of this initiative confirmed its effectiveness (MOE, 2018), thus with these trialled materials, the Ministry of Education Fiji embarked on a comprehensive reform programme targeting lower primary teachers. Through the roll-out of literacy and numeracy PD, the teachers' role and changing of pedagogies were emphasised. It was believed that changing teaching practice would result in the transformation of the classroom that would lead to improvements in student achievements (MOE, 2015). These reforms involving PD consequently have given teachers opportunities to learn new teaching pedagogies. 2017 began with PD in numeracy for Year 1 to 4 teachers in maritime schools of Fiji. Teachers were trained in cohorts of Year 1 and 2, and Year 3 and 4. These teachers were expected to remain and implement the new literacy and numeracy strategies for the next three years at their current schools.

The Curriculum Development Unit (CDU) in conjunction with AQEP printed and provided copies of the mathematics teacher's guide that is now being used as the principal document in designing, planning, and teaching in the new way. The teacher's guide

highlights the importance of learning to know, whereby teachers use a variety of strategies in their teaching to encourage children to use mathematical language such as how much, how many, bigger than and smaller than. The pedagogy urges teachers to focus on the development of skills, knowledge, and attitudes of children to explore and understand the world in an enquiry and discovery manner. A do-talk-record (DTR) method dictates structured lessons:

Whenever children learn something new in maths:

- They should always learn it using materials,
- They should learn the new words for talking about it,
- They should always record it – by labelling, drawing pictures, assembling, arranging or writing. (MOE, 2017a, 2017b)

The mathematics guide also encourages teachers to contextualise their teaching by using local materials and relevant teaching aids to successfully teach the concepts. The school heads are to monitor the implementation of these new strategies and while it was planned that they would also be informed and trained on it, at the time of data collection this had not materialised.

The quality and effectiveness of this approach in enhancing the numeracy levels in primary schools are yet to be gauged. This nation-wide systematic reform requires quality evidence-based feedback and information if the numeracy levels in this context are to improve. Thus, one of the aims of this study is to highlight any difficulties that the teachers may face during a new curriculum reform in this context.

1.3 Study Aims and Research Questions

The essence of this study features the kinds of role teachers play in curriculum reforms and to what extent their knowledge, experience, and voices are (not) included. Through this study, I seek to identify and understand how education and curriculum policies and processes are deployed or understood in the context of incorporation of the NNS in the maritime context.

For numerous reasons, the reality of this context has never actually been documented and usually, the conclusions drawn are based on assumptions or generalised with references to similar contexts. These conclusions lead to initiatives that do not really

match and often are irrelevant. For example, Douglas, Eti-Tofinga, and Singh (2018) describe Fiji as 'one of the most developed and connected small Pacific Island country (PIC), yet very remote. The authors describe "IT structures as not sufficiently robust to resist being disrupted by the extreme weather events" and that "internet is not a reliable means of communications". In contrast, the Systems Approach for Better Education Results [SABER] country report (2017) documents that approximately 90% of Fiji schools have access to the internet, and the 10% without internet owing to being smaller primary schools in rural or remote areas. The report uses diagnostic tools that examine education management and information systems and their component policy domains against global standards. Fiji's education system is thus reported as having an enabling environment, system soundness, and quality data while utilisation for decision making is emerging.

The two recent reports mentioned above have reviewed Fiji through different lenses and both, to some extent, conflict with my perceptions and experiences as an insider, a teacher who has taught in a variety of contexts in the Fijian primary system. This raises the issue of how accurately maritime classrooms are represented in the educational policies and decision-making. Examining this issue through the eyes of remote maritime teachers would add a new and authentic perspective, providing insights into the challenges and barriers in implementing a new reform in the mathematics curriculum. A study of this context would provide various stakeholders with an awareness and timely feedback regarding complexities in the implementation of the new reforms in the mathematics curriculum.

Finally, the issue of remoteness, of varying kinds, and its associated challenges is a common problem to many regions but underrepresented in international literature. While aid providers and other interested parties attempt to canvas their needs, the accessibility of these schools and teachers often prohibits such interactions. Thus, this study will attempt to facilitate a more accurate representation of the voices of teachers working in these conditions.

To provide insights as suggested above, the following research questions will guide the study. For Year 1 to 4 teachers implementing the NNS in a maritime context in Fiji:

1. What are their perceptions concerning the NNS and their implementation?
2. What barriers do they experience into their implementation of the strategies?

Chapter 2: Literature Review

2.1 Introduction

The following elements have been included to guide the reader towards an insightful understanding of how this study interacts with and complements existing research. Firstly, the review will examine educational goal alignments globally and regionally and the ways in which they prompt Fiji's focus on developing human capital through education. Secondly, the review will discuss the resulting (aid-responsive) curriculum reforms and their impacts on the Fijian education system. This will be followed by the theoretical perspectives regarding mathematics learning including reforms in mathematics and issues arising with reference to remote contexts, of which the maritime context for this study is an example. Through the evaluation and synthesis of literature, the implications for curriculum reforms in maritime Fijian classrooms will be discussed, followed by a summary.

2.2 Global Influences in Fijian Education

For over a quarter of a century, formal global programmes of development have contributed to the growth of the educational contexts of Pacific Island countries (PICs). Small PICs like Fiji "continue to reconcile and recover identities that were challenged, even erased, during the colonial rule" (McCormick, 2014 p.16). Policy actors, for example, the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the World Bank, through financial aid, personnel, and advisory commissions continue to influence education policies (Crossley et al., 2017). Global social policy programmes such as Education for All, Millennium Development Goals, and now the Sustainable Development Goals have all been part of UNESCO's influence in moulding the education system of most PICs.

From basic education to current contemporary educational developments, literature is sceptical of the nature of aid delivery in the Pacific (Coxon & Munce, 2008; Crossley et al., 2017; McCormick, 2014; McLaughlin, 2018). There is an agreement amongst authors that in terms of education, so-called international 'best-practice' informs and shapes decisions on both what aid is to be allocated and the mechanisms for how it should be delivered, with little attention to particular regional or national needs (Coxon & Tolley, 2005). Begg et al. (2018) attribute the substantial changes in organisation and practices of the education systems in PICs to an increased awareness by its leaders of the need to meet the demands

of an educated workforce. However, according to McCormick (2014), “post-2015 SDGs continue to promote a type of development and education that is sculpted to serve formal economics” (p.17) and may only be partially relevant to PIC’s contexts. Sanga (2003) declares that after many years of donor-driven and aid-controlled systems, Pacific educators are discouraged by the outcomes of aid projects. Even though with great advancement in the worldwide delivery of education, for example use of AR (augmented reality) or VR (virtual reality) by modern societies rapidly embracing education of the future, McLaughlin (2018) points out that quality of education remains “an elusive goal of education globally” and continues to be a major concern for all those involved in education. McCormick states that the relevance of global processes to national or local contexts and how they are perceived to be relevant needs to be well articulated. He proposes that the process of continued developments through aid must change. However, it remains uncertain in which ways this can happen.

In Fiji, improving the quality of education has progressively become a major concern, although Fiji’s colonialist history lingers on in the present-day education curriculum (Lingam, Lingam, & Sharma, 2017). Fiji’s quest to develop its own identity has increasingly become more important, and awareness that education can significantly influence these aspirations (Begg et al., 2018) has created an almost flux like state whereby solutions are desperately sought.

As a consequence of the past focus of educational dialogues and debates on the school and the role of teachers in particular being profoundly impacted by colonial mindsets prevalent in the Fijian education system (Baba & Puamau, 1999; Sharma, 1990), the need to develop and sustain relevant education systems within the politics of aid-relationships has been recognised (Baba & Puamau, 1999; Nabobo-Baba, 2013; Thaman, 1993). There has also been acknowledgement of the limitations required for revolutionary system changes, such as professional expertise (Taufe'ulungaki, 2002). In the past two decades, much activity in the education sector has focused on changing teaching and learning to align with the development of “Quality education for peace, change and progress” (MOE, 2015). The 2015-2018 Education Sector Strategic Development Plan of the Ministry of Education, Heritage and Arts Fiji states one of its guiding principles as “we keep the student at the centre of everything we do” (p.8) and concurrently acknowledges that despite education being the

largest portion of the government's annual budget, the progress of reforms and initiatives are often derailed due to shortfalls in funding. The aid donors are therefore regarded as well-wishers who have "harmonised these gaps" intermittently and progress in the status of education in Fiji is often attributed to them.

2.3 Current Reforms in Fiji

2.3.1. Current curriculum reforms and issues arising

Most recently, Fiji's National 20-Year Development Plan 2017-2036 (NDP) provides a vision for revolutionising Fiji and states that

curriculum will continually be reviewed and strengthened to achieve national objectives ...incorporating contemporary thematic areas in educational curriculum such as cultural diversity, gender, nutrition, respectful relationships, drugs and alcohol, climate change and the environment that will enrich students' understanding of wider social issues (Ministry of Economy, 2017, p. 40).

According to Williams and Cummings (2005), reform is the goal of policies aimed at improving a system of education, but state that the word 'reform' can be used casually, suggesting substantive changes being planned or underway, whereas little of real substance is changing in a system. While the NDP is "aligned with global commitments including the 2030 Agenda for Sustainable Development" (p.3), there is a growing concern about "transplanting reforms... and unquestioningly implementing them in ways that are insensitive to the receiving ecology" (Lingam et al., 2017), leading to failures of the reform initiatives in developing countries (Bruns, Filmer, & Patrinos, 2011). In the Fijian context, numerous challenges in the process of curriculum implementation have often been overlooked when it comes to national policy and planning in education. Tuinamuana et al. (2006) reminisce that in emerging nations such as Fiji, new concepts are usually introduced into the education systems "without due attention being paid to contexts of implementing" (p.324). Moreover, substantial belief tends to have been placed in the new idea and then "teachers are expected to bring about the changes that the new slogans embody" (p.115). Hargreaves (2007) points out that most countries' educational research lacks studies which provide pupils, teachers, parents, and communities with the opportunity to fully voice their concerns. He suggests that independent national databases should be established giving the

opportunity for analytical and comparative research on rural and urban schools and their communities, adding critical independent quality educational research that can inform curriculum reforms.

In the case of Fiji, local researchers have undertaken an investigation into some aspects of recent curriculum reforms. Crossley et al. (2017) in a study of quality education and the role of the teacher in Fiji, describe the move to renewed policy emphasis on the centrality of the teacher's role as essential if quality education is to be achieved. The study revealed that although Fijian teachers claim to value learner-centeredness, evidence of it is lacking in widespread practice. The participants of the study (teachers, student teachers and teacher educators) raised their strong concerns about the increase in teacher accountability and performance-based culture rapidly engulfing Fiji's education system. The authors suggest that for successful educational reforms, it is necessary to gain an in-depth understanding of the practical realities of the contexts within which teachers operate (Crossley et al., 2017).

In another study, Tuimavana and Datt (2017) analysed teachers' attitudes towards teaching mathematics at upper primary levels in Fiji's primary schools. The study focused on teachers in the Western Division, a selection of rural and urban schools. Their findings reveal that the teachers in this study were "relatively equipped with the necessary pedagogies to impart the upper primary mathematics curriculum" (p.272). Although this research did not extend to mathematics teaching in lower primary or remote maritime areas, it presents primary school teachers as having positive attitudes towards mathematics and complements the Ministry of Education's efforts at addressing the needs of most teachers in the study. In contrast, Joweli (2017) in his study "An In-Depth Analysis of Fiji Grade 6 Mathematics External Examination Items and Results" found that students' poor numeracy achievement is highly related to the students' lack of basic mathematical conceptual knowledge and skills to solve comprehension and application related problems which involve "high-level thinking influence" (p.73). He goes on to question the competence level of teachers and the quality of mathematics teaching in primary schools (Joweli, 2017). Studies such as the above contributed to continued dissatisfaction with student performance in national assessments and examinations leading the stakeholders to contemplate that change is needed, a change in a different way.

The continued partnership with Australian-aid programmes potentially places Fiji in a better position than it was in 2008 when it first drafted the NCF. The second edition, the 2013 Fiji National Curriculum Framework (2013 FNCF) was informed by the trials and errors of the previous curriculum and its implementations. However, it remained largely examination-driven and prescriptive in nature (Crossley et al., 2017). Under the 2013 FNCF mathematics syllabi, Year 1 and 2 teachers were trained to teach mathematics thematically to the learning standards; with an emphasis on the use of the applications of mathematics around a central theme, considered situated learning because content is embedded in themes that, in turn, serve as learning contexts (Henderson & Landesman, 1995). Mathematics for Year 3 and 4 was organised into strands with strand and content learning outcomes and teachers used achievement indicators in conjunction with the scope of content to organise their learning and teaching programme for the year (MOE, 2014). Maintaining the 2013 FNCF mathematics syllabi (i.e. learning standards of Year 1 and 2 and achievement indicators of Year 3 and 4), the current new numeracy strategies (NNS) encourage teachers to develop focus objectives to plan, teach, assess and monitor students' numeracy development from Year 1 to 4 in the hope of bringing about a pedagogical reform in teachers' mathematics teaching, leading to improved student performances in Fiji.

2.3.2 Reform-oriented pedagogy for mathematics

The NNS are focused to move lower primary mathematics teaching towards a new investigative paradigm and pedagogies. Two main reference documents, Math Teachers Guide Year 1 and 2 and Math Teachers Guide Year 3 and 4, have been published and distributed, Fiji-wide, accompanied by five days of PD sessions to train lower primary teachers (MOE, 2017a, 2017b). The math teachers' guides promotes NNS through organisation of mathematics lessons into a do-talk-record (DTR) structure and advocates active learning of mathematics. The writer of the texts states that "active learning is related to other teaching approaches such as child-centred learning, inquiry learning or a problem-solving approach" and the DTR approach has been adopted to help teachers to "plan and deliver active learning lessons" (MOE, 2017a, p.64). The DTR triad is a description of what is likely to take place in collaborative mathematics classrooms (Delaney, 2001) and is focused on the learner.

One lesson learnt from continuous curriculum reforms in Fiji is that “the reforms have intensified the work of teachers” as highlighted by Lingam et al. (2017) in their recent publication concerning Fijian primary teachers. They stress the need to acknowledge the teachers’ workloads in future changes because it will influence children’s learning outcomes in future as well. Further, while it is widely accepted that to implement a curriculum reform, teachers need support, the type of support needed is not quite implicit, especially as it relates to specific contexts, and consequently the focus of recent studies is to understand what processes teachers undergo as they attempt to change their instructional practices (Cheung & Wong, 2012; Ganim, 2016; Hirsch, 2016; Lasen, Skamp, & Simoncini, 2017).

These perspectives from the literature support the focus of this research, which is in part to examine the in-context teachers’ understandings of the expectations of current reforms and the support they identify as necessary in implementing them.

2.4 Implementing Curriculum Change

The implementation of any curriculum initiative in the classroom is dependent mostly on the teacher and the teacher’s perceived desirability and practicality of the new teaching approaches (Swann & Brown, 1997). As discussed earlier, the new reform NNS calls for a change towards teaching approaches that could prove to be new for many teachers in a remote context. The reform intentions need to be translated into classroom teaching practice if change is to be made. The curriculum and its implementation encompass aspects that are more than the written curriculum documents such as teachers guides and syllabi (Cuban, 1998; Stenhouse, 1968). The literature outlines two types of factors that can act as either inhibitors or facilitators of curriculum reform implementation. There are internal factors such as teachers’ beliefs regarding the curriculum reform, teacher beliefs regarding mathematics teaching and learning, teachers’ pedagogical and mathematical understanding and teachers’ self-efficacy (Ball, Hill, & Bass, 2005; Minnich, 2008). External factors that will also impact the process of implementation are the school context, staff, parents, and students as well as opportunities for professional development (Roehrig, Kruse, & Kern, 2007).

Porter (1980) states that people concerned with “creating policy and enacting the relevant legislation seldom look down the track to the implementation stage” (p.74).

Surprisingly, after nearly four decades Begg et al. (2018) similarly assert that to promote long-term economic development, improving numeracy education is often regarded as a priority for developing countries but the focus in such mathematics education initiatives, whether funded locally or through aid, is often limited to the development of the curriculum. Many teachers experience the burden of keeping up with what was required of them by the education system and matching the expectations of the communities they work in (Stake & Migotsky, 1995). Clements and Ellerton (1996) stress that when governments accept every child's right to at least a primary education, then spending money on resources needed to meet this obligation will be wasteful if the curricula and the delivery does not result in helping children become productive individuals.

Reformed curricula can be made to work as hoped when teachers are well supported in teaching for understanding and have good curricular materials to use whereby children really do learn and differences in performance diminish (Schoenfeld, 2002). Fullan and Miles (1992) state that without deliberate measures to continue an innovation, it may disappear, as history has shown that many reform efforts in mathematics education have lacked sustainability.

Schoenfeld (2002) identifies four fundamental issues in regard to sustained reform and improvement in mathematics that are relevant to other contexts, including Fiji. They are summarised as:

- A. A high-quality curriculum - research-based curriculum grounded in an understanding of mathematical thinking, teaching, and learning available with mechanisms to improve and update it from regular feedback.
- B. A stable, knowledgeable, and professional teaching community - redefinition of the contexts of teaching, teachers' responsibilities, and accountability measures so that professionalism becomes a meaningful possibility.
- C. High-quality assessment aligned with curricular goals - assessment is a means of fostering growth toward high expectations and should support high levels of student learning.
- D. Stability and mechanisms for evolution - access to solid and well-aligned standards, curriculum, and assessments.

2.4.1 Curriculum implementation and the teacher

Remillard (2005) states that in order to write a curriculum that influences learning, it is important that we know how the teachers engage with it. Teachers are the mediators between the curriculum content and its delivery. Their views, values, and perceptions influence the way they interpret the curriculum and unpack it; eventually creating outcomes that are under their control. According to Shouse (2004), any reform in curriculum signals a newer philosophy of education and accordingly a redefinition of roles of the teacher and students. Sadly, as Thaman (1993) points out “teachers have not always been a priority” in the Pacific Islands region, rather teachers have been perceived as a barrier to the educational reform movement of the last three decades. The majority of educational reforms in PICs like Fiji have been based on the advice of donor-driven educational projects resulting in curricula that can be classified as ‘teacher-proof’ based on the assumptions that despite incompetent or under-qualified teachers, students could learn (Thaman, 1993).

However, reforms need not only be focused on students as learners, but teachers as learners also (Marshman, Clark, & Carey, 2015). According to Marshman et al. (2015), doing so enables teachers to “reflect on their own performance as professionals, ask questions about their knowledge and skill areas and then investigate ways in which they can improve on them” (p.4). Roehrig et al. (2007) warn that a practicing teacher, with different education and work experiences, may perceive the reform ideas otherwise. The teacher is the one who is confronted with everyday schooling reality and the interpretation of the new teaching approaches could vary from the intended curriculum. To avoid this, the authors stress that to convince a teacher concerning the need and nature of reforms will be imperative and will require support in many ways. The support needs to be aimed at fostering an appreciation of the benefits and advantages of the new teaching approaches (Roehrig et al., 2007).

2.4.2 Issues for teachers in rural remote contexts

Bruns et al. (2011) in their cross-country, globally funded (by the World Bank and partner countries) study “Making schools work” examined the phenomenon of ‘service delivery failures’; cases where programmes and policies that increase the inputs to education fail to produce effective delivery of services where it counts - in schools and classrooms. It was discovered that student achievements continue to remain at low levels even after

addressing issues such as lower teacher-pupil ratios and better salaried teachers with adequate resources. The authors argue that a developing country's biggest challenge may not be inadequate funding, but the teacher. The authors suggest that while improvement in teacher accountability could potentially be addressed by "contract tenure and pay-for-performance reforms", reforms need to address teacher issues such as "intrinsic motivation" (Bruns et al., 2011). However, Berliner (2002) points out that an accurate view of the extent of which context and the meaning of the context the researchers include as part of their educational research in developing theories is essential. Rosenberg and Koehler (2015) in their comprehensive systematic review illustrate the phenomenon whereby researchers' meanings of context could be any one of classroom factors, school factors, teacher factors, student factors, societal factors, or a combination with more emphasis on one.

The rural remote educational context and their communities are often "complex, contradicting and diverse" (Lock et al., 2009). International research, for rural teachers, students, and schools has identified a wide array of issues associated with isolation, size, and socio-economic factors (Jorgensen, Grootenboer, Niesche, & Lerman, 2010; Roberts, 2004; Tytler, Symington, Darby, Malcolm, & Kirkwood, 2011; Wilson, Lyons, & Quinn, 2013). The authors point out that the vastly different characteristics of rural remote areas in terms of health, wealth, age, housing, employment, ethnicity, race, and culture needs to be considered to attract and retain teachers for successful service in these locations. Lunn (as cited in Kelly & Forgarty, 2015, p.7) established five major barriers for retaining teachers in remote locations; social isolation, lack of opportunities for professional advancement, dissatisfaction with living and working in rural/remote areas, lack of appropriate incentives, and the selection of teachers for appointment to rural and remote areas.

Hardre (2009) similarly reported that most rural teachers "often sense an isolation, face deficiencies of instructional resources, feel remote from similarly-minded colleagues, and yearn for innovative ideas and professional development opportunities" (p.3). She proposed that for teachers to work in rural remote locations, the school district and the community needs to provide for needs such as employment opportunities for spouses, quality education for the teachers' children, appropriate salaries and compensation, and acceptance in the community. Lock et al. (2009) in their study found that involving the

teacher in the community and leadership support had positive effects on teachers settling in their rural schools.

Other factors such as instructional, curricular, and organisational factors also influence teacher attrition in remote schools. Handal, Watson, Petocz, & Maher (2013) found that the pressing demands and expectations of working in rural and remote communities often discourage teachers from remaining longer in their positions. A significant issue surfacing in an exploratory study, by Jorgensen et al. (2010), of poor performance of Australian Indigenous students in mathematics was that a bulk of new graduates were teaching in these remote contexts. These teachers realised that they needed to implement changed practice, but their inexperience meant they did not know what it could look like.

The above issues also represent significant challenges for the Fijian education system in terms of staffing of remote and rural schools. Each school in these areas has its own challenges, not necessarily similar to each other. These problems are due to a variety of reasons including early discriminating funding policies that created a socio-economic gulf between racial groups that persists to this day (Crossley et al., 2017). Teachers' varied experience can create disparities in general notions and misunderstandings about maritime schools which have implications for staffing. In this study, the huge diversity of schools in Fiji is a consideration. Schools in the maritime context studied vary from large well-maintained facilities and buildings to those that occupy broken down buildings lacking doors and windows, electricity, sanitation, and proper resources.

Any curriculum changes need to take this diversity into account. According to Tuinamuana et al. (2006), often the teachers are seen as a problem in this context so the focus is on fixing teachers rather than the underlying causes of low student achievement. The authors state that any curriculum reform needs to consider influences from the teacher, the curriculum, the school, and students with considerations of their backgrounds. While Fiji is diverse in its multi-ethnic and multi-cultural practices, a notable feature of the maritime context in this study is that it is predominantly populated by the Indigenous Itaukei and the schools' staffed by Indigenous teachers. Warren & Miller (2013) point out that teachers' understandings of Indigenous identity and culture promotes rural schools' capacity to

contextualise mathematics learning; a way to overcome systemic issues making mathematics more culturally appropriate for Indigenous students.

A desirable trait for teachers working in remote contexts is the ability to “adapt curricular and policy reforms to contextual needs, and a willingness to learn on-the-job, on an ongoing basis” (Hardy, 2013, p. 206). Hardy (2016) states that while such “capacity and complexity” is encouraged in policies and curricular, pedagogical practices are not promoted. From a study of teachers working in a remote community in Queensland, he speculates that more attention needs to be given to teachers’ own pedagogies, work, and learning related to specific settings.

2.4.3 Teacher beliefs and quality of curriculum implementation

With the kinds of innovations being implemented in Fiji, teachers’ mathematical beliefs have the potential to influence the implementation process. The beliefs, attitudes, and expectations of those who implement curriculum reforms and are consequently most affected have been identified as possibly the most important barrier to reform (Handal et al., 2013; Jorgensen et al., 2010; Minnich, 2008). In their review of studies (published between 1993 and 2000) that contained empirical evidence of the effects of mathematics reforms or difficulties in implementing them, Ross, McDougall, and Hogaboam-Gray (2002) found that teacher beliefs and previous experience of mathematics “not congruent” with goals of reform was the most important obstacle.

Ernest (1989) proposes that a shift to a reform-oriented pedagogy would require a shift in the teachers’ belief systems. Three different views of mathematics were identified by Ernest (1989); the instrumentalist view where mathematics is seen as an unconnected set of rules and facts, yet useful; the Platonist view of mathematics as a definite, unified, unchanging body of knowledge that is discovered; and the problem-solving view that considers mathematics as of a volatile, evolving nature situated socially and contextually. Extensive literature and varied findings exist about teachers’ mathematical beliefs and mathematical teaching practices.

Meador (1995) in a longitudinal study, of ten years, confirms that the beliefs that the teachers had about what was relevant, worthwhile mathematics persisted and continued to sustain the teachers’ efforts in changing their mathematics curricular. Handal and

Herrington (2003) state that “curriculum implementation may only occur through sufferance as many teachers are suspicious of reform in mathematics education given its equivocal success over the past decades” (p.59). The authors suggest most teachers depend on their own beliefs rather than new teaching and learning approaches during the implementation processes of a curriculum (Handal & Herrington, 2003). This was also proposed by Manouchehri and Goodman (1998) who found that what teachers knew about mathematics content and innovative pedagogical practices and their personal theories about learning and teaching mathematics were the greatest influences on how they valued and implemented the reform programmes.

Additionally, self-efficacy, a teacher’s individual beliefs in their capability, has also been shown to affect student achievement and teachers’ satisfaction with their work (Caprara, Barbaranelli, Steca, & Malone, 2006). Mohamadi and Asadzadeh (2012) state that a teacher’s self-efficacy correlates with past teaching experiences. That is, for teachers with experience, there is a higher expectation of success in curriculum reforms, whereas lesser experienced or new teachers are more dependent on support structures such as resources and collaboration.

Teacher beliefs, therefore, make educational change more complex and less likely to succeed and need to be a consideration for policy-makers. Ball et al. (2005) state that even with a quality curriculum and implementation plans, ignoring teachers’ beliefs will be problematic as the curriculum will not teach itself; if the teachers are unable to interpret the new goals of the curriculum, they will simply ignore them. As stated earlier, for the current Fijian reforms, the guidelines and instructions aimed at implementing the change in teachers’ instructional practice have been outlined in the two teaching guides, the Mathematics Handbook for Year 1 and 2 and the Mathematics Handbook for Year 3 and 4. Specifically, the two documents provide structures for lesson planning (prescribed tasks), focusing on delivery (teacher, student, tools), establishing a routine in learning and finally reflection with assessments at the end of each unit (MOE, 2017a; 2017b). This DTR method for many practicing teachers may be quite unfamiliar and for the recommended changes to become reality, teachers must receive support and guidance (Cooney, 1992). Cooney (1992) and Oja (1995) describe the relationship between change and teachers’ feelings of ownership. They stress that to stimulate a change in teacher beliefs, teachers need to take

ownership of the change. It is more likely that the implementation process will be more successful if teachers feel that “the change is something not happening to them rather it is something happening because of them” (Oja, 1995, p. 12).

2.5 Reform-Oriented Professional Development

Attempting to deconstruct and reconstruct their own practice in mathematics reform affects teachers’ confidence and competence (Sykes, 1996), often causing feelings of inadequacy due to previous experiences which can impede teachers’ efforts to adopt new strategies and implement reforms (Ball, 1996). There is consensus amongst the literature that effective PD helps teachers become enthusiastic and successful learners of mathematical content and pedagogical skills, and thus a means to effective curriculum reform.

A synthesis of findings from five recent studies that utilised teacher learning by PD participation to implement a new mathematics teaching pedagogy within existing curricular in mathematics shows that: PD increases teachers’ mathematical content knowledge; PD positively correlates with students’ mathematics achievement through change in teacher practice; teachers’ mathematics practices may be changed as a result of participation in PD, yet there is little or no evidence to suggest change in teacher beliefs or the design of the PD impacts teacher learning (Kutaka et.al, 2017; Polly et.al, 2017; Jacob Hill, & Corey, 2017; Althausen, 2015; Andersson & Palm, 2017).

Choi and Walker (2018) further proposed that customising PD provision would contribute to teachers’ positive perceptions of and experience with reforms; a view supported by Andersson and Palm (2017) who reported highly motivated participants accepting and implementing newer pedagogies into their mathematics teaching. While Pajares (1992) proposes that beliefs persist, defying reasoning, experiences, time, and schooling, research shows that focused and reform-oriented PD affirms positive changes in teacher beliefs (Jacob et al., 2017; Kutaka et al., 2017). Moreover, PD could be effective and relevant if it focused on developing teachers’ training needs within their own environments (Petaia, 2009).

On the other hand, although observing improvements in teachers’ pedagogical content knowledge through PD, Norris (2014) reports significant differences in individual

teacher practice. A similar phenomenon was noted by Jacob et al. (2017) in their study of the impact of a PD programme on teacher's mathematical knowledge for teaching, instruction, and student achievement. Despite significant time and effort dedicated, the authors describe a disappointing outcome where little or no change was noted in the teacher's instructional practice and student outcomes. It was identified that perhaps the nature of PD was not enough to alter teacher pedagogy. Materials and continuous support were identified as tools that should accompany teachers in the implementation of new knowledge (Jacob et al., 2017).

Roehrig et. al (2007) and Warren and Miller (2013) argue that one critical aspect of reforms in a curriculum is the events that transpire at ground level; the existence of a support system at the school was imperative. The authors stress that conditions that either support or constrain the work of teachers in implementing the curriculum need to be explored. Fullan and Miles (1992) also conclude that quality teaching and training materials are important to propel successful and large systematic changes. He argues that "people's capacity to bring about change" (p.745) cannot be relied on and suggests the use of reform-based curriculum materials concurrently with comprehensive PD. Young-Loveridge (2008) found that the use of mathematical content knowledge and as well as newer pedagogies requires considerable time and effort to be understood and adopted by teachers.

It is agreed that the ongoing PD that develops knowledge about teaching strategies involved in the curriculum reform, as well as required support, may influence how a teacher adjusts her styles of teaching mathematics. Haimi and Smith (2001) and Mayo (1995) suggest that in a remote rural reform context, the capability of teachers to evaluate and alter their understandings of the teaching and learning process will lead to an empowered teaching community; subsequently the success of any reform programme is heavily dependent on teachers and their willingness to fully and effectively implement a programme. In their study, Lingam et.al (2017) confirms Fijian teachers expressing a need for future educational reforms to include more opportunities for continuous PD. Thus, investigating the relationship between teachers' experience and their perceptions of the impact of PD on their practice is a focus in this study.

2.6 Summary

It appears reforms and developments in mathematics education cannot be separated from the contexts in which they occur. The contexts of learning have been identified as critical to supporting students' academic achievement and a thorough understanding of the nature of associated factors is important.

In Fiji, the lack of research into teacher practice means that there is limited understanding of how well-versed and willing teachers are to develop and apply contextualised pedagogies. Existing research findings can therefore only provide limited views of teachers' beliefs, understanding, and practices. Ndongko and Tambo (2000) attributed the continuous failure of mathematical reforms to the poor process of reform implementation, the cause usually being ignorance and non-involvement of major stakeholders in the development and field-testing phase of these reforms.

I wish to argue that if the teachers' perceptions and understandings of the new curriculum reforms are poor, then we can expect that unresolved factors will continue to linger as unexplained issues affecting their success. Consequently, significant improvements in numeracy achievement of students in the maritime areas of Fiji are unlikely to materialise. Before further effort is given to incorporate any future reforms in Fiji's mathematics curriculum, we need to have a better understanding of the stakeholders' interest, response, and receptiveness of these new numeracy strategies. The literature review confirms that while studies on teachers' perceptions in mathematics curriculum reforms have been conducted, there remains a need for empirical research in remote, geographically isolated regions such as Fiji, specifically positioned from the teachers' viewpoints. With consecutive recent numeracy reforms, teachers have been challenged to change their instructional style and planning documents. It is important to both understand the context-based challenges and the challenges of the individual teachers within the reform context. Thus, this study is based on the understanding that mathematics reform in Fiji is an interconnected process that depends on political developments but cannot be sustained without the active participation of teachers and the implementers of the reform, yet in very different contexts within Fiji. The knowledge, assumptions, and lessons learnt from current reform could usefully influence the formulation of further initiatives.

Chapter 3: Methodology

3.1 An Overview of the Methodological Approach

The purpose of this research is to determine the perceptions of teachers working in maritime areas of Fiji towards implementing a numeracy strategy that is new to them. This study sought their perspectives as they experienced the challenges of the new reform and its implementation. For this reason, I selected a methodology adhering to interpretive research principles. This paradigm concerns efforts to understand individuals and their experiences in natural settings while sustaining the integrity of the phenomena being interpreted (Johnson & Christensen, 2012). In this study, the individuals are Year 1 to 4 teachers implementing the new numeracy strategies (NNS) while living and working in their 'natural setting', classrooms of maritime schools in Fiji.

A qualitative research approach was adopted for this study because it aligns with an interpretive paradigm. Punch (2014) and Johnson and Christensen (2012) propose that the research approach is drawn from the research topic and questions. It was determined that the qualitative research was most appropriate to the nature of this study as in this approach people's understanding, views, interpretations, and interactions are all meaningful segments for the researcher (Denzin, 2008; Johnson & Christensen, 2012). It is viewed by Mason (2006) as a "legitimate way for collecting data on ontological properties, to interact with people, to talk to them and to gain access to their accounts, experiences and articulations" (p. 39). Face to face discussions and listening to people's views, experiences, and perceptions provide rich data about a phenomenon.

The organisation and interpretation of the research data are significant to the critical analysis of the data. Being involved in collecting the data enables the researcher to make a critical analysis and offer relevant suggestions (Johnson & Christensen, 2012). Self-appraisal, termed reflexivity, in qualitative research is hence considered important. Throughout the study, I was aware of my position within the research and its possible effects on the setting and people being studied, the questions being asked, data being collected, and its interpretations (Berger, 2015; Pillow, 2003). With recent teaching experience in this context, I was conscious that my access to the field not only physically but in terms of the willingness of the participants to share information, as well as my worldview and background, may affect the lens through which I filter and make meaning of the information I gather (Berger,

2015). Cutcliffe (2003) states that one goal of reflexivity in qualitative research is to deliberately self-monitor such effects, thus ensuring the accuracy of the research and “the credibility of the findings by accounting for researcher values, beliefs, knowledge, and biases” (p.137). I made my experience and position clear in Chapter One and maintained a continued awareness throughout the study, self- reflecting and discussing with my supervisor how it may affect the research.

My interaction with the educational environment I studied as a practitioner-observer that informs this discussion can best be illustrated as below:

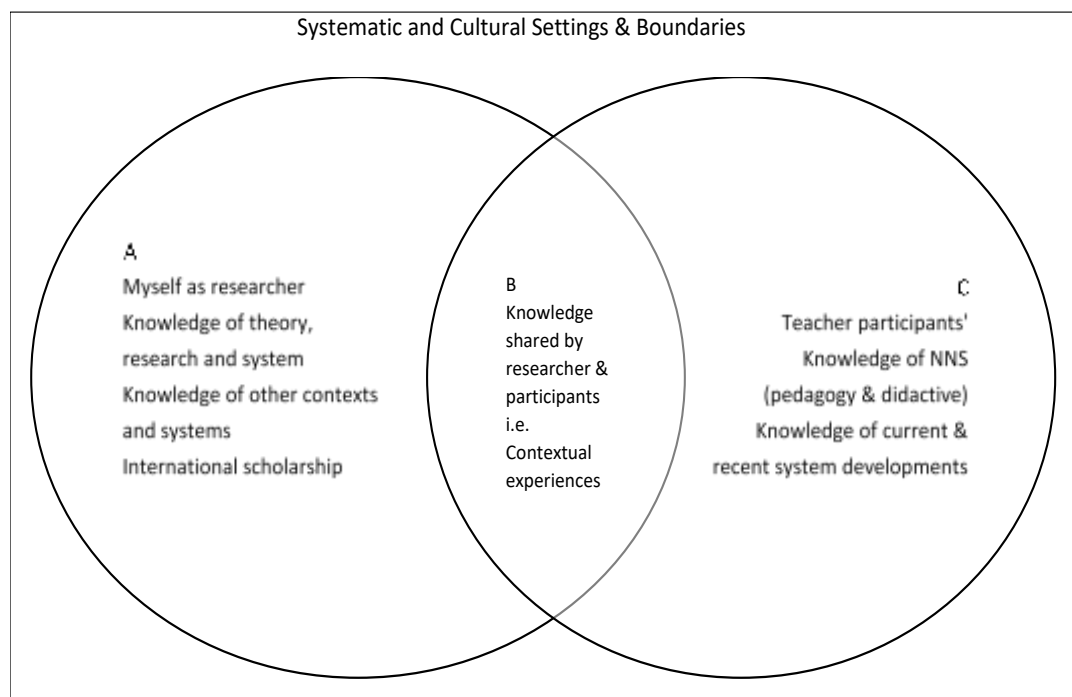


Figure 1 My position as the researcher in this study. Adapted from Jaworski, 2008, p.336

The ultimate goal of interpretivism is to understand individual experiences, with the belief that reality is subjective and constructed by the individual (Lather, 2006). Data collected in interpretive research is 'rich' data, which is usually qualitative, although quantitative data can be collected as well to inform the description (Lather, 2006). Since this investigation was conducted in a geographically challenging context, I considered the use of questionnaires and focus group interviews to be methodologically suitable to gather information from a purposefully selected population of Year 1 to 4 teachers.

3.2 Research Setting

The setting for this research is significant as it was conducted in an authentic context. At the time of this study, the teachers were immersed in the process of implementing the NNS in their schools located in the outer maritime areas of Fiji, as discussed in Chapter One. While Fiji itself has an ethnically and linguistically diverse population, socio-economic issues and the geographic distribution of ethnic groups mean that maritime areas are usually populated by Indigenous Itaukei with Vosavakaviti being the first language spoken from home (own experience). Except for other languages taught in schools (Vosavakaviti, Hindi, Urdu etc.), Fijian curriculum for decades has maintained English as the exclusive language of all its curriculum documents and its delivery by qualified teachers. This study specifically considers the implementation of the NNS by Year 1 to 4 teachers in the maritime schools of Fiji as pictured below:



Figure 2. Context of study. Adapted from (Google, n.d.)

3.3 Participants

The participants in this study are Year 1 to 4 teachers who were teaching in the above maritime primary schools at the time of data collection. The criterion for sample selection

was a lower primary teacher in this setting who was engaged in the implementation of the NNS.

Permission to conduct the study was first sought from the permanent secretary of the Ministry of Education, Culture, and Arts, Fiji, and an agreement was signed to adhere to the Ministry's guidelines and protocols when conducting research in Indigenous settings. The district education office was then approached, and email addresses of maritime primary schools, where the participants were teaching were obtained. Five questionnaires were trialled with my colleagues, teachers identified in a similar context (remote mainland schools) before emails were sent with an information sheet, consent form, and improved questionnaire to 115 maritime schools, requesting the school heads for dissemination to Year 1 to 4 teachers. Targeting all potential participants ensured a greater chance for a better response rate. Sixty-two participants (representing 39 schools)returned completed questionnaires via email and post. 11 questionnaires that had been returned by Year 1 to 4 teachers not implementing the NNS were excluded from the study. Table 1 shows the demographic information from the 62 questionnaire participants.

Table 1

Questionnaire Participants' Background Information (N=62)

Question	Data	Participants by percentage
a. Age	20-30 years	32%
	31-40 years	45%
	41-50 years	13%
	>50 years	10%
b. Gender	Male	26%
	Female	69%
	Not stated	5%
c. Ethnicity	Itaukei	90%
	Indian	3%
	Rotuman	6%
	Others	1%
d. Total length in service	0-5 years	34%
	6-10 years	16%
	10-15 years	21%
	16-20 years	18%
	>20 years	11%
e. Highest teaching qualification	Certificate	39%
	Diploma	41%
	Degree	13%
	Postgraduate	-
	Not stated	7%

The selection process for the two focus group interviews was based on access, availability, and agreement of participants, due to the nature of travelling involved. Informal consent to participate was verbally given by phone and the times and locations negotiated (refer to the ethics section regarding formal consent). Small boats were then arranged to gather the participants at identified locations. Seven teachers met in one location and six in another for focus group discussions, we had a 100% response rate even though the sessions were held on Saturdays with unfavourable weather conditions and rough seas.

Tables 2 and 3 summarise the focus group participants' background information. To protect the anonymity and confidentiality of participants, pseudonyms have been used.

Table 2

Focus Group 1 Participants' Background Information

	Focus Group 1						
	P1	P2	P3	P4	P5	P6	P7
Gender	F	F	F	F	F	F	F
Ethnicity	Itaukei	Itaukei	Itaukei	Itaukei	Itaukei	Itaukei	Itaukei
Teaching Qualification	Diploma	Certificate	Certificate	Degree	Diploma	Diploma	Certificate
Total length in service	13	24	21	23	2	4	14
Position	Teacher Primary	School Head	Ass. School head	Ass. school head	Teacher primary	Teacher primary	Teacher primary
Year level teaching	1&2	3&4	1&2	3&4	1&2	3&4	1&2

Table 3

Focus Group 2 Participants' Background Information

	Focus Group 2					
	P1	P2	P3	P4	P5	P6
Gender	F	F	F	F	F	F
Ethnicity	Itaukei	Itaukei	Itaukei	Itaukei	Itaukei	Itaukei
Teaching Qualification	Certificate	Certificate	Diploma	Diploma	Certificate	Certificate
Total length in service	26	16	9	6	14	24
Position	Assistant Sch. head	Teacher Primary	Teacher Primary	Teacher Primary	Teacher Primary	School Head
Year level teaching	2	1	1&2	3&4	1&2	1

3.4 Data Collection Tools

Methods of data collection are closely associated with the research methodology (Denscombe, 2014). The two main data collection methods for this study were questionnaires and focus group interviews. These were selected because they are consistent with qualitative research methods and considered the most appropriate and efficient way to gather information for this study. As stated earlier, Fijian schooling system ensures presence of qualified teachers, competent in English communication skills, thus data collection for this study did not necessitate translations in any other language.

3.4.1 Questionnaire

A questionnaire comprising a mix of Likert-scale and open-ended questions (Johnson & Christensen, 2012) was designed to gather data in three stages (See Appendix D). In the first part, demographic details were asked of participants such as their teaching experiences, length of service, and qualifications. The second part consisted of a list of statements about the impacts of the strategies that the researcher identified from the literature to which teachers were asked to indicate their degree of agreement, with the lowest being strongly disagreeing through to strongly agreeing as the highest. This provided an overall view and was followed with open-ended questions. The open-ended questions provided ample opportunity for the participants to elaborate further and express their views regarding their current interpretations and changes surrounding the implementation processes of the new numeracy curriculum as well as their expectations for the future. This part also asked teachers to comment on the major changes that they felt had the most impact on their work. Data collected from this qualitative section provided additional and relevant insights concerning the changes in teachers' work.

The third part of the questionnaire comprised a list of possible factors, again identified from the literature, that may impede the implementation of the new numeracy approach; the teachers were asked to rate to what extent that factor posed a barrier for them. Participants were encouraged to indicate other barriers that had not been mentioned.

Burns (2009) states that questionnaires provide a standardised format to participants and while consistency in design is offered, the same cannot be assumed in the interpretation of questions by participants. This study aimed at stimulating teachers' views, so it was important that the open-ended sections of the questionnaire gave them the opportunity to explicitly express their opinions in an anonymous and honest manner. The questionnaire was an appropriate tool to reach out to a larger number of participants in the greater maritime area in terms of administration and costs which otherwise would have been considerably difficult. With varying connectivity and internet access issues, ample time was allowed for the respondents to submit their completed questionnaires by email or otherwise. Each returned questionnaire was treated with respect and considered valuable, not only because of the data it contained but because of the commitment on the part of the respondents to complete and submit the questionnaire despite their locations.

While the questionnaire was considered most useful to gather data in this geographically challenging context, its limitations were also addressed. As Burns (2009) suggests, responses to the questionnaires can be interpreted in different ways and the answers could possibly be incomplete, specifically when clarification, explanation, or elaboration of information is desirable. In this regard, I conducted focus group interviews allowing for an additional data collection opportunity through open-ended discussions.

3.4.2 Focus-group interviews

A semi-structured interviewing approach was used with a list of interview questions as a guide (Denscombe, 2014) (See Appendix C). Use of focus group interviews to collect data has been described as a powerful tool to elucidate opinions, beliefs, and insights into issues of concern, discussed freely within groups (Tolich & Davidson, 1999).

I chose this approach because while the questionnaires had elicited information from individual participants, I needed a method that would require the participants to talk about and elaborate more on the strengths, challenges, and conceptions of the new numeracy strategies. This was very important in the context of this study as I wanted the participants to communicate their views and for their agenda to emerge, as opposed to that of the researcher. Cohen, Manion, and Morrison (2007) propose that group processes are

also helpful in stimulating deliberations as participants interact with each other which further encourages them to realise their own thoughts.

A semi-structured interview guide based on open-ended questions was used to give direction to the interviews so that the content focused on crucial issues of the study (Burns, 2009). This allowed me to remain focused but vary the questions and be flexible in probing participants for more information, specifically about the trends that were being generated from the piloted questionnaire analysis data.

For this study, focus group interviewing was very vigorous as the logistics of organising and carrying them out had to be carefully considered. The timeframe available for the study was challenging, particularly as geographical challenges, weather and marine conditions had to be accounted for, such as times for tides, essential for travelling by small boats to reach some schools. Cohen et al. (2007) discuss ways for overcoming such constraints of the study, like over-recruiting the participants. Following this advice, I managed to schedule two focus groups through phone calls and emails, overseeing the convenience of the participants by providing transportation and meals to encourage their presence.

I was also aware of the need to keep the interviews open-ended without being too intrusive or directive, research skills identified as important to facilitate the interview (Cohen et al., 2007). Additionally, each participant needed an opportunity to speak at the discussion without anyone dominating. Before conducting the group sessions, the ground rules and procedures were discussed and agreed upon. Both sessions were recorded using an Mp3 recorder and later transcribed for analysis.

3.5 Data Analysis

3.5.1 Analysis of interview data and open-ended questionnaire data

LeCompte (1999) describes analysis as a process of reducing, interpreting, and transforming data into a story that describes and explains what has been studied. Qualitative research consists of thick and careful description as is the case in this study because it is possible that the numeracy reform has a different meaning for individual teachers. The acknowledgement of their voices is important (Mauthner & Doucet, 2003).

An inductive analysis approach (Patton, 2002; Strauss & Corbin 1990) was used as a process for analysing data for this study. Patton (2002) describes this process as “immersion in the details and specifics of the data to discover important patterns, themes and interrelationships” guided by analytical principles (p.41). An inductive approach allows patterns to emerge rather than presuming what the dimensions will be (Patton, 2002). Using this approach, the researcher immersed herself in the data attempting to understand and interpret specific meaningful segments that emerged across research instruments. Data were not viewed as meaningful in themselves. They were treated according to the research objectives and the questions as well as the researcher’s interpretation of the data according to the new numeracy approach framework. This data analysis also allowed for reflexivity. Mauthner and Doucet (2003) state that reflexivity in data analysis involves moving back and forth in the data linking them with emerging themes, generating an enhanced direction and understandings. They describe that the researchers’ repetitive and reflective practices in data analysis are important in meaningfully interpreting individuals’ experiences and practices. Thus, with reflexive practice at the heart of data analysis, I worked with the data developing sub-categories and categories resulting in the development of themes. This process involved thorough reading and re-reading of the data, making sense of the information and reflecting on its underlying meaning, then recording general thoughts for comparison and triangulation between instruments.

3.5.2 Likert questionnaire data

Descriptive statistics were used to analyse the Likert scale questionnaire data. The responses were coded and aggregated to yield frequencies and percentages. This data provided the extent of the participant views, from a larger context, about how they perceived, experienced, and accounted for the introduction of the NNS in their teaching and the support received for implementation. To allow for a judgement of conclusions reached, the frequencies and percentages have been reported revealing the trends in their responses.

3.6 Trustworthiness of the Findings

To ensure trustworthiness of the findings in a qualitative study, researchers strive to establish the credibility, transferability, dependability, and confirmability of the research

findings (Lincoln & Guba, 1985). The credibility of a qualitative study is the degree to which findings correspond with the reality of the participants (Lincoln & Guba, 1985); the threats from researcher biases are acknowledged and minimised (Johnson & Christensen, 2012). For this study, being a teacher from the context enabled trust and rapport as the participants felt comfortable in sharing their views and opinions to one of their own after being assured of confidentiality. Possible reactivity of participants towards the researcher (Maxwell, 2013) and the impact of a “perceived hierarchical relationship between the researcher and participant” (Daudau, 2010) was also lessened, thus further reducing potential biases in the study. The trustworthiness was strengthened in this study through triangulation, using different sources and methods of data collection. The two different tools allowed validation of categories, concepts, and theories generated throughout the analysis (Goldstein, 2017).

3.7 Ethical Considerations

From the conception of the study, I was aware of the need to consider ethical issues pertaining to the participants and the research context. Punch (2014) outlines several ethical issues when carrying out qualitative research: participants’ protection from possible harm, voluntary participation, informed consent, avoiding deceit, and ensuring anonymity and privacy.

I adhered to these principles by following procedures as outlined for a thesis student by firstly gaining ethics approval from the Victoria University of Wellington Human Ethics Committee (see Appendix A), conforming to the New Zealand Association of Research in Educational Ethical Guidelines (NZARE, 2010). Following this, permission to conduct research in Fiji was obtained from the Ministry of Education, Culture and Arts, Fiji, agreeing to protocols for collecting data in Indigenous contexts. Thereafter, consent from potential participants was sought. The potential participants were provided with information sheets and consent forms prior to any data collection explaining the purpose, procedures, and possible uses of the information collected, with their freedom to participate and withdraw from the study clearly stated. It was made clear that confidentiality will be paramount and their decision to participate would have no negative consequences on their professional career. To maintain participants’ confidentiality, pseudonyms were used to refer to participants and contexts (Johnson & Christensen, 2012). All questionnaires, notes,

transcripts, and the recordings have been secured and will be destroyed after five years from the date of submission of the report.

3.8 Limitations

This study was limited to the perceptions of lower primary, Year 1 to 4, teachers implementing the NNS in maritime areas of Fiji. The participants were carefully considered, in terms of constricting factors such as time and resources available (Cohen et al., 2007). Data collection was further limited by costs and safety involved in travelling by sea which I was able to manage given my experiences as a maritime teacher. While a larger sample could provide more rich and insightful data, the questionnaire participants in this study were those who managed to return their questionnaires to me and the focus group teachers were from locations I could access. It is important to note that I was unknown to the majority of the participants except a few whom I came to know while working there.

3.9 Conclusion

This chapter, with justifications, presented the research design important to understanding the nature of this study. It described the methodology, procedures, and processes involved in conducting this research. In the next chapter, I will present the results and findings.

Chapter 4: Results and Findings

4.1 Introduction

This study aimed to develop an understanding of maritime Year 1 to 4 teachers' perceptions regarding the implementation of the NNS, any issues in its implementation and possible barriers for new curriculum reform in their remote maritime context.

This chapter presents the findings of the data given by these teachers in the questionnaire and the interviews, described in themes generated in the process of data analysis done to address the research questions. This chapter has four main sections. The first section describes the background of participants critical to the interpretation of data; the second and third sections include themes generated from the participants' perceptions of strengths and weaknesses associated with the NNS, followed by perceived barriers to the reforms; the fourth section includes participants' reflections and suggestions. This chapter concludes with a summary of findings.

4.2 Background

This section synthesises the demographical data collected in questionnaires and focus groups to describe the characteristics of the teacher participants of this study.

With regards to gender, the survey data revealed 68.5% female, 25.9% male, and 5.5% who chose not to disclose, while the interviews had 100% female participants. Regarding ethnicity, 88.7% of teachers identified themselves as Itaukei, 4.8% as Indian, 4.8% as Rotuman, and 1.62% as others in the survey data. Part I of question 1 also confirmed the majority of these teachers' students as Itaukei with a smaller proportion being Rotuman. All focus group participants were Itaukei teachers with Itaukei students in their classrooms.

The average teaching experience of the 62 participants was 11.8 years, with a range from less than one to 30 years of teaching, 66% had more than five years of total teaching experience, with 80% of teachers having three or more years of teaching in lower primary. While it is typical to have composite classes in maritime schools, 25% reported teaching straight (single level) classes, notably in a few schools on the larger islands of the maritime area. Figure 3 shows the classification of all participants according to year levels they were teaching at the time of data collection.

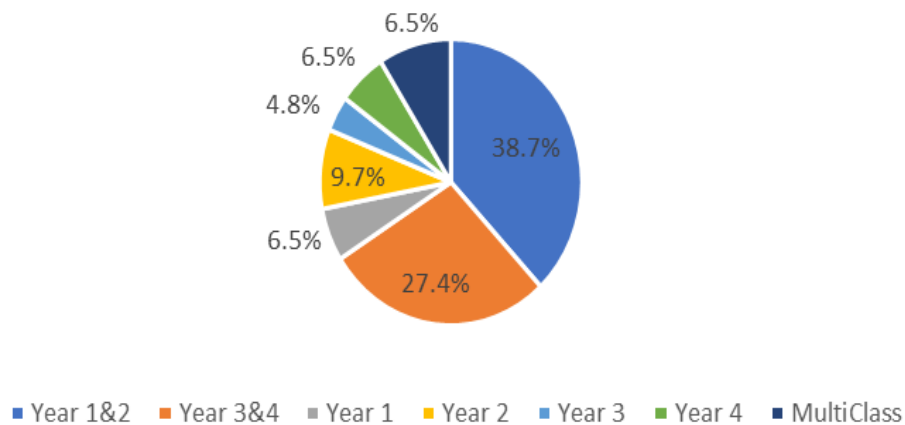


Figure 3. Classification of participants according to year level taught

53.2% of participants had never taught in urban or semi-urban areas including a few having spent 27 to 30 years in only maritime schools. The average time a teacher had spent in their current school is 2.9 years, with five of them serving seven or more years at the current school. Nine participants were teaching heads, while 38 (61%) were regular classroom teachers.

75.9% had attended the numeracy training workshops for the class level they were teaching, 9.3% had attended workshops for a level they were not teaching in the current year, while 14.8% had been informed and supported by their colleagues or school heads. The main reason stated for not attending the training was the cancellation of the workshops, with one teacher stating that she had even “travelled to the venue before finding out”.

4.3 Strengths of the NNS

Analysis showed teachers identified a range of strengths of the NNS which I organised into three broad categories: strengths related to the DTR-based curriculum, strengths related to teachers and strengths related to students

4.3.1 Strengths related to the DTR-based curriculum

4.3.1.1 Structured and coherent teaching methods

The NNS developers adopted the do-talk-record (DTR) framework to assist teachers in planning and delivering active learning lessons. All survey participants indicated they made changes to their practice and are now using the DTR approach to plan, prepare, and conduct

math lessons, and 92% agreed that they were comfortable teaching with the new numeracy approach.

Participants pointed out that the DTR approach provided them with consistency in their planning, preparation, and teaching. One teacher stated that prior to the DTR approach, “our math teaching was not organised but now it is structured as we follow the steps that are there”. Several teachers agreed that the “content is more ordered”, “concepts to be taught are more structured”, and “the concept being taught is clear and coherent from the beginning of each lesson; introduction to the conclusion”.

Focus group comments confirmed these perceptions. One Year 3 and 4 teacher stated that “now all of us teachers are required to become good planners and do preparations for teaching numeracy in the same way”. She added, “I have been teaching for 13 years and from teacher’s college we have been taught to conduct student-centred lessons which we all have or should have been practising”. She explained that “the steps of the DTR is the strength of this NNS that requires teachers to be more consistent and focused in their teaching”.

Another Year 3 and 4 teacher explained that before the NNS, her students were not used to working in groups or participating in class discussions because “they (students) had been taught by teachers using the chalk and board method”. She added,

since I went through this numeracy training, I learnt a lot. My teaching strategies have changed and now I am more consistent in following the steps of DTR for every lesson. The DTRs interest students and they understand the concepts better.

Another teacher explained that because “teachers are now using consistent teaching approaches”, the focus of numeracy is “no longer on rote learning, but student understanding”. It appears these teachers value the consistency the structured approach produces amongst mathematics teachers.

The focus group teachers gave evidence that the NNS equipped them to overcome inconsistent and more transmissive teaching practices in mathematics that existed previously. These responses suggested that in implementing the NNS teachers feel they are

using more constructivist approaches and their students are learning mathematics actively with a focus on understanding.

4.3.1.2 Consistency in learning standards and outcomes

43% of survey participants offered evidence that the standards-based NNS provided consistency in the expectations for the numeracy outcomes of students. One focus group teacher stated that before the NNS, the teacher's comprehension regarding the students' outcomes according to syllabi was inconsistent and varied due to the previous thematic approach to math teaching of the same content. She said, "most teachers were devising workplans according to their unpacking processes which resulted in differences amongst teachers' workplans, lessons, and subsequently student learning". She then described how she felt after realising "the level of her children had dropped", she sought out opinions and "discussed with other teachers from different schools" and discovered that they also felt the same. She states that "thereon, I just took away the thematic [approach] and I did what I felt was the right way to ensure that my children are at the levels I needed them to be".

Other focus group teachers suggested that since implementation of the NNS, all students were being instructed with the "same math concepts in the same ways", one teacher pointed out that "all students should, therefore, be well-prepared for the next level and this will assist in the work of students' teachers when the students' progress to the next level". One teacher further elaborated that prior to the NNS, the teaching was teacher-controlled resulting in "some students not [being] exposed to concepts that were meant to be covered at [the] previous level". She added, "if students are being taught from Year 1 using this new approach, there would not be any problems in numeracy in the upper classes". One teacher shared her experience:

I was teaching Year 5 and sometimes I had to go back to the lessons in Year 3 and 4 textbooks and guides which I borrowed from those class teachers. When looking at it, I think there was nothing wrong with them (syllabi) because I think if the teachers had really taught the students well in previous classes, there wouldn't be any problems. It's the teachers who need to know the syllabi and the concepts very well and understand the importance of teaching them well too.

The comments offered by the focus group teachers indicated they felt there were inconsistencies in the math content under the previous approach, translating into vague learning outcomes for students, eventually mirrored in “poor performance of students in LANA” (An annual national Literacy and numeracy assessment for Year 5 and 7). With the NNS, most participants’ comments agreed about an “improvement in numeracy outcomes for students” with “better LANA results”. As one participant summarised, “over a longer period of time, students’ outcomes should be at its absolute best, provided the planning, preparation, and delivery is consistent with the expected learning standards”. Some teachers stated that the learning standards set in DTR assisted them in clarifying expected outcomes at each year level, thus reducing inconsistencies in both the teaching methods as well as students’ learning.

4.3.1.3 Learning activities for diverse needs of learners

76% of survey participants perceived they were able to meet the needs of all learners in their class using the NNS. Many participants commented that since the implementation of the NNS, their math class had become more student-centred, with references to learning activities that accommodated individual students’ capabilities and levels of understandings.

One focus group participant said that “different children have different capabilities”. She further explained that “as teachers, we all have our methods of teaching that we believe is effective, but only if followed correctly”. She related to how “students in special education were also being taught in this approach”, and with explicit teaching, it allowed “these students to grasp concepts according to their levels of understandings”. Another teacher added, “DTR allows me as a teacher to give time to students to think for themselves rather than thinking for them”. She detailed how by using “more hands-on activities involving manipulatives”, she was able to encourage students to “attempt on their own” and “be able to work with their peers to develop better understandings of a concept”. Another teacher concurred and added that the DTR approach could be “useful in assisting slower ones”. She suggested, “all teachers must be trained in this approach as it will assist teachers to work with students with learning difficulties and even for weaker ones at upper classes”. One teacher observed that “all students, including those with disabilities” were accommodated in the way teaching was structured in the NNS.

In summary, the participants identified the learning activities of the NNS as a strength because they catered for students' individual differences. They indicated that the activities allowed focus on the teaching of concepts and these concepts could be presented according to students needs and levels of understanding.

4.3.2 Strengths related to teachers

Analysis across the questionnaires and focus group interviews revealed three teacher-related strengths of the NNS as perceived by the participants: increased confidence and understanding of teaching mathematics, more comprehensive planning, and improved use of resources.

4.3.2.1 Teachers' increased confidence and knowledge of content

It was clear that participating in the NNS professional development and training workshops had given teachers a positive perception of the NNS. Regardless of age, experience, qualifications, or responsibilities of teaching in a maritime context, convergence towards having gained knowledge of the DTR teaching approach was apparent in participants' views and opinions. One focus group teacher shared as to how during the workshop conducted in the holidays, "I began looking forward for the school to start so that I could implement all that I had learnt". She added, "I understood the DTR and wanted to try it out with my class". Two other teachers agreed that they felt the same. Another mentioned "I am now able to successfully incorporate various teaching approaches and activities in my math lessons. Using the DTR approach has enabled me to find or devise new activities that help me make use of materials readily available at school". He further added that "knowing the NNS has greatly made math teaching more enjoyable and satisfying".

Several teachers stated that the NNS have given them "confidence to teach maths". One teacher explained that "there wasn't enough focus on how to teach maths" during his initial teacher training. Another experienced teacher commented that "learning how to do math" in the training was very useful. She explained that "the specifics of [the] DTR approach" practiced during the training "increased her knowledge of it" which she was now applying in her planning and teaching. Self-reflecting, an experienced focus group teacher's comment gives evidence of the impact of the NNS on her teacher knowledge:

My personal perspective regarding this approach is that I wish I could have those students back in my class so that I can teach them in this way (NNS)...and teach them how to go about mathematics...some still complain to me that ma'am we are not good at mathematics.

These teachers agreed that there was "a need to have good math knowledge to teach good math" and the NNS strength lies in contributing towards the development of teachers' mathematics knowledge.

4.3.2.2 Increase in teachers' need for comprehensive (advanced) planning and preparation

An overwhelming response both in questionnaire and interviews regarding planning and preparation confirms teachers' perceived need for advanced, comprehensive planning and preparation to implement the NNS in their math teaching. Referring to planning, preparation, and implementation, the teachers listed changes in practice that include; changes in workbook/work plan, applying DTR approach in (detailed) lesson planning and 'child-centred' teaching, increased use of teaching aids, and changes in assessment methods. 94% of participants in the survey agreed or strongly agreed that they mostly used the handbook provided with the NNS as their guide. The focus group participants described how every math lesson was now focusing on and emphasising the DTR steps provided in the teacher's guide. Participants agreed, as one teacher pointed out, that the "NNS couldn't be implemented without proper planning and preparation".

Some participants perceived that teachers' comprehensive planning was directly linked to student outcomes. A teacher mentioned that "teachers need to plan and prepare very well before teaching the lesson". She added, "it's a lot of work, so we need to work very hard to ensure students learn and like maths". Echoing these thoughts, another teacher stated, "I really enjoy my teaching in this new approach...I actually find my class enjoying a lot when I prepare well especially the fun activities...". One teacher thoughtfully commented that the NNS required greater "understanding and insights of the teacher".

"Requiring teachers to do advanced planning" for "better delivery of lessons" was perceived to be a strength of the NNS.

4.3.2.3 Evolution of teacher's understanding of the relationship between teaching and resources

After reflecting on the comments shared by both participants, focus group and open-ended responses in the questionnaire, it was clear many felt that one strength of the NNS was a development in teachers' understandings regarding resources and their role in teaching. Most participants agreed that "resources ensure effective lessons in [the] NNS" when children "actively use manipulatives" and not "see and learn from charts" as had been their practice prior to the NNS. The comments indicated that there was a shift in teachers' perceptions of the use of resources from instructional aids to the hands-on activities needed to "stimulate understanding of concepts well within students before continuing on [to] other concepts in NNS" as suggested in the following comments. One teacher stated, "children enjoy using concrete materials in their group work or individually". Another added that "students find it interesting and fun when using materials like straws, ice-block sticks etc". Other teachers mentioned that students look forward to math since there are "more resources provided in this lesson".

Apart from students' improvement in learning, several participants offered evidence of why more resources and a wider variety of them were definitely needed. Most of these commentaries were from composite class teachers. A further look at questionnaire survey results (question 2), in response to the statement "The new numeracy approach requires new teaching materials", 80.5% who agreed or strongly agreed were composite class teachers, 19.6% who disagreed or indicated not agreeing or disagreeing, were mostly straight class teachers, suggesting that the type of class a teacher taught seemed to influence their perceptions regarding resources.

A composite-class focus group teacher indicates a possible explanation for this disparity. She described how she can, in the NNS, "manage easier between Year 1 and 2 if one class is engaged better in activities with things that capture their attention for longer time". Another added, "class concentration and control becomes an issue when children get bored easily, especially Year 2". Agreeing, another teacher added, "resources help students to be confident enough to stand and talk, they get used to it...are able to express themselves".

Teachers indicated that they prepared required resources for the new approach as expected and saw the many benefits of using them in learning activities as well.

4.3.3 Strengths related to students

The participants identified three strengths of the NNS related to students, firstly an increase in students' participation and engagement in mathematics, secondly an increase in students' confidence, enjoyment, and love for mathematics (self-efficacy), and finally an increase in students' use of mathematical vocabulary.

4.3.3.1 Increase in students' participation in mathematics

Greater student participation in math lessons and activities was reported by 87.8% of survey participants. Substantiating this, one teacher stated that "students remind me when it is math time, they watch the clock", adding that "students enjoyed the activities so much that they want to continue even when it was time for recess". Another mentioned that "it was often difficult to stop students and transit to another lesson". Another teacher with 12 years' experience stated how she observed that since she began using the NNS, students are enjoying her teaching methods and activities far better. She writes, "I think more are now liking maths because they actually engage in their own learning".

Some teachers attributed enhanced student participation in math activities to the "increased use of manipulatives and concrete materials" needed to implement the NNS. "Manipulatives encourage creativity and students can learn at their own pace", one Year 2 teacher stated. Another pronounced, "calculation is a bit easier for some children when they use manipulatives and concrete materials". Another observed that students are "engaging themselves in this approach, [they] put in their own effort to learn by working out themselves".

The focus group participants similarly expressed that prior to the NNS, they seldom used manipulatives. One confessed that now, "since DTR activities requires them (manipulatives), I try to make them available for all my math lessons whereas I usually managed without them before". Another teacher concurred and further added, "children are participating actively and learning to express themselves.....developing confidence...even the shy ones are also participating".

In summary, teachers offered evidence of their perceived correlation between the implementation of the NNS and an increase in student engagement. Their comments reflected the NNS as a student-centred, activity-based, and constructivist teaching and learning approach, as one teacher stated, “when students do, they understand”.

4.3.3.2 Increase in students’ interest and enjoyment for mathematics

Another strength of the NNS identified by participants was an increase in students’ interest and enjoyment in doing mathematics. Several teachers in the questionnaire commented that students were excited, more interested, and “actually enjoying while being taught”. Two teachers associated students’ increased enjoyment of math lessons with students being more confident and being “motivated and familiar” with math concepts. Focus group members also offered evidence that they noticed their students taking more interest in mathematics. One Year 3 and 4 teacher shared, “for my case, my students are really interested especially with having a starter”. Another continued that, “we can see children are liking this approach, the DTR...they like to talk and share”. She added, “students are enjoying and taking interest in maths because we now emphasise what I see, I remember...what I do, I understand.” Another teacher articulating similar feelings said, “math is now more interesting because students are thinking and learning at their own pace”. Several teachers also cited “peer learning” as a cause of enthusiasm for math. As one focus group teacher explained, “students talk it over in groups to grasp the idea of the taught concept rather than hearing full time from the teacher”.

In summary, teachers offered examples of students’ increased enjoyment and interest in math as an influence of NNS.

4.3.3.3 Increase in students’ mathematical vocabulary

Across focus group interviews and open-ended questionnaire data, an emerging strength of the NNS perceived was students’ development of mathematical vocabulary. As an example, one experienced focus group teacher explained:

“If I remember right, when LANA was implemented, some of the terms used in the paper confused the children because they were unfamiliar with it, like they knew the plus sign, but were not familiar with the word sum...they didn’t know what to do”.

She added, “but now we specifically teach the math related vocabs and if taught very well from Year 1, students will understand the related terms and their meanings”. All focus group teachers agreed and one describing her teaching said, “pasting new words on the wall gives a clearer, visual understanding of the math vocabs improving students’ spelling, reading, and pronunciation skills improving student’s literacy skills also”. Another added, “the children will do better in assessment and tackle the questions with understanding”.

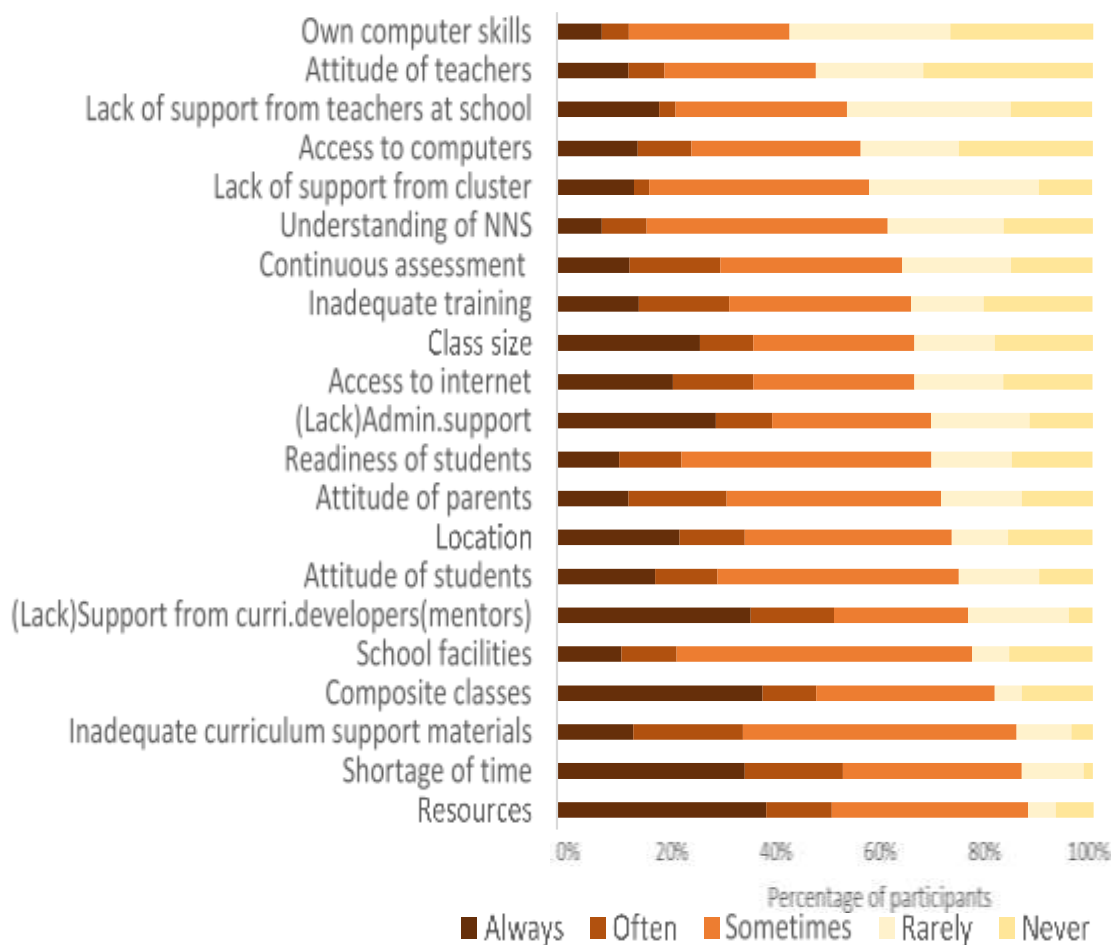
Most teachers in the questionnaire when asked to comment on the effect of changes they made to practice while implementing NNS indicated vocabulary development. One teacher commented, “students have better knowledge of math vocabs and try to use them correctly”. One teacher mentioned that hearing conversations in her math class she observed that students, “when working in groups share their ideas, discuss among themselves, and often help correct each other”. She added, “because children are given time to discuss and work out answers to the problems given, they are using more maths language in their conversations”.

In summary, the teachers offered evidence that students “understand the math vocabs better now when compared to the teaching methods followed before this approach”. The DTR method, wherein the step involving ‘talk’ is integrated as an essential part of every math lesson was identified as a strength of NNS, contributing to an increase in students’ math vocabularies.

4.4 Perceived Challenges of the New Curriculum Reform

Analysis related to lower primary teacher’s perceived challenges of implementing the NNS is presented in this section. The researcher had identified from the literature possible factors that could be possible barriers to the implementation of the new curriculum and asked the participants in the questionnaire to indicate the extent to which each factor posed a barrier with choices of never, rarely, sometimes, often, always (refer Appendix D Questionnaire q.8). Figure 4 summarises responses from the least to the most challenging factor of the implementation of the NNS as perceived by the 62 survey participants.

Figure 4. *Extent to which each factor is a barrier as perceived by maritime teachers*



Resources and time were identified as the largest barrier to implementation of NNS. In conjunction with an overview of the extent of influence of each factor (as shown in Figure 3), analysis of qualitative data from focus group interviews and questionnaires revealed four overarching themes that I have categorised into two broad categories presented as challenges related to the DTR-based curriculum and challenges related to teachers implementing the NNS in maritime schools of Fiji.

4.4.1 Challenges related to the DTR-based curriculum and its implementation

Respondents in open-ended survey questions and focus groups identified three major challenges that they perceived to be significantly influencing the process of the NNS implementation in maritime schools.

4.4.1.1 Lack of provisions for appropriate implementation

The most significant challenges of the NNS implementation process expressed by nearly all of the focus group and questionnaire participants were lack of support in terms of relevant resources and inconsistencies related to the methods of training and teaching. Resources not being provided for the activities to aid the implementation of the NNS was identified as the largest barrier, indicated by 87.7% of survey participants. Teachers were quite obviously concerned about this, indicating that the “curriculum developers should have developed and distributed relevant resources to all schools before implementing this approach”. According to teachers, provision of resources meant a numeracy kit integral to planning and facilitating numeracy lessons in an effective manner, allowing teachers to “plan with resources and not around resources”, saving them time, and reducing their already heavy workloads. One teacher commented that “when the aids we need are not readily available, especially in a resource-limited place like mine, a lot of improvisation has to be done, but then again all at the cost of our personal time”. Notably, only one participant in an open-ended response mentioned that he was “able to work with resources already in school”.

The pressures of ‘improvisation’ to prepare necessary resources brought about by the NNS was quite noticeable amongst these teachers. One confirmed what many others had voiced, “...but the collection.... preparation takes time...” All focus group members concurred and expressed their frustrations with the lack of provisions for resources in terms of realising that they were ill-prepared, leading to more negative perceptions of NNS. One teacher said she realised that the concepts for the class-level remained the same and the NNS were “only another teaching method” that “requires the teachers to take structured lesson”, and she said, “I have always been a good math teacherit might have been different if something extra was done like a resources kit....that would have really interested my kids and save me a lot of time too.”

In ensuing discussions regarding the need to continue to ‘improvise’, one focus group teacher revealed that she was one of the national trained mentors. She shared that:

one thing I found out is that the aids that teachers here are trying to put up or prepare for children, it does not match...doesn’t look anything like those that were in

the mentors' training kits...here in the islands we teachers have to make things out of what is available and that for all subjects, but our children like colourful things.

All the participants concurred, and one added, "our children here grow up playing with things we tend to use to teach, like seeds...it's there every day and is simply boring".

In summary, teachers expressed concerns for having to make use of "what is available" which to them was a normal practice and felt that the NNS called for 'teaching aids' that were different, colourful, and attractive. The teachers believed that not being given a 'numeracy kit' to implement the NNS influenced their quality of math lesson planning and preparation, eventually transpiring into less effective math teaching and learning.

Another issue addressed by a couple of participants in open-ended responses was that of discrepancies in the professional developments organised to train and inform teachers regarding the NNS, resulting in untrained teachers, in terms of the NNS, in the classroom. These teachers were concerned with the "late training" causing confusion whereby some lower primary teachers "were struggling with unfamiliar and challenging DTR methods". A Year 1 and 2 teaching head in a focus group described her multiple roles including being a mentor to an untrained Year 3 and 4 teacher. She revealed the difficulties stating, "it is best to have only the teacher trained for the level" being "allowed to implement this NNS". She added that "because the trained teacher from my school was transferred to another school, we are unable to properly implement this new approach". Another teacher who had been trained for Year 3 and 4 level complained that she was now "teaching Year 1 and 2 as asked by her school head because of no other trained teacher at school". She added that "a tab on trained teachers should be kept and teachers should remain in the schools they had been trained for". Pertaining to untrained teachers, several participants expressed concerns with the problem of improving students' "numeracy achievements in underperforming schools" as was the aim of this numeracy project. In answer to the effects on student outcomes in future, one teaching school head in an open-ended question summarised the issue as "it will be unfair to compare students' performances in maritime school against national standards in LANA because some of us are still waiting for the trainings to implement (the NNS) while other schools in other divisions are already one to three years ahead of us".

In summary, the participants expressed their concerns that discrepancies in training being conducted, different times for different context teachers, caused inconsistencies in the implementation of NNS. Teachers were anxious that this will cause inconsistent numeracy outcomes in future in their maritime context.

4.4.1.2 Inconsistencies between expectations and reality

The participants identified another challenge, a significant gap in the expectations of the NNS and the teachers' actual practice during the implementation process, which the teachers found unmanageable. These were related to allocated times versus the actual time needed for planning and instruction that was taken up by the DTR lessons, as well as a mismatch in assessment expectations.

Apart from two male participants, 96.8% in the survey agreed or strongly agreed that the planning and preparation for DTR activities aligned with the NNS took more time while, as discussed earlier, most associated the time-consuming nature of the preparation and planning to the lack of accessibility to resources. However, it was noted that teachers further mentioned "planning for composite-class lessons" as a challenging aspect of NNS. One focus group composite-class teacher commented:

planning to teach dual classes at once takes time...any composite teacher will tell you this...because we not only have to think of two year levels...what I see is students at different levels...like although the strands are similar, but for example Year 4 we have to go deeper than the concepts covered for Year 3...there's a big difference..."

Another, agreeing, added that "it now takes more time because I have to familiarise myself with how I'm going to develop concepts first before planning and also there are other subjects to plan for, also for double classes...". She also noticed that with DTR methods, "smarter children, especially Year 2 had more voice in the math lessons". She stated that "it is harder to take separate lessons for Year 1 and 2 as the time does not allow that". While most focus group teachers shared how they "spent more time in planning and preparation for math lessons", one teacher indicated that the demands placed on her are causing her to "sometimes dislike teaching in this way" because "a lot of personal time is being consumed". Several examples of challenges associated with the extra time required

for planning in the NNS were discussed by focus group participants, providing evidence that these teachers were struggling to keep par with the expectations of NNS.

Actual instructional time taken for a DTR lesson was another challenge perceived by 96.8% of participants in the survey mentioning it as a weakness of the NNS which was also reflected in the focus group interviews. The participants reported that the “allocated time for each step of DTR” and the overall time needed for each lesson is “misrepresenting as to what actually happens in the classroom”. Most teachers expressed their problems in “completing the steps of DTR” as per their plan, indicating their frustrations as “not able to cater for all students within time”. The teachers appeared greatly concerned regarding coverage of syllabi in all subjects and offered evidence of trying to manage their teaching by ‘trimming’ the steps as one experienced focus group teacher explained, “you know in our classrooms, we have timetables.... we have certain subjects in certain times. It takes a whole morning to do these (DTR) steps in that order. What I see myself doing is that I jump to the main idea or concept”. Several teachers concurred and added that “organising classes into groups with manipulatives”, “attending to misbehaviours”, “explaining the instructions for activities”, and “following-up on weaker students”, took “time that is more than the time allocated for math lesson” in the timeframes provided by the NNS as well as their own plans.

To summarise, the participants expressed that time constraints were the biggest challenge, influencing their facilitation of the DTR activities for the NNS.

Another challenge voiced by several teachers was their concern regarding the lack of consistency in the expectations of assessment processes in NNS. Teachers voiced that while the “NNS teacher’s guide outlines the assessment methods and procedures such as end of topic tests”, the school heads expected monthly tests to fulfil requirements for “monthly reports to district offices”. One focus group teacher commented that “we usually think of assessment as a monthly test and not a continuous process as expected in NNS”. Another added, “although students enjoy and learn, applying learning in the set examinations is something we teachers need to work for”. This discussion further led to focus group teachers sharing concerns regarding parents as “not ready to accept the new system”. One teacher said, “...in our village school, parents just want...that my children add, subtract and should be able to read, full stop. If a child can’t do these, there is a big question mark on the

teacher...". Another teacher agreed "... they blame the teacher because they do not have enough information about what is going on".

Notably, a younger teacher commented that "it is our responsibility to make parents realise that children will achieve better marks with this approach because a strong foundation is being built". In open-ended responses, two teachers had similarly stated that the NNS will "build solid foundations for the child to be a quick thinker and a problem-solver" and "we will produce a generation that will have a strong mental visualising skill, so maths marks will improve in future examinations".

In summary, the teachers offered evidence of their concerns about the mismatch between assessment processes of the NNS and the expectations placed on them by school heads and parents.

4.4.1.3 Developmental level of materials provided for NNS

Several teachers expressed dissatisfaction with the level of the DTR activities set out in the NNS handbook provided to guide teachers in the implementation process. One Year 1 and 2 teacher in an open-ended response stated that "some activities does not match the ability level of Year 1". She added that it was "difficult for students to cope with that level of problem-solving" because the children had "yet to master the required basic skills such as number recognition".

Year 1 and 2 focus group teachers also provided examples of DTR activities that they perceived were either not suitable for their class level or contradicted their beliefs of better ways to teach that particular concept. For example, one teacher referring to the teacher's guide explained the use of dice to teach writing and reading numbers. She stated that "this DTR activity defeats the purpose of teaching the students place value" as it later contradicted "use of dices to teach addition and partitioning of numbers". Similarly, a focus group teacher pointed out that the handbook "did not adequately cover all the concepts that should be taught at that level" and added that "the curriculum developers should be mindful of these because those teachers who are either new to the level or new to teaching will likely miss out teaching them". She added that "new teachers will not be able to make [the] necessary connections as they do not have experiences with the previous curriculums and will only follow this guide".

In summary, some teachers communicated that perception of shortcomings in the resource material provided for the implementation of the NNS.

4.4.2 Challenges related to teachers in the maritime context

Four major barriers for curriculum reform related to teachers in a maritime context, as perceived by the participants, emerged from the data which are discussed in the following sections.

4.4.2.1 Accessibility to support

These maritime participants commonly mentioned that inaccessibility to supports such as resources, professional development, mentoring, and connectivity issues were factors that hindered them in implementing the NNS. The most commonly cited gap in the NNS in both focus groups was the lack of support and need for the realisation that teachers cannot teach effectively in isolation.

Inconsistencies in accessibility as opposed to ‘inaccessibility’ emerged from questionnaire analysis. ‘Location/remoteness of school’ only ranked eighth in importance as a barrier to the implementation of the NNS, contrary to my expectations, which initiated in-depth analysis of the interviews and open-ended questionnaire data, wherein participants’ perceptions differed widely according to how accessible their locations were in terms of distance from the mainland, access to internet, attendance at PD, and mostly, the ability to purchase resources on time. The 16% of teachers reporting location as ‘never’ a barrier were all closest to the mainland, while the 23% indicating that location was ‘always’ a barrier, were located further out in the smaller islands scattered in the Eastern seas of Fiji. Comments offered by participants furthest from the mainland described their concerns as being very isolated and needing ample time to buy resources for the NNS because it took “time to get things done here”. One teacher explained that it took “ages to even get our photocopier repaired” referring to the “travelling and access to services as such”. She added that it would have been helpful to be “prepared well for the NNS” since the school’s location did not “offer many choices”. Thus, it can be inferred that location to maritime teachers was perceived in terms of anomalies such as the degree of remoteness and time needed to resource the NNS implementation.

Another challenge raised by the teachers comprising the 14.8% of participants who had not attended the NNS training workshops and yet were trying to implement it, was the inconsistencies of the training conducted with regards to them accessing these sessions. Common reasons provided for their non-attendance was cancellation of workshops or being transferred to a school where a trained teacher had left, and the class reallocated to them. These teachers claimed to be informed by colleagues or the school head, had in-house training sessions, and/or followed the provided NNS teacher's handbook. During focus group interviews, an untrained Year 1 and 2 teacher commented that "we have the math guides in school brought in by those teachers who were trained and later transferred". She added that there was "no trained teacher" at her school and that she was "looking forward to attending the numeracy workshop". She expressed her concerns about still teaching math in the old way. One teacher in an open-ended response indicated the reluctance of the school head to release her for the workshop due to "restrictions of teachers to travel for training in small schools".

Another issue of concern to some remote participants was inaccessibility to the internet. A few open-ended responses indicated that internet access affected their communication with each other. One focus group teacher stated the "ministry should improve our network system so that we can share ideas with other teachers". Another emphasised a "need for mentors to guide" them. Most agreed and one teacher voiced what others were discussing as "...mentors can clarify some concepts...first-hand information we received but no support for later". A school head commented that "some school heads also do not understand this new change and so are neither able to support or monitor teachers correctly". In an open-ended response in the questionnaire, along similar lines, one teacher wrote that "teachers need to be assessed frequently if they are implementing [the] NNS properly or not".

These comments provide evidence that teachers perceived that there were inconsistencies in access to required support in either the resources, training, communications, or monitoring. These concerns and conflicting perceptions regarding the NNS pose challenges to its implementation and may influence its ability to achieve its purpose, to counter low numeracy outcomes in schools.

4.4.2.2 Learning environments

Issues related to learning environments surfaced as another factor that was challenging the NNS implementation as perceived by these maritime participants in both focus groups and open-ended responses. 77.6% of participants in the survey indicated that school facilities were a barrier to the implementation of NNS. Several participants in the survey reported that because of limited space in classrooms, it was challenging for the teacher and grouping of students and supervision from one group to another was chaotic. One teacher mentioned that “the condition and size of the classroom is not conducive...a lot of noise is not appreciated by other teachers”. Another Year 1 and 2 teacher stated that “there is not enough space for children to move around for the DTR activities because it is composite”.

Two focus group teachers also shared how they were teaching “straight classes but in a composite classroom”, due to lack of rooms to host separate classes in their school. One said, “she takes Year 2 and I take Year 1...we have our children (total of 38) sitting and facing both sides...we try to keep our children’s voices low so as not to disturb each other”. They described that due to the small size of the room, there’s not enough space for children to move around and how it was difficult to conduct DTR activities. Notably, one very remote teacher had added learning environment-tents used as classrooms to the list of barriers to the implementation of the NNS in the questionnaire. A few participants also highlighted the need for improvement in structures and maintenance to classrooms when asked for comments.

These comments reflected some teachers’ concerns with learning environments that challenged the NNS implementation. These teachers concurred that they needed better facilities to support the success of the NNS.

4.4.2.3 Teacher obligations in remote schools

The focus group participants offered evidence of added challenges to implementing the NNS that related to working as a teacher in maritime schools. The participants identified increased workloads with the NNS as they further amplify their roles and obligations, in the schools and communities they taught in. One teacher expressing her concern stated that “...like most of the time the amount of workload coming in...we are using most of our personal time...like my afternoons are always spent in preparations” indicating that school

and boarding duties (which is common in most maritime schools), took away from their family time. “Our families are sleeping when we leave and ready to sleep again when we finally come home”, one teacher said, describing the level of commitment. One teacher mentioned that they were overloaded because of fewer teachers in the school and the rotation of duties being more frequent than bigger schools. Another mentioned that it was a “lot of commitment when teaching in a close-knit community like ours...even our husbands are obligated to participate in all village activities”.

The above citations from a number of focus group participants indicate the teachers’ perceptions that the NNS added to demands on their time. Most agreed and one teacher summarised it as “sometimes when new things are implemented, the expectations are unrealistic...it’s very high for teachers and to fulfil those expectations, teachers put their hearts and souls in them”.

4.4.2.4 Poor motivation and incentives

It was clear that another major challenge for the NNS implementation was the lack of teacher motivation and incentives related to their context. Several participants in open-ended responses concurred that there is an over-reliance on the teachers by curriculum developers to manage on their own at all times whenever something new comes along. While some teachers perceived the NNS as “profoundly changing students math learning experiences”, at the same time they expressed their struggles and burdens, and a few demonstrated being demotivated by the implementation. For example, one focus group teacher commented that “when at the workshop I felt so positive about making these changes, but when I came back to the classroom the reality was totally different”.

Participants mentioned that the location allowances they received “paid only their fare to and from mainland to do shopping” and “provided no incentive to stay and work in remote schools”. Another added, “what we are paid and the amounts of work that we are expected to do...it doesn’t go together”. One teacher comparing their situation to mainland teachers explained, “when we go for holidays, we spend days travelling, shopping and preparations to come back...we don’t have time off like other teachers do”. Some teachers expressed their concerns regarding their children in high schools. Two participants shared their roles as “more than a teacher”, expressing the difficulties of how having to shorten

holidays to attend PDs significantly affected the well-being of their families, especially the needs of their own children whom they leave on the mainland for secondary or tertiary schooling. The participants offered evidence of causes that de-motivated teachers from remaining longer in maritime schools.

In summary, teachers were very forthcoming in expressing various challenges unique to their locations that they perceived to be discouraging and negatively influencing their enthusiasm to implement the NNS. They regarded these issues a “huge gap between the expectations of the ministry and the realities of the classrooms”.

4.5 Perceived Strategies for Improved Curriculum Reform

Both focus group and questionnaire participants were given the opportunity to offer suggestions that they perceived could improve the implementation of NNS. I have grouped their responses into two main categories: Provisions for support and provisions for maritime teachers.

4.5.1 Provisions for support

Teachers identified several areas where improvements could be undertaken to overcome the challenges of the NNS. To begin with, most teachers cited the need for the provision of required resources. Teachers were firm in their beliefs that they needed resources for several reasons: to reduce planning and preparation time, for better class control especially in a composite classroom, for better facilitation in developing concepts, and to foster confidence in students for independent learning. While teachers indicated that they “had been so positive at the training workshops”, the practical realities of teaching in remote locations quickly made them realise the importance of bright, colourful and interesting objects that were needed as opposed to their “improvised materials”. Nearly all teachers agreed that the types of resources they needed for quality implementation were “not available in their remote locations” and they suggested that “a numeracy kit with durable aids” be provided to each school.

A second area of improvement cited by some experienced teachers involved reviewing and “including math concepts that were necessary in the teacher’s guide” so that the “delivery of the required concept is not missed by new teachers who had never taught

at lower primary levels". These experienced teachers recognised that teachers new to the lower primary level will not have the necessary background or knowledge often gained through experience over the years and will "use the handbooks as their bible for teaching math" and omit other curriculum content not included in the guide. A few teachers offered possibilities of straight class teaching, especially for composite classes with a higher number of children. One teacher commented that "NNS would be very effective in straight classes to allow for one good preparation rather than composite classes where one is well-prepared, and the other neglected because of time factor". Two other teachers contemplated the idea of specialised subject teaching for core subjects "just like secondary schools".

An additional area of need identified by participating teachers and deliberated upon in focus groups was for the MOE to create awareness amongst parents, management, and school heads regarding the NNS and its expectations. The focus group teachers agreed that "parents attitudes need to change" regarding students' assessments and awareness of the types of assistance that parents could provide at home to their child. The teachers also concurred that school heads needed to be informed of the NNS so that they are better able to "liaise with the management" and the MOE, especially concerning the high costs involved in travelling for professional development and acquisition of resources. The school heads in focus groups suggested that school heads should assess teachers' performance often for the NNS to ensure proper implementation and in order to this, they need to be relieved of their teaching roles.

Another area of improvement cited by many teachers was the need for professional development, not only to train remaining untrained teachers but to "train all teachers" regardless of the current level they taught. Teachers recognised the volatile nature of staffing in maritime schools, suggesting that having all teachers trained would ensure a trained teacher in the lower primary classroom at all times. A few suggested that upper primary teachers "can also use [the] DTR strategy to provide remedial activities for weaker children in their class". One teacher concluded that "all teachers must attend these workshops and become fully informed of all the changes, share ideas and knowledge...to make this work".

In summary, the participants provided suggestions for improvements on issues and concerns that were found across the data, regarding supports that were perceived important for this mathematics curriculum reform.

4.5.2 Provisions for maritime teachers

The participating focus group teachers concurred that there was a need for the authorities concerned to have an adequate “understanding of where teachers come from” to “understand the many challenges” that the maritime teachers face every day. Teachers suggested that “maritime teachers should be treated differently from other locations” because “standard practices that work elsewhere” pose challenges that “makes many teachers take transfers as early as possible” from the schools they work in. The teachers provided examples of ‘student free days’ that were implemented whereby all teachers were expected to report to schools earlier than the start of term. According to teachers, having to attend student free days “cut their days on mainland shorter”, giving them “lesser time to do their shopping”, meant they had to “rush to catch the available transportation” and often come back not having prepared well for the next three months because the salary came late. The teachers suggested that retention of teachers is an area that needs improvement which would impact strongly on student outcomes in future. Finally, one teacher suggested that there was a significant need to “adjust the curriculum to context” for smoother implementation of future curriculums.

4.6 Summary of Results

This chapter reported the findings of data gathered from 62 questionnaires and two focus groups (13 participants) from Year 1 to 4 lower primary teachers in a maritime context of Fiji. Findings highlighted that these teachers were quite receptive of the new math strategies (NNS). A number of strengths of the NNS were identified, and most teachers perceived the NNS as a much needed and welcomed change that standardised the math teaching practices of all lower primary teachers in Fiji.

The challenges related to the NNS seemed to stem from methods of implementation and the mechanics required to actually teach the NNS, which the teachers perceived as ‘over-reliance’ on them in challenging, constraining teaching environments. Instead of themselves, teachers focused more on what the stakeholders could contribute towards

lessening the barriers to effective teaching practices and better learning outcomes. The responses identified lack of support related to implementation (resources, training, monitoring); context-related issues (inaccessibility, infrastructure, opportunities for collaboration) and teacher-related barriers (professional and personal obligations, motivation and incentives). Time (generally the lack of) seemed to be an overarching influence that informed most of the teachers' perceptions of challenges regarding the NNS.

Chapter 5: Discussion, Conclusions and Recommendations

5.1 Introduction

This research arose from the nation-wide new numeracy strategies (NNS) initiative and its implementation involving Year 1 to 4 lower primary Fijian teachers. The focus of my study was how the processes of the NNS and its implementation was comprehended by teachers, considering the challenges encountered by them in their contexts.

The previous chapter highlighted the teachers' perceptions regarding the NNS. A consistent finding is that teachers in this study whilst receptive to the change, felt that there had been a lack of support required to effectively implement the NNS and sustain the kinds of effective teaching envisioned by curriculum developers. This chapter explores the complexity of the teachers' perceptions as they endeavoured to improve their pedagogical practices propelled and inhibited by their experiences.

This chapter brings together the findings presented in Chapter 4 and in three parts discusses: influences on teachers' perceptions, the identified barriers and features of the maritime context in its uniqueness, and finally, a direction for achieving sustainability in curriculum reforms is proposed.

5.2 The NNS from the Teachers' Perspectives

New responsibilities and teaching procedures are often recognised as characteristics of new reforms (Taylor, Muller, & Vinjevoold, 2003). Such recognition means that effective, well-planned PD for induction of new strategies needs to customise teachers' experiences to reformed characteristics (Choi & Walker, 2018). The 2017-2018 school year marked the PD, training, and implementation of the NNS in maritime schools. The findings from this study revealed a profound impact of this training on teachers' pedagogical approaches, with practically all respondents reporting changes to mathematics teaching practices.

As discussed in Chapter 1 and 2, the Fijian education system is such that the curriculum is centrally managed. Curriculum reforms are usually mandatory, which the teachers either adopt or adapt to their practices, which is described as a teacher-proof curriculum by Crossley et al. (2017). Similarly, this study suggests that the MOE assumed that with adequate pressure and/or monitoring from the system or school level, the

teachers' role as implementers would be enough to ensure improved student outcomes. As discussed in earlier chapters, NNS was an initiative resulting from the second phase of an Australian-aided AQEP project whereby 84 schools had previously benefited from Phase 1 with numerous supports such as resources and structural upgrades. This study confirms part of the initial findings from a pilot project whereby AQEP schools' teachers after training and implementing the numeracy strategies for three to five months, demonstrated increased confidence and skills in mathematics teaching. The strong support and perceived adherence to the NNS suggested by teachers in this study seemed to be influenced by three inter-related factors. Compounded with pressures of concurrent PD training and implementation for literacy curriculum strategies, these influences seemed to define teachers' perceptions of how successful the implementation of the NNS was, their interpretations of what challenges they encountered and their overall receptivity to the NNS, as discussed below.

5.3 Influences on Teachers' Perceptions of the NNS Implementation

Three major influences on teacher's perceptions that emerged from the findings are teachers' prior experiences within and with the climate of change, their pre-existing beliefs about mathematics teaching and learning, and their presumptions regarding what success is and what factors that led to success.

5.3.1 Prior experiences within and with the climate of change

Crossley et al. (2017) reported that Fijian teachers often did not practice, although ascribing to, learner-centred teaching pedagogies. Evidence from this study confirmed this notion to some extent, as generally, teachers in this study seemed to be re-examining and reconceptualising their current practices due to demands of the NNS as a learner-centred teaching pedagogy. Critical evaluation of the teachers' responses identified that most teachers, prior to NNS, had been teaching mathematics using traditional methods of 'chalk and board' (Section 4.3.1.1) despite previous curriculum reforms that had also encouraged learner-centred pedagogies. This finding implies that the previous reform initiative, a 'thematic' approach, in lower primary had failed to sustain teachers' interests and the teachers had reverted back to their comfortable ways of teaching. The findings from this study also suggest that teachers' inclination to use the new strategies was likely due to its consistency in expectations for numeracy outcomes which they felt was a weakness of the

previous curriculum and its pedagogical orientation which a few respondents hinted that they had been coerced to implement (Section 4.3.1.2). The standardised pedagogical approaches that reduced inconsistencies in teaching methods amongst teachers could be a reason that teachers were more receptive to the new strategies (Lloyd, 1999).

Crossley et al. (2017) proposed that there was a need for an emphasis on the central role of Fijian teachers as practitioners (Section 2.2.1). Evidence in this study showed that teachers perceived the NNS's learner-centeredness as a move towards more evidence-based practices of teachers with a focus on their pedagogy. The NNS clearly outlined the expectations for mathematics teaching with its defined learning standards. The reform had adopted six structured steps that needed to be followed in order (Section 1.2.2). The steps were developed by AQEP to help teachers plan and deliver active learning lessons (MOE, 2017a; 2017b), which the teachers in this study perceived they were doing. They agreed that the DTR steps guided the mathematical content and mathematical processes, which they found to be helpful in understanding what the students needed to know and how they would acquire this knowledge. This study revealed that teachers felt the NNS provided consistency in expectations for both student learning and teaching approaches. Schoenfeld (2002) reported that such consistency in the curriculum is critical for sustained improvements and has the potential to provide all classrooms with a coherent core of mathematical content.

It is important to make the distinction that this study did not seek evidence related to previous curriculum implementations, however, it was apparent that the experiences that teachers had with them significantly influenced their current perceptions of the NNS in all aspects, surfacing throughout data as a point of reference and comparison. This raises the issues of whether, as Meador (1995) pointed out, the earlier curriculum implementation occurred through 'sufferance' and therefore teachers' perceptions of the NNS were influenced by "suspicions of past reforms in mathematics education" (p.59).

Evidence from this research indicates that the teachers' perceptions of the strengths of the NNS were mainly due to its standard-based outcomes perceived as levelling the experiences of all students in Fiji, regardless of factors such as school contexts that often-promoted disparities within students' performances. These findings imply that Fijian teachers in this study liked the NNS because they provided a greater structure, coherence, and organisation

in teaching approaches than before, providing teachers with a sense of confidence in the system (Warren & Miller, 2013). These findings are also consistent with literature described in Chapter 2 (Section 2.4) whereby researchers provided evidence that the implementation of any curriculum initiative in the classroom is mostly dependent on the teachers' perceived desirability and the practicality of the new teaching approaches (Swann & Brown, 1997) and that curriculum intentions need to be translated into the classroom teaching practices if change needs to be made (Cuban, 1998; Stenhouse, 1968).

Whilst the current NNS initiative was introduced to improve numeracy outcomes of students, it was also aimed at strengthening evidence-based practices for teachers. This research indicates that teachers' efforts to implement the NNS was influenced by their level of confidence in the NNS's capacity and probability to succeed, given the successive systemic and curriculum reforms in the Fijian education system. The confidence levels manifested in:

- the ways that teachers perceived they were interacting with the knowledge they gained at the training sessions, and from the guidance and supports they received or did not receive, and
- the confidence in their ability to teach in ways they felt the handbook, or the curriculum required them to.

A few teachers in the focus groups, with higher confidence in the NNS, adapted the DTR methodology to suit their classroom environment (especially composite-classrooms) and indicated that they did not necessarily adhere to everything that the trainers suggested, or the curriculum developers intended, whilst others, less assured, followed it exactly. Overall, the findings suggest that the PD improved teachers' pedagogical knowledge but the degree of confidence that teachers showed in their practice differed markedly between teachers.

This study thus indicates that teachers' experience with prior reforms and change seem to be influencing the quality of the teachers' perceptions of the NNS. Teachers' positive disposition towards changing classroom practices needs to be fostered, to facilitate the current vision of the Fijian education system.

5.3.2 Pre-existing beliefs about mathematics teaching and learning

A wide range of studies have shown that teachers' personal beliefs greatly affect how they teach and what they teach (Levenson & Barkai, 2017; Pajares, 1992; Roehrig et.al, 2007) and that beliefs influence reform efforts as well as the extent of implementation fidelity of reform materials (Cheung & Wong, 2012). Teachers' personal beliefs, while affecting how they teach, can be further seen as how they actually interpret the curricular, examine its contents, evaluate and determine its effectiveness, as was found in this study. In this research, it was clear that the teachers' beliefs were a critical mediator between teachers' perception of the new strategies and their efforts of adoption, within the climate of change in Fiji as discussed previously.

Evidence from this research implies that teachers' beliefs about teaching mathematics and more specifically what they saw as important in that teaching, shaped their responses to the NNS. Many teachers expressed that ensuring improved student outcomes required them to commit to being more productive in terms of advanced, detailed planning and preparation as described in Section 4.3.2.2. Teachers recognised their role as being an 'expert' and were convinced that comprehensive planning and consistency of structured lesson delivery aligned to expected learning standards would produce improved student outcomes in future assessments. It is possible that early success in terms of excitement generated in students and students' positive responses with DTR activities as mentioned in Section 4.3.3 affirmed teachers' pedagogical shift to learner-centred lessons.

Evidence from this study implies that while the teachers felt PD improved their pedagogical content knowledge, they perceived that significant differences in expected practice existed for different levels, similar to findings of Norris (2014). The PD was designed to prepare teachers for the implementation of the NNS by curriculum developers, the AQEP team. During these sessions, the teachers were separately trained in cohorts of Year 1 and 2 or Year 3 and 4, working on level related components of the DTR methods, which Desimone (2009) describes as an effective strategy for improving teacher knowledge and skill, to effect changes in classroom practice. A few teachers in this study revealed that while they had been trained in the DTR methods, they expressed discomfort in transferring this knowledge when allocated to another class. For example, a teacher trained in Year 3 and 4 level mentioned being not comfortable in implementing DTR in a Year 1 and 2 classroom. This

study shows that while most teachers reported understanding the math reform and its goals, their belief in their own or others' ability to implement it at all levels was less strong, perhaps because of their beliefs concerning the nature of teaching mathematics at different levels. They did not necessarily feel comfortable implementing it more widely. The general finding was that initial confidence in the NNS was very high, while implementation in part was left to their own initiatives and efforts.

Another finding in this study was that teachers' experiences with NNS had significantly focused around the two handbooks; Mathematics Guide Year 1 and 2 and Mathematics Guide Year 3 and 4. Evidence from this study shows that there were teachers who were pleased with the sequencing of materials, lesson activities and strategies for keeping students organised, while a few were critical of the type, level and appropriateness of concepts as discussed above. For example, focus group Year 1 and 2 teachers commented that some activities were difficult for Year 1 level. Thus, they again conveyed their beliefs, in some way, about what students should be learning at different levels. Additionally, two teachers pointed out that teachers new to service or new to the class level will miss out on concepts not covered in the handbook. Clearly, all these are critical beliefs about teaching mathematics which influenced the teachers' perceptions and experiences.

5.3.3 Teachers definitions of success and factors inducing success

This study highlighted that an underlying factor influencing teachers' perceptions of NNS was teachers' notions of what they saw as success and factors that enabled these successes. Evidence from the study suggests teachers had an overwhelmingly positive experience when they implemented the NNS in their classrooms. The success of the NNS was being directly linked to increases in student engagement, interest, and enjoyment in mathematics as a subject. The teachers focused on the use of manipulatives, reporting that the students' physical involvement as groups in learning tasks helped develop student skills and confidence in doing mathematics. These findings are consistent with those of Warren and Miller (2013) who found that manipulatives increased student engagement in mathematics tasks through cooperative learning activities.

Warren and Miller (2013) and Marshman, Clark, and Carey (2015) in their studies had reported that modelling mathematical concepts with a variety of representations

(manipulatives) allowed students to see the structure of mathematics. In conjunction with a focus on an oral language approach, similar to NNS, this had improved students' mathematical language and its understanding. Teachers in this study similarly reported a correlation between the use of manipulatives and an increase in students' math vocabulary in the language of instruction in Fiji, English. A feature of DTR-based lessons is the visual introduction of new words or words that the teacher will be using during the math lesson. MOE (2017) highlights math vocabulary development an important feature of DTR-based lessons and this was emphasised to the teachers during the training sessions. The teachers in this study reported promoting this feature in conjunction with encouragement of active participation throughout mathematics lessons as well as social interactions in groups.

Evidence from this research also shows that teachers noticed student interactions in small groups fostered peer learning whereby students learnt and developed a better understanding of math concepts, similar to the findings of Warren and Miller (2013) who reported that students' communication in groups promoted connections between mathematical concepts. As discussed in Chapter 2, Bakalevu (1999) proposed that for Indigenous contexts, the English of mathematics can cause cognitive problems, an issue that seemed to be addressed by the NNS in its focused teaching methods. One focus group teacher viewed the compulsory component of vocabulary development as a major strength of the NNS. Most participants agreed that student numeracy outcomes in future would be improved, mainly linking this opinion with the students' developing ability to read and understand the language of mathematics, which needs to be noted is different from the students' first language. Findings from this study suggest that teachers while implementing the NNS perceived that explicitly teaching mathematics language leads to a greater understanding of math concepts by Indigenous students.

These teachers saw student engagement and vocabulary development as indicators of success, which influenced their positive view of the NNS. This success as perceived by teachers in this study does not necessarily equate with an increase in student achievement, which is the aim of the NNS.

5.4 Identified Barriers

Throughout this thesis, there has been an emphasis on the recognition of the uniqueness of maritime contexts, its varying remoteness and its associated challenges for teachers working and living in these locations. Consistent with the literature and typical to mathematics curriculum reforms, a variety of barriers in the process of the NNS implementation encountered by teachers were identified. While some barriers (e.g. lack of resources) were immediately identified and stated, further evaluation of the data revealed those other obstacles, the nature of which provide invaluable insights to understanding the process of curriculum reforms in maritime contexts as highlighted in Chapter 4.

A key finding in this study was that teacher participants, in general, were inclined to or able to alter their pedagogical practices in response to the mathematics curriculum reform. However, nearly all respondents reported a disconnect in terms of not being supported well with the NNS implementation process as well as the implementation contexts; these findings are similar to those reported by Petaia (2009) in a study with Samoan educators. In this study, teachers' perceptions of barriers (Section 4.4) appeared to arise from three sets of influences or teacher concerns: teachers' concerns regarding student success, external expectations, and professional and personal opportunities.

5.4.1 Barriers related to concerns about student success

An underlying concern for students' future numeracy performances was apparent in the teachers' discussions as they identified several issues as barriers that they perceived could have been constrained by curriculum developers at the onset of this reform

5.4.1.1 Lack of time and resources

The largest barrier to the successful implementation of the NNS evident throughout the previously discussed sections was related to time and resources. Overall, teachers thought that not only is planning, preparing, and getting resources in the NNS time-consuming, the time taken to teach the lesson was also a challenge. Manouchehri and Goodman (1998) reported similar results whereby teachers, regardless of experience and comfort level with new pedagogies found a lack of sufficient time when implementing the new reform. Another finding of this study is that teachers strongly believed that the resources they

needed to support changes to practice and student learning were not provided. Ball and Cohen (1996) argued that while reforms changed expectations for teachers, how the curriculum developers and others perceived teachers' work remained unchanged, and thus little support was provided in terms of time and resources. Evidence from this study illustrates how crucial it is for Fiji to re-assess the role of providing appropriate subject-related resources with new initiatives. A related finding in this study is that while using the structured, resourced-based NNS, there has been an evolution in the Fijian teachers' understanding of the role of resources, more evident in composite class teachers and those from the remotest areas. Readily available, bright coloured aids not being provided led to teachers comparing their circumstances to other teachers in locations more easily accessible, where teachers were in a better position to overcome this shortcoming by obtaining materials they needed at their own cost. Remote maritime teachers reported gathering or improvising relevant teaching aids for the NNS in order to be effective in their mathematics lessons. The teachers identified a positive correlation between the availability of resources to efficient use of time, better class management with greater motivation for both the teacher and the students resulting in learner-centred, evidence-based practices.

This discussion is not to imply that successful curriculum reforms can only be fostered with provision of resources, but it is fair to say that the culture of improvisation has characterised Fijian classrooms for decades and, as Taylor et al. (2003) suggested, reform initiatives aiming to improve instruction cannot rely only on the teachers. Evidence from this study shows teachers considered the structure of NNS itself as inadequate in increasing students' mathematical understanding and suggested that appropriate support be given to the teachers in terms of continued PD, mentoring, modelling, and resourcing of classrooms, similar to findings of Warren and Miller (2013). The teachers through the current study highlighted their excessive workload and issues resulting from lack of resources, poor classroom conditions, and lack of mentoring though most reported feeling competent teaching in the new way. In her doctoral thesis, Younghusband (2005) pointed out that poor resourcing affected both teachers and students. She states that the matter needs to be addressed at all levels of education with teachers concerns taken seriously.

5.4.1.2 Poor administration of training and implementation

Another substantial barrier identified by maritime teachers that signals concerns about students' numeracy success in this exploration of the NNS was the poor process of reform implementation, a feature of remote contexts also reported by Ndongko and Tambo (2000). Apart from non-involvement of major stakeholders, that is school heads and parents, miscommunications regarding PD training, identified by teachers as essential to the process of implementation, led to teachers untrained in the NNS in the lower classrooms of maritime schools in the first year of implementation. Apparently, some sessions were conducted right at the end of school year, when teachers were uncertain of the school and year level they would be teaching in the following year. The irregularity with the major phase of PD training of the NNS raised concerns about NNS and its future, negatively influencing those teachers' and school heads' perceptions who raised the issue of maritime students' future performance in national numeracy assessments.

The evidence from this study suggests that some teachers were concerned about future numeracy outcomes when compared with national standards, i.e., that it will imply low performance of maritime students due to the inconsistencies in the training sessions and the ad-hoc implementation in maritime schools. Smith and Heaton (2013) observed that teachers often returned to methods that work in order to address accountability issues, which was also evident in this study as one focus group teacher refused to implement the NNS in her class while another, an assistant school head expressed her concerns about students' performance in tests as the reason why she chose not to fully integrate all aspects of the NNS in her lessons. Consistent with the literature, this study highlights the need for better PD for teachers in curriculum reforms that is appropriately planned (Couper, 2004), as this aspect has been proved, to some extent, to help overcome anticipated obstacles that have been categorised by Kelly & Fogarty (2017) as controllable barriers.

5.4.2 External expectations

Another critical set of barriers to the successful implementation of the NNS was related to what teachers reported as inconsistencies in expectations for teachers, as discussed in Section 4.4.1.2. School heads, parents, and assessments were different aspects yet powerful influences on teachers' implementation efforts for the NNS.

5.4.2.1 Lack of school-level support

Teachers in this research identified school heads as not supporting them in the implementation of the NNS. As stated in Chapter 1, while teachers were being trained and asked to implement the NNS, the school heads, as well as parents and management, were unaware of the goals of the NNS and their differing expectations became barriers to teachers' implementation efforts. These expectations manifested in several ways as some teachers mentioned school heads refusing to let teachers travel for PD training and, for some, disagreeing to purchase more resources requested by teachers. Ngcobo and Tikly (2010) identified school heads training as essential to implementing quality reforms. The authors point out that the school heads play a key role in mobilising resources, developing and motivating staff and empowering parents to support children's learning. This study confirms that teachers perceived the role of school heads' involvement during the implementation process as very important, which the curriculum developers had left until later. This seemed to have affected the momentum of effective implementation. At the time of writing this report, workshops for school heads were being conducted to inform and train Fijian school heads for standardised monitoring of the NNS.

A barrier perceived by some teachers was parents' expectations of what students should learn and how they should be taught. Some teachers perceived that parents were not being supportive of the NNS because of the different assessment strategies. A few teachers who claimed to have informed parents reported negative attitudes towards the NNS. There was not sufficient evidence in this study to confirm this perception.

Participants of this study, i.e. Indigenous teachers in authentic Indigenous contexts (Section 3.3), to some extent still face the difficult task of "mediating the interface between cultural systems of meanings and values that exist in schools" as proposed by Thaman (2009, p.3). Evidence in this study suggests that while there were some teachers who expressed the wish to better contextualise their teaching, they faced a lack of support from school heads and inadequate resources to reach out to the parents to inform them of the goals of the new reform.

5.4.2.2 Assessment processes and practices

This study showed that inconsistent assessment expectations by the school heads, parents, and the district office posed a challenge to the successful implementation of this mathematics reform, as is consistent with findings of Thompson (2009). Thompson reported that teachers found it difficult to integrate standards-based practices in the existing assessment system of the school and district, which the teachers in this study also reported. Consistent with findings of Manouchehri and Goodman (1998), teachers in this study reported operating within existing evaluation structures such as monthly tests under administrative pressures of documentation, reporting, and accountability. This finding suggests that teachers' use of expected assessment methods for the NNS were not consistent with the vision of the NNS wherein assessment is to be embedded in the learning processes with the expectation that teachers continually assess students learning in a variety of ways (MOE, 2017).

5.4.3 Personal and professional opportunities

In the implementation of NNS, the researched context (geographically isolated, maritime schools) presented an interplay of those barriers that the teachers felt needed to be addressed but were not in their control. These were related to their professional growth as well as persons with needs other than employment.

5.4.3.1 Inconsistencies in accessibility to required support

Evidence in this study shows that while location was identified as a barrier to the implementation of the NNS, there was a disparity in this perception. The frequency of location being listed as an obstacle was determined by the degree of remoteness. That is, those teachers located nearer to the mainland or those with easier opportunities to travel to the mainland reported location as never a barrier in sharp contrast to those participants located further out who identified a range of location-related issues. High travelling costs, connectivity, poor living conditions, and access to services such as health and sanitation were some issues perceived to hinder teachers living and working in the remoter maritime schools (see Chapter 4). An important finding in this study is that teachers perceive that the

risks and costs involved in travelling, living, and working in maritime schools are not adequately being compensated for, consistent with findings in the literature (Hardre, 2009; Jorgensen et al., 2010). Evidence from this study suggests that travelling by sea in small boats, the physicality involved in 'getting there' and 'surviving' for months, dependent on the community, puts these teachers at risk. The teachers used words like 'our sacrifices' and 'splitting up my family' to describe how their lives are affected by the context of their schools that often confine teachers to their location for long periods. Teachers from this research strongly voiced a need for the MOE to revise some of its policies that are insensitive to the personal needs of maritime teachers. These findings are consistent with those of Brasche and Harrington (2012) and Hardre (2009) who point out that without rural policy initiatives it is difficult to recruit and retain teachers in rural areas.

Apart from challenges in professional opportunities (e.g., access to PD and mentors), teachers generally expressed not being able to collaborate with colleagues on issues regarding the NNS as a challenge also. It was evident that teachers in this study were willing to work and assist each other during the implementation of the NNS however did not have the support, means, or resources to do so. These aspects were mentioned in the findings of Lock et al. (2009) which highlighted that while maritime teachers lacked motivation and incentives to continue working in maritime schools and were generally uncomfortable teaching composite classes, managing their workloads (e.g., boarding supervision) and being part of the community were considered expectations to be fulfilled. While most teachers in the current study reported feeling overworked and unsupported in the implementation of the NNS, teachers appeared to have acclimatised to their school environments and exhibited this in their suggestions for improvements in the NNS, reaching out for assistance and recognition of their work as remote maritime teachers.

5.5 Conclusions and Recommendations

5.5.1 Summary of findings

I write this conclusion with the knowledge that MOE Fiji is currently more focused on making the NNS reform succeed by continuing to train teachers as well as the school heads, informing and preparing them for a structured monitoring and performance-based reward system for teachers. Within this climate of accountability, grounded within evidence-based

practices, this research set out to investigate and understand remote maritime teachers' experiences with the NNS reform that was and is being implemented in the lower primary classrooms of Fiji. Past reform initiatives have had a history of being shelved without proper evaluation and this endeavour was welcomed by the teacher participants who took the opportunity to share their experiences and perceptions. This study may contribute to the MOE's goals by highlighting the strengths, weaknesses, and the nature of challenges that remote teachers encounter during the implementation of different reforms.

Given that this research has shown how a new curriculum was received and interpreted, and that the effectiveness of this reform is vulnerable to an array of inter-related factors, it was important to evaluate teacher's interaction with the NNS goals within their geographically isolated contexts.

The findings showed that the majority of the teachers reported changing their pedagogical practices to align with goals of the NNS that offered a structured DTR approach to mathematics teaching yet felt a disconnect when the reform intentions were challenged with the realities of their contextual, structural, and organisational factors. The perceived strengths as well as challenges of the NNS and its implementation in the researched remote maritime context indicate that mathematics reform is not a straightforward exercise and requires a combination of contextual knowledge, expertise, and considerable planning to overcome anticipated barriers and, at least, minimise the impact of those variables that are non-controllable (e.g., teacher beliefs, isolation).

The perceived strengths of the NNS include a structured and coherent curriculum, consistent learning standards and outcomes, learning activities for diverse needs of learners, enhanced teacher planning and preparation, and constructivist teaching methods.

The study also revealed perceived weaknesses in the process of implementation of the new mathematics reform which included inconsistencies between expectations and reality, lack of provision for appropriate implementation (such as resources, mentoring, training, and miscommunications with school heads) and clarity and quality of materials provided for the NNS. These aspects were further exaggerated due to contextual barriers of accessibility, continued existence of unresolved issues, obligations related to being a remote school's teacher and lack of teacher motivation and incentives - features of the maritime

context that teachers perceived needed to be acknowledged prior to the implementation process.

An examination and critical evaluation of the teachers' perceptions as they struggled between their professional beliefs and efforts to adopt new pedagogical approaches modelled to them in PD revealed an interplay of influences. These influences (prior experiences, pre-existing beliefs about math teaching and learning, definitions of success, concerns about students' success, external expectations, and professional and personal opportunities) were the 'lenses' through which teachers sifted all the information derived from the training and the handbooks. Through these 'influence lenses', they made choices that informed their practices - what they saw as strengths and challenges with the NNS in their context, and the extent to which a particular factor was a barrier to them. These findings are some important cues to remind curriculum developers that teachers really are the key enablers or inhibitors to successful reforms and their roles in context are an indispensable consideration when aiming for quality in education.

5.5.2 Limitations of the study

Qualitative studies interpret findings for their unique settings, rather than generalisations, to create an understanding of a phenomenon (Merriam, 2009). While findings are not generalisable, I have provided detailed information about the context, so others can consider their applicability in other settings.

The findings in this study are limited by the accuracy and trustworthiness of self-reported data from the participants. However, triangulation was achieved when consistency in teachers' responses within and across instruments was established.

Also, the rating-scale items may not have adequately represented participants' view and practice, and the inclusion of more items could have reduced this potential effect. Nevertheless, the provision of open-ended questions saw some participants pointing out issues that they perceived needed to be included (e.g., use of tents as classrooms).

Due to the scope and timeframe of a master's thesis, there has been a deliberate absence of voices of other stakeholders in this study. The inclusion of students, school heads, parents, and curriculum developers would have added rich and valuable insights into

the evaluation of the NNS, its effectiveness, and its future. However, this study is a start to a better understanding of issues arising out of the experiences and lives of maritime teachers.

5.5.3 Considerations for future focus

This study has provided insights on maritime teachers' perceptions of mathematics reform and the barriers that teachers encounter in this context while implementing it. The findings provide a basis for further empirical research to highlight experiences and empower maritime teachers for a more supportive and collaborative professional and personal network.

Maritime teachers' unique needs amidst the tension generated due to large systematic changes in the Fijian education system can easily be discounted. This study showed that expectations at system-level when filtering down to teacher-level are combined with many factors that become barriers to effective implementation of reforms. A teacher without adequate support, thus cannot be held responsible for seeking comfort in familiarity rather than volatility.

The assessment and reporting methods in lower primary appear to be an obstruction to mathematical pedagogical reform and may need to be re-examined for better alignment to the goals of the reform. Also, support structures (e.g., PD, resources, leadership, and support) and prevailing issues (e.g., deteriorating classrooms, teacher retention) need to be addressed for successful reform efforts. The teachers indicated that inclusion of major stakeholders, i.e. parents and school heads, at the onset of reforms could have reduced the effects that otherwise become barriers to their genuine efforts for change. This study indicates that the participation in NNS significantly influenced teacher's dispositions in mathematical pedagogical change and further reinforcing PD would thus encourage a successful systematic reform.

Maritime teachers' responses indicated greater recognition was warranted of their personal needs which arise out of their professional practice as a maritime teacher in an isolated context. Policies addressing this issue are therefore worthy of consideration.

5.5.4 Experiences of the researcher

This thesis has been a learning journey where I began as a classroom teacher with motivation to potentially contribute to the quality of education for remote maritime children. I started by reflecting on the current reforms and importance of the teachers' role in them. This research further convinced me that highlighting the critical role of teachers who have the knowledge and skills of contexts they work in is important. As a teacher with years of primary teaching experience, I continue to advocate for the importance of research-based, contextually relevant decision-making. As a beginning researcher, I aim to contribute further to professional discourse in educational research agendas in Fiji.

5.5.5 Concluding remarks

The Fijian education system is robust and rapidly developing with teachers who are far better trained, qualified, and knowledgeable than ever before. Considering this, not only identification of potential barriers for an intended reform is important, rather acknowledging and addressing them to minimise their potential impacts also need to be prioritised.

Finally, I leave the last thought to Mr Suliasi Vuli, Divisional Education Officer Eastern with extensive background experience who made me realise the immensity of demands placed on maritime teachers who nevertheless choose to work in these locations:

You know, the value of a dollar. A dollar is a dollar but out there it's just twenty cents. The rest is lost somewhere in between.... just getting there.

In reading this, I hope that the work of maritime teachers is appreciated, and their resourcefulness in context viewed with a greater understanding of the reality of this context. This thesis has identified strengths and challenges of the NNS which if addressed has the potential to mark an era of enhanced student performance in numeracy.

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Appendix A: Ethics Approval from Victoria University



Phone 0-4-463 6028
Email judith.loveridge@vuw.ac.nz

MEMORANDUM

TO	Helen Prakash
FROM	Dr Judith Loveridge, Convenor, Human Ethics Committee
DATE	14 June 2018
PAGES	1
SUBJECT	Ethics Approval: 26062 Perspectives of composite class teachers on the implementation of new numeracy teaching practices in remote maritime schools in Fiji

Thank you for your application for ethical approval, which has now been considered by the Human Ethics Committee.

Your application has been approved from the above date and this approval is valid for three years. If your data collection is not completed by this date you should apply to the Human Ethics Committee for an extension to this approval.

Best wishes with the research.

Kind regards

Judith Loveridge

Convenor, Victoria University Human Ethics Committee

Appendix B: Approval to Conduct Research in Fiji



MINISTRY OF EDUCATION, HERITAGE & ARTS

Quality Education for Change, Peace and Progress



Resident Address: Marela House, 19 Thurston Street, Suva, Fiji.
Postal Address: Private Mail Bag, Government Buildings, Suva, Fiji.

Ph: (679) 3314477
Fax: (679) 3303511

Our Reference: RA 38/18

Date: 27th June 2018

Ms Helen Prakash
Victoria University of Wellington
New Zealand

Re: **Official Approval to Conduct Research in Fiji**

Dear Ms Prakash

We are pleased to inform you that the approval for the request to conduct research in Fiji has been granted on the topic: **"Perspectives of composite class teachers on the implementation of new numeracy teaching practices in remote maritime schools in Fiji"**.

The approval is granted from July 1st, 2018 to August 31st, 2018 as specified in your request.

It is also noted that in this research, you will be working closely with the Ministry of Education who would be assisting you with facilitating your research. Please liaise with the relevant personnel and organizations with regards to the logistics and the conduct of your research and be further advised that the Government of Fiji's legislations, procedures, policies and protocols must be unreservedly adhered to.

As a condition for the research approval, a copy of the final research report must be submitted to the Ministry of Education, Heritage and Arts (MOEHA) through this office upon completion, before the commencement of any publication. Only after the MOEHA Research & Ethics Committee has endorsed the report, shall you be allowed to do any publication of the report. The report will be reserved in the MOEHA Research Library and will be availed for reference by Senior Ministry and Government officials.

Moreover, it is important to note that the Ministry of Education reserves a right to publish the final report or an edited summary of it.

We further wish you success in your research study.



Ranish Nitesh Chand (Mr)
for **Permanent Secretary for Education, Heritage & Arts.**

cc. MoE Research File

ALL COMMUNICATIONS TO BE ADDRESSED TO THE PERMANENT SECRETARY FOR EDUCATION, HERITAGE & ARTS

Appendix C: Focus Group Participant Information Pack



Project Title:

Perspectives of composite class teachers on the implementation of new numeracy teaching practices in remote maritime schools in Fiji

INFORMATION SHEET FOR PARTICIPANTS *[for Focus Groups]*

You are invited to take part in this research. Please read this information before deciding whether or not to take part. If you decide to participate, thank you. If you decide not to participate, thank you for considering this request.

Who am I?

My name is *Helen Prakash* and I am a Masters student in *Education* at Victoria University of Wellington. This research project is work towards my thesis.

What is the aim of the project?

This project aims to explore the attitudes of lower primary teachers concerning the new numeracy curriculum that has been implemented in Fiji. This project specifically focuses on the views of composite classroom teachers located on island schools and hopes to highlight the issues experienced by teachers in implementing the new numeracy developments in these unique classrooms.

This research has been approved by the Victoria University of Wellington Human Ethics Committee {application reference number 0000026062}.

How can you help?

You have been invited to participate because *you have been recognized as a teacher in lower primary composite class in your school that is in the maritime zone*. If you agree to take part, you will be part of a focus group with four or five other teachers in a convenient location to be confirmed later. I will ask you and other participants questions related to the new numeracy approach. The focus group will take *about an hour*. I will audio record the focus group with your permission and write it up later.

The information shared during the focus group is confidential. That means after the focus group, you may not communicate to anyone, including family members and close friends, any details about the focus group.

You can withdraw from the focus group at any time before the focus group begins.

You can also withdraw while the focus group it is in progress. However, it will not be possible to withdraw the information you have provided up to that point as it will be part of a discussion with other participants.

What will happen to the information you give?

This research is confidential*. This means that the researchers named below will be aware of your identity, but the research data will be combined, and your identity will not be revealed in any reports, presentations, or public documentation. However, you should be aware that in small projects your identity might be obvious to others in your community.

Only my supervisor and I will read the notes or transcript of the focus group. The focus group transcripts, summaries and any recordings will be kept securely and destroyed on 27/02/2024.

What will the project produce?

The information from my research will be used in my Masters thesis and academic publications and conferences.

If you accept this invitation, what are your rights as a research participant?

You do not have to accept this invitation if you don't want to. If you do decide to participate, you have the right to:

- choose not to answer any question;
- ask for the recorder to be turned off at any time during the focus group;
- withdraw from the focus group while it is taking part however it will not be possible to withdraw the information you have provided up to that point;
- ask any questions about the study at any time;
- be able to read any reports of this research by emailing the researcher to request a copy.

If you have any questions or problems, who can you contact?

If you have any questions, either now or in the future, please feel free to contact me or my supervisor:

Student:

Helen Prakash

helen.prakash@vuw.ac.nz

Supervisor:

Dr. Dayle Anderson

School of Education

dayle.anderson@vuw.ac.nz

Human Ethics Committee information

If you have any concerns about the ethical conduct of the research, you may contact the Victoria University HEC Convenor: Associate Professor Susan Corbett. Email hec@vuw.ac.nz or telephone +64-4-463 9451.



Project Title:

Perspectives of composite class teachers on the implementation of new numeracy teaching practices in remote maritime schools in Fiji

CONSENT TO PARTICIPATE IN FOCUS GROUP

This consent form will be held for 5 years.

Researcher: *Helen Prakash, School of Education, Victoria University of Wellington.*

I have read the Information Sheet and the project has been explained to me. My questions have been answered to my satisfaction. I understand that I can ask further questions at any time.

I agree to take part in an audio recorded focus group.

understand that:

I acknowledge that I am agreeing to keep the information shared during the focus group confidential. I am aware that after the focus group, I must not communicate to anyone, including family members and close friends, any details about the focus group.

I can withdraw from the focus group while it is in progress however it will not be possible to withdraw the information I have provided up to that point as it will be part of a discussion with other participants

The identifiable information I have provided will be destroyed on 27/02/2024.

Any information I provide will be kept confidential to the researcher and the supervisor.

I understand that the results will be used for a Masters report, academic publications and presented to conferences.

My name will not be used in reports, nor will any information that would identify me.

would like to receive a summary of findings and a link to the published thesis. ☐ Yes ☐ No

Signature of participant: _____

Name of participant: _____

Date: _____

Contact details: _____



Project Title:
**Perspectives of composite class teachers on the implementation of new numeracy
teaching practices in remote maritime schools in Fiji**

Ground Rules for Focus Group

You have been invited to participate because *you have been recognized as a teacher in lower primary composite class in your school that is in the maritime zone.*

- I will ask you and other participants questions related to the new numeracy approach.
- The focus group will take *about an hour*. I will audio record the focus group with your permission and write it up later.
- You may choose not to answer any question
- You may ask for the recorder to be turned off at any time during the focus group;
- You can also withdraw while the focus group it is in progress. However, it will not be possible to withdraw the information you have provided up to that point as it will be part of a discussion with other participants.
- You are encouraged to give your views as well as respect others views.
- The information shared during the focus group is confidential. That means after the focus group, you may not communicate to anyone, including family members and close friends, any details about the focus group.

Focus Group Interview Draft Questions

Research: Perspectives of composite class teachers on implementation of new numeracy teaching practices in remote maritime schools of Fiji

Confidentiality

All information that is collected in this study will be treated confidentially. Every effort will be made that neither you nor your school be identified in any report of the results of the study. {Participation in this focus group is voluntary and you may withdraw at any time or refuse to answer a question}

The following interview questions are a guide only.

1. Could you share your experience in implementing the new numeracy programme in your classroom?
2. What are some barriers or challenges you faced or are experiencing while implementing this new curriculum in your remote maritime classroom and how do you manage them?
3. What was the reaction and response of students after they had been taught with the new numeracy approach?
4. What is your view of how the new numeracy approach compares with the previous teaching methods that you were using?
5. Thinking of the new numeracy approach, what are some issues you think needs to be addressed for your composite classroom in the maritime school?

Appendix D: Questionnaire Participant Information Pack



Project Title:

Perspectives of composite class teachers on the implementation of new numeracy teaching practices in remote maritime schools in Fiji

INFORMATION FOR PARTICIPANTS [for Questionnaire]

You are invited to take part in this research. Please read this information before deciding whether or not to take part. If you decide to participate, thank you. If you decide not to participate, thank you for considering this request.

Who am I?

My name is *Helen Prakash* and I am a Masters student in *Education* at Victoria University of Wellington. This research project is work towards my thesis.

What is the aim of the project?

This project aims to explore the attitudes of lower primary teachers concerning the new numeracy curriculum that has been implemented in Fiji. This project specifically focuses on the views of composite classroom teachers located on island schools and hopes to highlight the issues experienced by teachers in implementing the new numeracy developments in these unique classrooms.

This research has been approved by the Victoria University of Wellington Human Ethics Committee [application reference number 0000026062].

How can you help?

You have been invited to participate because *you have been recognized as a teacher in lower primary composite class in your school that is in the maritime zone*. If you agree to take part you will complete a questionnaire. The questionnaire will ask you questions about the *implementation of the new numeracy curriculum*. If you agree to take part, I will send you a written questionnaire through email. This questionnaire will take about 20 minutes to complete, however, in order for you to have enough time to think and reflect you may take up to three days to complete and return it by email. The questionnaire will have questions about you and your views regarding *the new numeracy approach*.

You can choose to not answer any question without giving a reason. You can withdraw from the study by contacting me at any time before *30th July 2018*. If you withdraw, the information you provided will be destroyed.



Perspectives of composite class teachers on the implementation of new numeracy teaching practices in remote maritime schools in Fiji

CONSENT TO PARTICIPATE

This consent form will be held for 5 years.

Researcher: Helen Prakash, *School of Education, Victoria University of Wellington.*

I have read the Information Sheet and the project has been explained to me. My questions have been answered to my satisfaction. I understand that I can ask further questions at any time.

I agree to take part in completing the questionnaire.

I may withdraw from this study at any point before 30/07/2018, and any information that I have provided will be returned to me or destroyed.

The identifiable information I have provided will be destroyed on 27/02/2024.

Any information I provide will be kept confidential to the researcher and the supervisor.

I understand that the results will be used for a Masters report, academic publications and presented to conferences.

My name will not be used in reports, nor will any information that would identify me.

would like to receive a summary of findings and a link to the published thesis. ☐ Yes ☐ No

Signature of participant: _____

Name of participant: _____

Date: _____

Contact details: _____

Teacher Questionnaire

Research : *Perspectives of teachers on implementation of new numeracy teaching practices in remote maritime schools of Fiji*

Confidentiality: All information that is collected in this study will be treated confidentially. Every effort will be made that neither you nor your school be identified in any report of the results of the study. {Participation in this survey is voluntary and any individual may withdraw at any time.}

About the Questionnaire

- This questionnaire asks for information about yourself and you as a teacher. Please answer as accurately and completely as possible.
- When you have completed this questionnaire, please return it by email on the following address: prakashele@myvu.ac.nz

Thank you very much for your cooperation!

1. Background Information: (please tick or complete all those that apply)

- How old are you? ☐20-25 years ☐26-30years ☐31-40yrs ☐41-50yrs ☐51-55yrs
- Gender: ☐ Male ☐ Female
- Ethnicity: ☐ iTaukei ☐ Indian ☐ Rotuman ☐ others
- Which of the following do you have as a teaching qualification? (please tick all that apply)
☐ Certificate ☐ Diploma ☐ Postgraduate ☐ Masters
- Total Number of Years in service:.....

Please tick and complete all those that apply

I have taught in.....schools	b. Please specify for how long	c. Was it Composite(C), Straight (S) or Multi-levels(M)....Circle all that apply
<input type="checkbox"/> Urban or semi-urban		C S M
<input type="checkbox"/> Rural		C S M
<input type="checkbox"/> Remote (other than maritime)		C S M
<input type="checkbox"/> Maritime Schools		C S M

f. The following questions are based on your current school and classes.

- How long have you been in your current school? _____
- Number of students in your current class at each level and their ethnic background

Year	No. of Girls	No. of Boys	Total

Class	iTaukei	Indian	Rotuman	Others
Ethnicity				

- When and where did you attend the professional development for the new numeracy curriculum for your class?

2. Please describe most significant change you have made to your practice in response to the PD:
What do you see as being the effect of this change?

3. Below is a list of statements about the new numeracy curriculum. Please indicate how strongly you disagree or agree with each statement by placing a tick in the appropriate column.

	Strongly Disagree	Disagree	Neither agree or disagree	Agree	Strongly Agree
I am comfortable teaching in the new way					
The planning and preparation takes more time					
I mostly use the handbook provided as my guide					
The students engage well with their learning					
I am able to meet the needs of all learners in my composite class					
I require new teaching materials					

4. What strengths do you see in the new numeracy curriculum and teaching approach for your class?

5. In your opinion, what are the weakness of implementing the new numeracy in your class?

6. How do you think student outcomes would be affected if they were taught using the new numeracy approach over a long period of time?

7. What are your suggestions for improving the new numeracy approach?

8. Do you think the factors listed below affect the implementation of the new curriculum in your schools' context and to what extent do you think it is a challenge (barrier) for you as a teacher implementing a new curriculum?

(A) Affects implementation of curriculum 1-Never 2-Rarely 3-Sometimes 4-Often 5-Always		(B) How challenging is it?				
	For each alternative, circle your answer	Major Challenge	Minor Challenge	Neutral	Minor Support	Major Support
a. Location/remoteness of school	1 2 3 4 5					
b. School facilities	1 2 3 4 5					
c. Resources	1 2 3 4 5					
d. Support from administration	1 2 3 4 5					
e. Support from curriculum developers (experts)	1 2 3 4 5					
f. Curriculum support-materials provided for new curriculum	1 2 3 4 5					
g. Inadequate training	1 2 3 4 5					
h. Unavailability of internet	1 2 3 4 5					
i. Attitude of teachers	1 2 3 4 5					
j. Attitude of students	1 2 3 4 5					
k. Attitude of parents	1 2 3 4 5					
l. Continuous assessments	1 2 3 4 5					
m. Composite classes	1 2 3 4 5					
n. Class size	1 2 3 4 5					
o. Shortage of Time	1 2 3 4 5					
p. Lack of awareness(knowledge)	1 2 3 4 5					
q. Readiness of students	1 2 3 4 5					
r. Other: (please state)						

9. Any relevant comments you would like to add:

Thank you for your time