Assessing Primary Preservice Teachers' Mathematical Competence

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The diagnostic test results from a second cohort of preservice teachers in a longitudinal project are presented. Data analysis using the Rasch Model showed consecutive intakes' performances improved. However, diploma-education students consistently performed lower than foundation-education students. Item analyses indicate problem solving, fractions, and interpreting complex diagrams are most difficult. Findings suggest the university needs to address the mathematical needs of at-risk preservice teachers and to develop policies to regulate entry requirements and enhance course content and delivery.

Professional Teaching Standards mandate teachers demonstrate excellence in their knowledge of the subject content and how to teach that content to students (NSWIT, 2007) otherwise they struggle to effectively "design mathematically accurate explanations that are comprehensible and useful for students … and interpret and make mathematical and pedagogical judgements about students' questions, solutions, problems and insights (both predictable and unusual)" (Ball, Bass, & Hill, 2004, p. 59). Also, Hill, Rowan, and Ball (2005) found in their empirical study, elementary mathematics teachers' knowledge had a significant positive impact on student achievement gains at first and third grades.

Students and teachers in Samoan schools are predominantly Samoan. Unlike the cultural identity crisis Samoan students experience when studying overseas, those in Samoa undergo a seamless practice of Samoan customs and traditions including the infusion of Samoan values in their formal schooling and daily home practices. Consequently, problems students face when learning mathematics, is not primarily attributed to social cultural factors as the situation would be for Samoans studying in New Zealand or Australian schools where the dominant culture of the particular country is privileged. For example, Anthony and Walshaw (2007) present evidence from intervention studies conducted to specifically address the needs of Pasifika students in New Zealand schools against a backdrop of continuously low mathematics achievement in numeracy and international tests. In contrast, problems learning mathematics more meaningfully in Samoa may be the result of untrained teachers who are not competent to teach mathematics, poor pedagogical practices, and/or the mismatch between the prescribed, taught and examined curriculum. To address a small part of these problems, the Samoan study reported here, focussed only on the identification of Samoan primary PS teachers' knowledge of the mathematics content they are expected to teach. Because of the continuously poor performance of primary students during national numeracy tests and later on, as secondary students in their national mathematics examinations (Afamasaga-Fuata'i, 2002), it became increasingly important for the country's only teacher education provider, that mathematical competence levels and needs of incoming PS teachers be identified initially at the point of entry so that timely remediation could be provided for at-risk students, and longitudinally during the program to monitor student progress and before exit to ensure graduate primary teachers are certified mathematically competent (Afamasaga-Fuata'i, Meyer, Falo, & Sufia, 2007). The presented data focuses only on the diagnosis of two consecutive cohorts of PS teachers' mathematics content knowledge as measured by a written test. The paper's focus questions are: (1) What are the levels of mathematical competence of the 2006 intakes into the entry foundation programs? (2) What are the trends of mathematical performances of the two consecutive intakes for the foundation education and diploma education programs? (3) What are some of the concerns emerging from these preservice comparisons for the university?

Theoretical Framework

Shulman's (1986) theory of teacher knowledge originally contained three categories of subject matter knowledge for teaching, namely content knowledge, pedagogical content knowledge (PCK) and curriculum knowledge. Content knowledge includes both facts and concepts in a domain and also how knowledge is validated, produced and structured in the discipline while PCK includes both the knowledge of the subject matter and knowledge of the subject matter for teaching. Of relevance here is the mathematics content knowledge of PS teachers. Ball (1990), based on analyses of classrooms, distinguished further teachers' content knowledge for teaching into knowledge about mathematics (knowledge of concepts, ideas and procedures and how they work) and knowledge about "doing" mathematics (how one decides that a claim is true, a solution is complete or a representation is accurate). In general, these perspectives theorise that teacher effects on student achievement are driven by teachers' ability to understand and use subject matter knowledge to carry out the tasks of teaching. Empirically identifying the effects of teachers' knowledge on student learning and the kinds of teacher knowledge that matter most in producing student learning led Hill, Schilling, and Ball (2004) to develop an instrument to measure teachers' mathematical knowledge for teaching elementary school mathematics. The instrument not only captured the actual content teachers taught – for example, decimals, area measurement – but also the specialised knowledge of mathematics needed for the work of teaching such as knowing how to represent ¼ in diagrams or how to appraise multiple solutions for 35 x 25. This instrument was subsequently used in an empirical study to determine the effects of teachers' mathematical knowledge for teaching on student achievement. "Mathematics knowledge for teaching" is the mathematical knowledge used to carry out the *work of teaching*, which includes explaining terms and concepts to students, interpreting students' statements and solutions, using representations accurately in the classroom, and providing students with examples of mathematical concepts, algorithms, or proofs (Hill, Rowan, & Ball, 2005). Hill et al. found teachers' mathematical knowledge plays a significant role even in the teaching of very elementary mathematics content. These findings further inform that teachers' content knowledge should be at least content-specific and even better specific to the knowledge used in teaching children. Unlike the Hill, Rowan, and Ball (2005) study, the study reported here focussed only on assessing primary preservice (PPS) teachers' content-specific knowledge and ability to solve items that centred primarily on content areas (whole numbers, fractions, decimals, percentage, operations, multi-digit subtraction, rate, ratio, proportion, area and perimeter) which comprised a significant portion of primary mathematics and including items that a first year secondary student is capable of solving (geometry, probability, and basic algebra). Therefore, PS teachers' *mathematical competence* is conceptualised as the ability to solve problems based on the relevant syllabus's content, requiring PS teachers *have* the appropriate mathematical knowledge and understanding of the specific content areas being examined and *ability to link* mathematics to experiences and *to ask* questions about the application of particular mathematical knowledge (Hogan, 2000).

Mathematics Diagnostic Test, Methodology and Analysis

A written Mathematics Diagnostic Test (MDT), developed at an Australian regional university, assesses the mathematical needs of different cohorts of PPS teachers (Mays, 2005; Afamasaga-Fuata'i, 2007). The same test and the content areas it examined was validated with the content of the Samoan Ministry of Education, Sports and Culture's (SMESC) primary and early secondary mathematics (PESM) syllabi (SMESC, 2003) after consultations with experienced Samoan educators to ensure the content areas' appropriateness to the local syllabi and item contexts' relevance to the Samoan cultural setting. The MDT1 test (see Afamasaga-Fuata'i et al., 2006) consisted of thirty items selected from the TIMSS-R 1999 mathematics paper (Mullis, Martin, Gonzalez, Gregory, Garden, O'Connor, Chrostowski, & Smith, 2000) and five mental computations. TIMSS-R 1999 items were selected as these have available reliability and validity data, been used already to measure the mathematics achievement of eighth grade students (ages 13 and 14 years) from 38 countries and been trialled previously in many international classrooms. Mental computation items included those on fractions (*Item 4:* $\frac{1}{2}+\frac{1}{3}$), percentage (*Item 2: What is 30% of 50?*), decimals (*Item 5: 0.3 x 0.3*) and multi-digit subtraction (*Item 3: 8006 – 2993*), which primary students commonly have difficulties solving (Callingham & Watson, 2004). The student:professor problem (Item 14) was included to test PS teachers' problem solving and algebraic thinking skills. The Samoan validation exercise ensured all items directly mapped to the prescribed content areas of Samoa's PESM syllabi and sampled the PESM content with a range of items first year secondary students are most likely to solve successfully. "(I)f teaching involves helping others to learn then understanding the subject content to be taught is a fundamental requirement of teaching" (Aubrey, 1997, p. 93). Because PS teachers had just completed secondary schooling, they should be capable of solving the items since the mathematics content is mainly primary mathematics with some basic algebraic computations typically encountered in early secondary (*e.g., Item 28: Write in simplest form n x n x n* and *Item 19: If x=3, what is the value of* $\frac{5x+3}{4x-3}$*?*). This paper reports the first diagnostic test (MDT1) data from two consecutive groups entering the foundation-education and primary diploma-education programs at the national university.

MDT1 was administered early in Semester 1. One hundred and forty (140) foundation- and primary diploma-education students took MDT1 in March 2005 while 263 completed it in March 2006. Cohort 2006 included other foundation students (i.e., science, arts and commerce) to provide a comprehensive snapshot of school leavers' mathematical competence across the university's foundation programs. PS teachers (secondary and primary) undertake the foundation-education year first before splitting up into their major teaching areas the following year. Students undertake the 2-year primary-diploma-education program only after satisfactorily completing foundation-education. With the latter, PPS teachers without a pass in the school certificate mathematics examination (at Year 12) should take the bridging mathematics elective to upgrade their content knowledge. Included in primary diploma-education are two compulsory mathematics methods courses. For this paper, only data based on whether students' responses were Correct (1), Incorrect (0) or Blank (B) are presented to identify general trends of cohort and group performances in order to inform policies and reform practices at the university. Although analysing students' error responses for specific misconceptions is not included in this paper, item analyses data is provided for content specific to primary mathematics. The three categories of student responses are analysed using the Dichotomous Rasch Measurement Model (Rasch, 1980) and QUEST software (Adams & Khoo, 1993). Rasch Model examines only one theoretical construct at a time on a hierarchical "more than/less than" logit scale (unidimensionality). Rasch parameters, item difficulty and person ability, are estimated from the natural logarithm of the pass-versus-fail proportion (*calibration of difficulties and abilities*). Both tests had exactly the same items; hence the 2006 MDT1 data was anchored on 2005 item estimates, hence the baseline cohort is the 2005 one. This test equating would enable meaningful and valid comparisons of ability estimates between the two cohorts (see Bond & Fox, 2001, for more details on test equating).

Results and Discussion

Rasch statistics from QUEST for item difficulty and case ability estimates (Table 1) indicate cohort 2006 had a higher mean ability than cohort 2005. This was predictable given the composition of cohort 2006. Both case standard deviation values (1.18 and 1.27) indicate a similar spread of cases around ability means.

Table 1

Cohorts' Rasch Estimates

	2005 Item	Cohort Case	2006 Item	Cohort Case
N	38	140	38	263
mean	0.00	-0.93*	0.00	-0.10*
Standard deviation	1.79	1.18	1.77	1.27
Reliability R	0.97	0.83	1.00	0.86
Zero scores	1	1	0	0
Perfect scores	0	0	0	0
*Significance	*t=6.547*	*p<0.00*	*df=302*	

Table 2

2006 Foundation Group Comparisons

	Foundation FED06 item	Education FED06 case	Foundation FSC06 item	Science FSC06 case	Foundation FOT06 item	Other (Arts & Commerce) FOT06 case
N	38	51	38	61	38	13
Mean	0.02	-0.25*	0.00	0.93*	0.06	0.99*
Standard deviation	1.71	0.92	1.77	1.08	1.76	1.60
Reliability R	1.00	0.74	1.00	0.81	0.99	0.90
Zero scores	2	0	0	0	0	0
Perfect scores	1	0	0	0	1	0
*significance tests	*t=6.2437*	*p<0.00,*	*df=93,*	*d=1.17*	*t=2.6835,*	*p<0.025, df=14, d=1.17*

One item (*Item 27: The length of the rectangle is twice as long as its width. What is the ratio of the width to the perimeter?*) in 2005 had zero score but 5.3% (14/263) of cohort 2006 cohort were successful. Also one student in 2005 (diploma-education) got a zero score. The high reliability (*R*) of the measures from the MDT1 instrument was established previously (Afamasaga-Fuata'i et al., 2007) but is again evident in 2006 ($R_{items}=1.00$ and $R_{cases}=0.86$). Statistical testing indicated a significant difference between the cohorts' mathematical performances (*t=6.5457, p<0.00, df=302*) and a moderate practical significance (*effect size=0.67*).

2006 Foundation Group Comparisons

Intakes for the foundation programs are primarily school leavers who completed the Year 13 Pacific Senior School Certificate (PSSC) Examinations. Minimum entry requirements to the various foundation programs are differential and are based on a cut-off aggregate score as regulated by the university. A comparison (Table 2) between foundation-education (FED06) and foundation-science (FSC06) groups shows a statistically significant difference (t=6.2437, p<0.000, df=93) with a large effect size (d=1.17) implying a strong practical significance. With the foundation-other (FOT06) group, a statistically significant better performance was noted (t=2.6835, p<0.02, df=14) compared to FED06. Practical significance was also strong (d=1.17) indicating FOT06 students were significantly more competent mathematically (>1 s.d.) than FED06. Collectively, these findings establish that incoming students to foundation programs are characterised differently on mathematical competence. Those who are mathematically competent are not choosing teacher education implying the university needs to review minimum entry requirements to foundation-education, to identify at-risk PS teachers and to provide adequate support for their mathematical needs, and for the education ministry to consider a systemic approach to make teaching a more attractive career choice.

2006 Preservice: Foundation Education and Diploma Education Comparisons

The gap between 2006 FED06 and diploma-education (DIP06) groups' performances is significantly different (*t = 2.5123, p<0.02, df =97, d=0.40*) but the practical significance is small. Nevertheless, unlike the FED06 students who have just entered the university and the PS program for the first time, those in DIP06 have already in 2005, completed their foundation-education year and in 2006, progressed onto year one of their diploma program. It follows then that the statistical and practical significances suggest the DIP06 group consisted mainly of mathematically weaker students from foundation-education 2005 (FED05) who may not have taken the bridging mathematics elective or barely passed (at 50%). The rest of the FED05 group were secondary PS teachers, who in 2006, have progressed onto their secondary programs. Most importantly, the evidence suggests the need to urgently remediate the identified misconceptions of at-risk DIP06 PS teachers (guided by their individual kidmaps from the Rasch analysis, not presented here) to ensure achievement of mastery mathematical competence level before exit the following year. Whilst group difference (FED06 and DIP06) is a small effect size (*d=0.40*), that between FED06 and other 2006 foundation groups (*d=1.17*) is more than doubled that of the PS groups. This finding accentuates, yet again, the need for the university to review minimum entry requirements to teacher education (foundation and diploma levels), and for the education ministry to consider providing financial support to the university to specifically redress the PPS teachers' mathematical needs admitted below minimum entry requirements at foundation level.

2005 and 2006: Consecutive Preservice Program Comparisons

As clearly illustrated in Figure 1, there is a consistent gap in the groups' mean abilities each year. Foundation-education (FED) intakes performed consistently higher than diploma-education (DIP) intakes. Table 3 illustrates a statistically significant difference (*t=2.835, p<0.01, df=118*) between consecutive FED intakes' performances (FED05 and FED06). However, the practical significance (*d=0.48*) is only moderate. Similarly, for the consecutive DIP intakes, DIP06 performed significantly better than DIP05 (*t=3.0018, p<0.01, df=75, d=0.56*) but the practical significance is also only moderate. Collectively, these findings indicate improvement with the consecutive PS intakes' mathematical performances; however, it is still much lower than that for the 'other' foundation groups. In spite of having 'satisfactorily' completed foundation-education, DIP groups consistently performed below FED groups. These findings raise two main concerns for the university. First, the FED program structure should be flexibly designed to encourage at-risk PS teachers to take the bridging mathematics elective to redress their mathematical needs. If at-risk PPS teachers did select the mathematics elective, then the university needs to examine ways in which this support could be more effectively implemented by reviewing the course's content and delivery and raising the "passing grade" higher to mastery level (>80%) instead of the existing at least 50%. Second, in retrospect given the demonstrated 2005 and 2006 trends (Figure 1), it would be more cost-effective for the university to level minimum entry requirements with those of the other foundation programs. Doing so could attract more mathematically capable students to teacher education, who would then most likely filter through to primary diploma-education. However, there are also pitfalls such as potentially low student enrolments in the education faculty and subsequently acute teacher shortage nation wide in the near future.

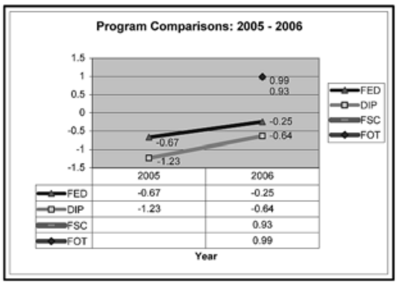

Figure 1. Consecutive Preservice Comparisons

Table 3

Rasch Estimates - Preservice Group Comparisons

	Foundation FED05 item	Education FED05 case	Foundation FED06 item	Education FED06 case	Diploma DIP05 item	Education DIP05 case	Diploma DIP06 item	Education DIP06 case
N	38	89	38	51	38	51	38	128
Mean	0.00	-0.67*	0.02	-0.25*	0.00	-1.23*	0.00	-0.64*
Standard deviation	1.75	0.93	1.71	0.92	1.77	1.86	1.77	0.98
Reliability R	0.95	0.80	1.00	0.74	0.91	0.85	1.00	0.81
Zero scores	1	0	2	0	3	1	0	0
Perfect scores	0	0	1	0	0	0	0	0
*significance tests	$t=2.835$	$p<0.01$,	$df=118$	$d=0.48$	$t=3.002$	$p<0.01$,	$df=75$	$d=0.56$

2005 Foundation Education Transition to 2006 Diploma Education

A comparison of FED05 to DIP06 mean abilities showed no statistically significant difference ($t=0.2286, p<$, $df=197$) and a trivial effect size ($d=0.03$), implying that the year spent at foundation-education level appeared not to have had any substantive impact on DIP06 students' mathematical competence either because the PPS teachers did not select the bridging mathematics elective or alternatively, they may have barely passed it (≈ 50%). This raises a concern, which the university needs to investigate more fully to rectify the situation such as possibly, requiring a mastery pass score (>80%) instead of at least 50% and pedagogically enhancing the course's delivery.

Identified Content Areas for Remediation

It was noted from item person maps (not shown here), that all students found solving word problems involving multiplicative thinking and multi-step procedures most difficult. Item analyses data (Table 4) of the content specific to primary mathematics (i.e., fractions, decimals, percentage, operations, number sense and measurement) provide further evidence that the PS teachers found solving word problems difficult (Items 24, 18 and 31). Furthermore, ordering fractions (Item 8) was quite difficult (<14% success rate). Many students attempted the items but were unsuccessful (>78%) with the rest ignoring the items. Ordering decimals (Item 6) was difficult with less than one-third of the PS teachers correctly solving it. With the exception of the FED06 (39%) group, the rest illustrated less than 29% success in shading an area to model an equivalent fraction (Item 26). Also between 25% and 54% of the PS teachers successfully generated equivalent fractions (Item 22) whilst between 27% and 59% were successful in determining percentage of a whole number (Item 2). Decimal multiplication was successfully completed by between 33% and 57%. Less than 22% success was noted for the measurement items (#s 15 and 34) involving the interpretation of complex diagrams.

Table 4

Item Analyses Data for the Primary Content-Specific Areas

Number of students, n	Foundation 89 FED05 Correct % / Number	Education 89 FED05 Incorrect / Blank	Foundation 51 FED06 Correct % / Number	Education 51 FED06 Incorrect/ Blank	Diploma 51 DIP05 Correct % / Number	Education 51 DIP05 Incorrect / Blank	Diploma 128 DIP06 Correct % / Number	Education 128 DIP06 Incorrect / Blank
Fractions								
Item 24- operations fractions	4.5 (4)	71.9 / 23.6	5.9 (3)	84.3 / 9.8	7.8 (4)	74.5 / 17.6	2.3 (3)	71.9 / 25.8
Item 8 – Ascending fractions	9.0 (8)	85.4 / 5.6	13.7 (8)	78.4 / 7.8	5.9 (3)	92.2 / 2.0	7.8 (10)	88.3 / 3.9
Item 6 – Ascending decimals	32.6 (29)	65.2 / 2.2	21.6 (11)	74.5 / 3.9	13.7 (7)	82.4 / 3.9	23.4 (30)	74.2 / 2.3
Item 26 – fraction area model	27.0 (24)	56.2 / 16.9	39.2 (20)	52.9 / 7.8	23.5 (12)	66.7 / 9.8	28.9 (37)	56.3 / 14.8
Item 32 – fraction of amount	27.0 (24)	59.6 / 13.5	43.1 (22)	41.2 / 15.7	27.5 (14)	64.7 / 7.8	25.8 (33)	53.1 / 21.1
Item 22 – equivalent fractions	37.1 (33)	52.8 / 10.1	49.0 (25)	41.2 / 9.8	25.5 (13)	58.8 / 15.7	53.1 (68)	35.9 / 10.9
Item 2 – percentage of number	40.4 (36)	40.4 /0.0	58.8 (30)	31.4 / 9.8	27.5 (14)	72.5 / 0.0	53.9 (69)	40.6 / 5.5
Item 5 – decimal multiplication	50.6 (45)	48.3/1.1	56.9 (29)	41.2 / 2.0	33.3 (17)	66.7 / 0.0	48.4 (62)	46.1 / 5.5
Number Sense								
Item 18 – Elevator problem	6.7 (6)	78.7 (14.6)	7.8 (4)	76.5 / 15.7	3.9 (2)	74.5 (21.6)	8.6 (11)	85.9 / 5.5
Item 11 – 4 times the number	43.8 (39)	42.7 / 13.5	52.9 (27)	41.2 / 5.9	29.4 (15)	58.8 (11.8)	47.7 (61)	43.0 / 9.4
Item 3 – multi-digit subtraction	73 (65)	27.0 / 0.0	64.7 (33)	29.4 / 5.9	68.6 (35)	31.4 / (0.0)	57.0 (73)	36.7 / 6.3
Measurement								
Item 31 – Salt average weight	1.1 (1)	73.0 (25.8)	2.0 (1)	58.8 / 39.2	0.0 (0)	66.7 (33.3)	1.6 (2)	59.4 / 39.1
Item 15 – Area garden path	20.2 (18)	74.2 / 5.6	13.7 (7)	80.4 / 5.9	11.8 (6)	80.4 (7.8)	10.2 (13)	81.3 / 8.6
Item 34 – Shaded rectangular area	16.9 (15)	69.7 (13.5)	21.6 (11)	52.9 / 25.5	17.6 (9)	68.6 (13.7)	16.4 (21)	60.9 / 22.7

Overall, PS teachers found operating with, ordering, representing, and generating equivalent, fractions; decimal multiplication; and interpreting complex diagrams (measurement) difficult. These findings raise concerns as these content areas are specific to primary mathematics and therefore would require explicit remediation to enable PPS teachers to competently mediate student learning of the same concepts in primary classrooms.

Main Findings and Implications

Main findings demonstrate that more mathematically capable students are not choosing teacher education at foundation level with the preservice group's performance at least one standard deviation lower than the "other" foundation groups. Also, the mathematical performances of consecutive preservice intakes illustrated moderate improvement with the diploma education trend consistently lower than that of foundation education albeit effect size is small. Further, the PPS teachers' foundation-diploma-education transition remains problematic as illustrated by the statistically non-significant difference and trivial effect size between the two groups despite "satisfactorily" completing foundation-education. The university needs to determine best strategies to monitor and sustain improved mathematics competency levels from year to year, towards mastery competence ideally before exit. A view of areas of difficulties was gleaned from an examination of item analysis data on content specific to primary mathematics. Evidence suggested preservice teachers in both programs experienced difficulties solving word problems and items on ordering, modelling, operating with, and generating equivalent, fractions; decimal multiplication; percentage; and determining area of geometric shapes embedded in complex diagrams. Collectively, these findings have implications for policy making (a) to improve the quality of intakes into teacher education by reviewing minimum entry requirements to attract more capable students, (b) to review the appropriateness of support for mathematically at-risk PS teachers, (c) to make the bridging mathematics course compulsory for PS teachers without Year 12 mathematics background to upgrade their content knowledge, (d) to include content specific to primary mathematics in the bridging mathematics course, (e) to incorporate the specific pedagogical content knowledge (Hill, Rowan, & Ball, 2005) required to teach word problems, fractions and measurement in the content of the two compulsory mathematics methods courses. On the other hand, the education ministry needs to consider systemic strategies to enhance teaching as an attractive career choice for capable school leavers and to provide sufficient support to the university to explicitly remediate the mathematical needs of PPS teachers as a result of lowering entry requirements to ensure a constant quota of incoming PS teachers and outgoing graduate teachers. Once the students are admitted then the university is obligated to address their mathematical needs.

In addition, the identified content areas of difficulties require explicit remediation as teachers' knowledge has a significant impact on students' learning of mathematics (Hill, Rowan, & Bill, 2005). From a social constructivist perspective, if teachers are to mediate mathematical meaning, facilitate and support students' mathematical thinking and reasoning, then teachers need to understand the mathematics children are dealing with and need to be aware of the many opportunities that present themselves for the learning of mathematics. (Perry & Dockett, 2002). Furthermore, "low levels of content knowledge and the resulting lack of confidence about mathematics limit teachers' ability to maximise opportunities for engaging children in the mathematics learning embedded within existing activities as well as their abilities to introduce more focussed intervention activities designed to cater for diverse learners" (Anthony & Walshaw, 2007, p. 45). This study contributes empirical data to inform the university of the need to develop policies to ensure its graduate teachers have the requisite content knowledge to teach primary mathematics competently and confidently so that they are able, in turn, to maximise opportunities for engaging children in learning mathematics and to effectively design intervention activities to cater for the diversity of student abilities in their classrooms. Finally, findings from this empirical study contribute to the scarce literature on Samoan preservice teacher education in particular and general preservice teacher education. Investigating in-depth the transitions from foundation-to-primary-diploma-education and from final-year-to-first-year-teaching in schools are areas worthy of further research in Samoa's educational system.

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