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A large, stylized yellow ribbon graphic with a black outline, winding across the purple background. The ribbon starts on the left, curves down, then up, then down again, ending on the right. It is partially overlaid by a black and white graphic of a staircase or ramp.

# WAIKATO JOURNAL OF EDUCATION TE HAUTAKA MĀTAURANGA O WAIKATO

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## Te Reo Tātai: Te Rēhita Motuhake o te Ako (Specialised Language Register of Learning and Teaching: Mathematics)

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### Whakarāpototanga

*Kei te ārohi tēnei pepa ki te reo o te ako mā te huarahi o te reo Māori mai i te tirohanga Systemic Functional Linguistics (SFL). Ko te tino whakaaro o SFL he nui ngā rerekētanga o te reo whakamahia ai i te kura i ō te reo whakamahia ai i waho i te kura nā te mea he rerekē ngā horopaki reo. E ai ki ngā ariā SFL, ko te “rēhita” te hanga matua e whakamārama ana i taua rerekētanga. Kei ngā marau pērā i te pāngarau he “rēhita” motuhake tōna. Kua waihangatia te rēhita, ki ōna ake kupu, ki tōna ake takatoranga reo. A tōna wā ka tino whakararuraru ngā āhuetanga o te rēhita i te ako o ngā ākonga. Kua whakaaturia e ngā rangahau te tino tikanga o te reo i te akoranga pāngarau me te tino mahi a te pouako hei whakatauiria i te reo mō ngā ākonga. Kei te ārohi tēnei pepa ka pēhea ngā pouako e ako ai i te rēhita me ngā rautaki ka whakamahia e ngā pouako hei ako i ngā kupu motuhake.*

*This paper examines the language of learning and teaching in Māori medium schooling from the perspective of Systemic Functional Linguistics (SFL). Essentially SFL suggests that language use in school differs in important ways from language use outside the classroom. Because language situations differ, the primary construct in SFL theory for explaining linguistic variation is the “register”. Subjects such as mathematics are characterised by specialised registers. The register is made up of linguistic features that can pose difficulties for the learner. Research has highlighted the role of language in learning mathematics and the key role of teachers in modelling the register for learners. This paper examines how teachers learn the register, in particular the strategies teachers use in Māori medium kura to learn the specialised terms.*

### Keywords

Mathematics register, dialect, vocabulary learning strategies, Māori medium education.



## **Te Whakatakinga**

Kua rerekē haere ngā kaupapa ako o ngā marau-ā-kura i Aotearoa mai i te taenga mai o te Pākehā ki Aotearoa tae noa ki nāianei. Engari, ko tētahi kaupapa pūmau ko te pāngarau o nāianei me tōna tīpuna te mahi whikawhika o mua. He mahi pāngarau tō tātou tīpuna, otirā i noho ki roto i ōna ake kaupapa, arā te whakaterere waka moana, te whakatū whare (arā, Riini & Riini, 1993). Nā te kaupapa here o te “Reo Pākehā anake” a te kāwanatanga mō ngā kura mai i te tau 1867 (Simon, 1998), i whakaakona te kaupapa o te pāngarau i roto i te reo Pākehā anake tae atu ki te 1980. Nō reira, ko te putanga mai o te pāngarau reo Māori i roto i te 1980 me tōna reo ā kura, he kaupapa ināia tata nei. Hei tautoko i ngā mahi whakaora reo ā ngā kura reo Māori i roto i ngā rua tekau tau ki muri, he nui tonu ngā mahi waihanga kupu, kohikohi kupu pāngarau hoki, ngā mahi hei whakahou, hei whakakotahi hoki i te reo o te pāngarau, kia pai ai te whakaako i te pāngarau mā te huarahi o te reo Māori.

I te tīmatanga, kāore he kupu ōkawa o te pāngarau, atu i ngā tau mai i te 1 ki te 1000 pea. I ngā tau 1980, ka whakaritea e ētahi pouako, he kupu pāngarau i runga i ngā hiahia o ia rā, o ia rā (Barton, Fairhall, & Trinick, 1998). Nō reira, mō ērā e whakaako ana i te pāngarau, i ētahi wā, ka hangaia ngā kupu pāngarau i hiahiatia i te rā i mua tonu i te akoranga. Ehara tēnei i te tikanga tika hei whakaako pāngarau ki ngā ākongā. Nō muri kē, nā te tautoko ā Te Taura Whiri i te Reo Māori, i whakakotahia nga kupu kē ki tētahi rārangi kupu ōkawa. I te putanga o te marautanga pāngarau i te tau 1995, i nui haere te rārangi kupu pāngarau. Pērā anō mō te putanga mai o te Poutama Tau me ētahi atu kaupapa pāngarau i roto i ngā rua tekau tau ki muri. Mai i te putanga me te whakamahi i ia kaupapa whakaako pāngarau ā motu, kua nui haere te tupu o ngā kupu pāngarau. Nā ēnei tū kaupapa kua rahi anō te kohikohinga o ngā kupu me ngā tapanga motuhake o te pāngarau hei ako, hei whakamahi mā ngā pouako. Ko tā tēnei tuhinga he tūhura i ngā take whakaako reo pāngarau ki ngā ākongā e ako ana mā te huarahi o te reo Māori. Tuarua, ko te tūmanako ia kia hoatu e tēnei tuhinga ētahi rautaki hei ako i te reo pāngarau hou.

## **Te Reo Māori: Te Reo Ako**

He nui ngā rangahau e tiro-tiro ana i ngā take reo e pā ana ki te ako i te pāngarau kua kite i te rerekē o te reo whakamahia ai i te kura i ō te reo whakamahia ai i waho i te kura. I tua atu hoki, kua kitea ngā rēhita reo motuhake o tēnā kaupapa ako, o tēnā kaupapa ako (arā, Halliday, 1978; Halliday & Hasan, 1985). E rua ngā tirohanga kōtui kua whakamahia e ngā kairangahau hei arotake i te rēhita pāngarau. Ko te tuatahi, ko te whakaaro he kaupapa whai mana te pāngarau i roto i te marautanga ā kura huri noa i te ao (Harris, 1997), nā reira he kaupapa e tino whakaawe i ngā kōwhiringa ako me ngā kōwhiringa umanga mō ngā ākongā. I runga i ngā ture o ētahi Whare Wānanga, mō ētahi mahi hoki, ki te kore te ākongā e whiwhi paerewa pāngarau NCEA, e kore e taea te kuhu atu. Ka katia te kuhunga. Nā konei, mai i te 1950, kua toko ake te hiahia o ngā pouako me ngā mātanga pāngarau ki ngā āhuatanga mātauranga wetereo me ngā āhuatanga mātauranga wetereo pāpori e pā ana ki te ako i te pāngarau, me ngā kaupapa pērā i te āhua me te hopu i te rēhita pāngarau (Meaney, 2002). Tuarua, ko ngā rangahau i ahu mai i ngā ariā ako hanga mōhio e kī ana kia nui te whakaharahara o te whakawhitihiti kōrero pāngarau nā te mea he tikanga pai kia hopu mōhio-tanga pāngarau me ngā pūkenga pāngarau (Bicknell, 1999).

### Te Whanaketanga o te Ariā Rēhita

Ko te tīmatanga o ngā kōrerorero mō ngā āhuatanga o te “rēhita pāngarau” ko te kaupapa whānui o te Systematic Functional Analysis (SFL) me te tohunga wetereo a Halliday (1978), te kaitaki matua o te ariā nei (Schleppegrell, 2004). Nā ngā mahi i roto i te kaupapa o te SFL i whanaketia ai he tautuhinga o te rēhita pāngarau, i kōrerorerotia ai hoki ngā take e pā ana ki te ako i te rēhita (arā, Dale & Cuevas, 1992). E whā ngā tino whakaaro o te SFL, arā, tuatahi, ko tā te reo he reo āhei, tuarua, ko tētahi o ngā āheinga reo ko te waihanga māramatanga, tuatoru ko te hanga me te whakapūmau whanaungatanga, ā, tuawhā, ka whakaawe te āheinga reo e ngā horopaki ahurea (cultural context), e ngā horopaki pāpori (social context) hoki i roto i aua whakamahinga reo (Taiwo, 2006). E ai ki te tirohanga reo a Halliday (1978), e kore e taea te wehewehe i te reo i tōna horopaki, i tōna ahurea hoki. Ko ētahi atu o ngā rangahau a Halliday rāua ko Hasan (1990) i roto i te mātauranga wetereo pāpori (sociolinguistics), e hāngai ana te tapanga “rēhita” ki ngā tino kōwhiringa ā kupu, ā wetewete i te reo hoki a ngā kaikōrero i runga anō i te pūāhua, ngā hoa kōrero, me te āheinga reo i roto i te whakawhitiwhitinga kōrero. Ki tā Halliday & Hasan (1990) kei te noho te horopaki o te pūāhua i roto i te horopaki ahurea. Hei whakarāpopoto ake, ko ngā tino arotahi o te SFL ko te whakamahinga a te tangata i te reo me te waihanganatanga a te tangata i te reo ka whakamahia. Nō te mea, he rerekē ngā pūāhua reo, ko te whakaaro matua o te ariā SFL ko te “rēhita” hei whakamārama i te rerekētanga ā reo.

Ki tō Halliday whakaaro (1978), ko te rēhita ngā āhuatanga wetereo e hāngai ana ki ngā āhuatanga pūāhua (situational feature)—tuatahi he aha te mahi, hei tauira, te pūtake, te horopaki, tuarua te momo mahi, hei tauira, te tuhituhi, te kōrero ā waha, tuatoru he aha te momo pāhekoheko, hei tauira, te mana o ngā kaikōrero. Ko ēnei pūāhua e toru, ko ngā kaiwhakarite i ngā āhuatanga wetereo o te rēhita (Halliday & Hasan, 1985).

### Ngā Rēhita me ngā Reo-ā-iwi

He maha tonu ngā kairangahau kua kī atu he hononga, he rite te tapanga “rēhita” me te tapanga o te “reo-ā-iwi” (Sanders, 1993). I te wā o te whakawhanaketanga o te kohikohinga kupu pāngarau i te 1990, he hiahia nō ētahi iwi kia whakahāngaitia ngā kupu pāngarau ki ō rātou reo-ā-iwi. Ko te take i pēnei ai rātou, ko tō rātou hiahia kia mau tonu ngā kupu ā iwi e whakaatu ana i ō rātou ake tuakiri ā iwi. Ahakoa te kore whakamahi a ngā kaumātua i te kupu “rēhita” i roto i ā rātou tautohetohe, kāore e kore i pā atu ki ngā āhuatanga o te rēhita i tautuhia e Halliday (1978). Heoi anō, e ai ki a Halliday rāua ko Hasan (1990) he rerekē te rēhita ki te reo-ā-iwi, i te mea he whakamahinga pāpori tā tētahi, he reo āhei tā tētahi. Ko ētahi o ngā tohu o te reo-ā-iwi ko te tāupetanga pāpori (social variation) me te tāupetanga ā rohe (regional variation); whakaata ai hoki rāua i te anga pāpori (social structure). Hei tauira, ahakoa he aha te mahi, ahakoa kei hea ia e tū ana ki te kōrero ka whakamahia e ētahi tāngata ō rātou reo-ā-iwi. Ko te nuinga o ngā iwi e kī ana he reo-ā-iwi motuhake tōna. Ko te reo-ā-iwi he momo reo ka tautuhia e te kaikōrero nōna tērā reo pēnei i te kōrero e whai ake nei;

He reo, he mauri, he mana, he wairua, he whakapono tō tēnā iwi ... tō tēnā rohe ... tō ia tangata.

Ahakoa iwi, ahakoa hapū, ahakoa rōpū, he reo tōna. (Tāhuhu o te Mātauranga, 1996, p. 9)

Heoi rā, ko te aronga o ngā rēhita ko te tāupetanga ā āheinga (functional variation); whakaata ai rātou i ngā tukanga pāpori, hei tauira, te wehenga o ngā mahi, te whakawhāititanga, ngā horopaki, ngā kaupapa ako me ētahi tino mahi (Halliday, 1978). Nō reira, ko te rēhita tētahi momo reo ka hāngai ki ngā pūāhua maha, engari e hāngai ana ki te mahi e maha ana. Ko te reo-a-iwi he hāngai tonu ki te rōpū e kōrero ana i taua reo.

Nā Halliday rāua ko Hasan (1986) te kaupapa o te rēhita i whakawhānui, “Since it is a configuration of meanings, a register must also include the expressions, the lexico-grammatical and phonological features, that typically accompany and realise these meanings” (p. 35). Anei e whai ake nei he whakamāramatanga o te rerekētanga kei waenganui i te reo-a-iwi me te rēhita arā figure 1.

**Figure 1. Dialects and Registers (Halliday & Hassan 1986, p. 35)**

Dialect = variety “according to the user”	Register = variety “according to the user”
A dialect is: - what you speak (habitually); - determined by who you are (socio-region of origin and/or adoption); and - expressing diversity of social structure (patterns of social hierarchy).	A register is: - what you are speaking (at the time); - determined by what you are doing (nature of social activity being engaged in); and - expressing diversity of social process (social division of labour).
So in principle dialects are different ways of saying the same thing and tend to differ in phonetics, phonology, lexicogrammar.	So in principle registers are: ways of saying different things and tend to differ in semantics (and hence in lexicogrammar, and sometimes phonology).
Typical instances: - iwi dialects (our example).	Typical instances: - occupational varieties (the teaching and learning of literacy and mathematics).

### Ngā Whakaahuatanga o te Rēhita Pāngarau

Ko te take nui i whakaarotia ngā āhuatanga o te rēhita pāngarau ko ngā take e pā ana ki te reo o te ākongā, pērā i ngā āhuatanga o te rēhita e uaua ana mō ngā ākongā, me te hononga kei waenganui i te hinengaro me te reo. Ehara i te mea hou te aronga ki te reo me te whanaketanga whakaaro, he kaupapa tēnei i tirohia e ngā kaimātai hinengaro (psychologist) maha pērā i a Bruner (1966), a Piaget (1952) rātou ko Vygotsky (1978). I whakaawe ā rātou mahi i ngā kairangahau pāngarau pērā i a Cuevas (1984) i a Spanos Rhodes, Dale, and Crandall (1988) i titiro ki te akoranga o te pāngarau mā tētahi reo tuarua, reo tuatoru hoki.

I runga i tō rātou maharahara ki ngā take o te matatau o te reo o ngā ākongā me te whakatutukitanga pāngarau (mathematics achievement), i ārohia, i whakarōpūngia e Spanos et al. (1988) ngā āhuatanga wetereo o te whakaoti rapanga pāngarau arā Figure 2.

**Figure 2. A Summary of Features of the Mathematics Register (Spanos et al., 1988, pp. 226–227)**

Syntactic features	Semantic	Pragmatic
1. Comparatives e.g. greater than.	1. Lexical <ul style="list-style-type: none"> <li>- New technical vocabulary</li> <li>- Natural vocabulary which has different meaning in mathematics;</li> <li>- Complex string of words or phrases;</li> <li>- Synonymous words and phrases;</li> <li>- Symbols and mathematical notation as vocabulary.</li> </ul>	1. Epistemological <ul style="list-style-type: none"> <li>- Lack of experience or knowledge of maths contexts;</li> <li>- Conflicting experience or knowledge;</li> <li>- Contradictory experience or knowledge.</li> </ul>
2. Prepositions e.g. divided by.		2. Textual <ul style="list-style-type: none"> <li>- Decontextualised nature of maths;</li> <li>- Lack of real life objects or activities;</li> <li>- Lack of natural interaction in maths classes.</li> </ul>
1. Passive voice e.g. when 15 is added to a number.	2. Referential <ul style="list-style-type: none"> <li>- Articles/premodifiers;</li> <li>- Variables.</li> </ul>	
3. Reversal errors e.g. a is 5 less than 8 incorrect equation $a=a-5=8$ .	4. Vagueness in problems and directions	
5. Logical connectors, if, when...	5. Similar terms, different functions.	

Ahakoia he whakaahuatanga o te reo pāngarau o te reo Ingarihi tēnei (Figure 2.), ka hāngai tonu ki te reo Māori. Tēnā pea he rerekē ētahi wāhanga o te rehita pāngarau reo Māori. Heoi anō kua whakarōpūngia ngā kupu pāngarau e ngā kairangahau i runga anō i ēnei āhuatanga;

1. Ngā kupu he ōrite ō rātou tikanga i roto i te pāngarau, i roto rānei i ngā whakawhitiwhitinga kōrero o ia rā, hei tauira, tāpiri, tango, marama, rā, maha, hōtoke
2. Ngā kupu he tikanga tōna kei roto i te reo pāngarau anake, hei tauira, tauwehe pātahi (common multiple), tānga ngahuru (standard form), koeko tapatoru rite (triangular pyramid)
3. Ngā kupu he tikanga pāngarau ō rātou, he tikanga anō hoki i roto i ngā whakawhitiwhitinga kōrero o ia rā; hei tauira, nekehanga (translation and move), aho (sine and string).



### Ngā Ākonga Reo Rua, Reo Maha hoki

Ahakoia kua roa nei ngā kairangahau i kitea ai te tūranga matua o te reo i roto i te tukanga o te ako, kātahi anō ka kitea e ētahi kairangahau te whakahirahiritanga o te reo i roto i ngā mahi ako i te pāngarau me ōna pūkenga (arā, Cocking & Mestre, 1988; Pimm, 1987). Waihoki, i aro atu a Halliday (1978) ki ngā raruraru ka pā ki ngā ākonga pāngarau ehara tō rātou reo tuatahi i te reo whakamahia ai ki te whakaako i te pāngarau. I karangatia tēnei āhuatanga ko te “tawhiti” kei waenganui i te reo o te ākonga me te reo pāngarau, ka meatia hoki he momo tauārai tēnei mō ētahi ākonga.

I roto i tētahi whakaputanga i whakawhānui a Halliday (1978) i tana whakaahuatanga o te rēhita pāngarau. I kī a Halliday (1978) he whānui ake te ako rehitā i te ako kupu hou noa iho, engari ko te ako i ngā “... styles of meaning and modes of argument ... and of combining existing elements into new combinations” (Halliday, 1978, p. 196). Nā Halliday (1978) te rēhita pāngarau i tautuhi pēnei:

... a set of meanings that is appropriate to a particular function of language, together with the words and structures that express these meanings. We can refer to “mathematics register”, in the sense of the meanings that belong to the language of mathematics (the mathematical use of natural language, that is: not mathematics itself), and that a language must express if it is being used for mathematical purposes. (p. 195)

Nā te māharahara o ētahi ki te rahinga o ngā ākonga reo rua, reo maha hoki kāore i te eke i roto i te mātauranga, i whakaputa a Crandall, Dale, Rhodes, and Spanos (1985) i te whakaaro he rēhita motuhake tō te pāngarau. Heoi anō kua whakaaturia ngā rangahau he uaua te reo pāngarau ahakoia te reo ako o te ākonga.

### Te Whakarauora i ngā Reo Iwi Taketake

Ināianei kua huri te tirohanga o te rehitā ki ngā iwi taketake e whakarauora i tō rātou reo, pērā i ngā iwi taketake o Amerika, o Ahitereiria, te Māori hoki o Aotearoa (arā Barton et al., 1998; Meaney, Trinick, & Fairhall, 2012). Kei roto i ngā tikanga o te whakarauora i te reo, kua whakahou, kua whakawhānui rātou i tō rātou reo kia āhe i te whakaako i te pāngarau. Heoi anō, kua puta ētahi tino maharahara i te whakakotahi i nga kupu o ngā reo iwi taketake kia āhe i te whakaako pāngarau o te ao hou nei:

- Ki te whakakotahi i ngā kupu, tēnā pea ka tango te kupu i tōna horopaki tuturu, arā ki ētahi reo iwi taketake he kupu kē mō tēnā maha, mō tēnā maha.
- Me whai atu i tēhea rautaki hanga kupu? Me huri te kupu Pākehā kia rite te āhua me te rongō ki tō te reo iwi taketake me kimi kupu tūturu nō taua iwi rānei?
- Ki te whakariterite, te whakakotahi i te reo pāngarau, tēnā pea ka huri, ka whakarerekē haere te reo iwi taketake.
- Mā wai e mahi te mahi whakakotahi kupu pāngarau. I te tuatahi ki Aotearoa nā te Taura Whiri tēnei mahi. Engari kāore te Taura Whiri i te mahi tēnei momo mahi mō te reo ā kura ināianei.

Otirā, kei te haere tēnei momo mahi, te whakakotahi kupu pāngarau huri noa i te ao.

## Te Tūranga o te Reo o te Pouako

Kua whakaaturia e ngā rangahau te tūranga matua o te pouako ki te whakatauiria i te reo e hiahiatia ana kia mau pai ai i ngā ākonga te reo o te pāngarau (arā, Bickmore-Brand & Gawned, 1990; Meany & Irwin, 2005). E whakapaetia ana ko te pouako me āna whakamāramatanga, pāhekohekotanga hoki ki ngā ākonga te pūtake o te hanganga mōhiotanga a te ākonga mō te pāngarau (Schleppegrell, 2007). He tino kaupapa tēnei mō ngā ākonga e ako ana i te pāngarau mā tō rātou reo tuarua ka utaina he wāhi nui ki runga i ngā mahi a ngā pouako (Khisty & Chval, 2002). I whakaatu ētahi rangahau ahakoa te mōhio o ngā pouako ki ngā huatau pāngarau, i ētahi wā, kāore i a rātou te āheinga reo ki te whakamahi i ētahi ara rerekē hei whakaatu, hei kōrerorero rānei i ngā whakaaro kāore e mārāma ki ā ake rātou ākonga (Ball & Bass, 2000, p. 94).

I ētahi wā, kāore te hanga o te reo pāngarau e tautoko atu ana i te whakawhitiwhitinga kōrero i waenga i te tangata, engari kua hangaia kētia hei whakaatu i te mōhiotanga pāngarau, i te huatau pāngarau rānei, hei tautoko rānei i te whakaoti i tētahi rapanga. Nā reira e kī ana ngā kairangahau, mā ngā pouako e whakamahi reo arahanga (bridging language) i roto i te akomanga pāngarau hei hono i te reo whakawhitiwhiti o ia rā ki te reo ōkawa o te rēhita pāngarau (Herbel-Eisenmann, 2002). E whakapaetia ana mā te whakapakari i ngā pūkenga whakawhitiwhiti kōrero o ngā ākonga, ka ngāwari ake te whakapakari tukutahi (simultaneous) i ngā pūkenga reo o te rēhita pāngarau (Meany et al., 2012).

Ka ako ngā pouako i ēnei momo reo o te pāngarau i te wā ka kura ana ia, i te wā ka haere ki ngā Whare Wānanga ako ai. Ko te mea nui o ngā rangahau kia whai wā te tauira pouako ki te “whakahōhonu me te whakawaitara (abstract) tētahi kaupapa pērā i te pāngarau me ōna kupu motuhake i runga i te reo whakaako o te kura (arā Liddicoat & Bryant, 2002). Anei e whai ake nei he tauira o te taupatupatu nei. Ko ngā kupu hautau pēnei i a “hāwhe” me te “koata” kua whakamahia whānuitia mō te wā roa. Heoi, ko te mea nui kē kia āhei tātou ngā pouako ki te kōrerorero i roto i te reo Māori te hōhonutanga o ngā huatau e pā ana ki ngā hautau. E tohu ana ēnei rangahau ki ētahi kaupapa hei whakaarotanga mā ērā e whakaako ana i te pāngarau mā te huarahi o te reo Māori. Ko tētahi o ēnei kaupapa ko te nui whakaharahara o te matatau o te pouako ki te hōhonutanga me te whānuitanga o te reo pāngarau, tae atu ki tōna rēhita pāngarau.

Nā te whatinga o te whakahekenga reo i tēnā whakatupuranga ki tēnā whakatupuranga i te nuinga o ngā kāinga, ehara te reo Māori i te reo tuatahi mō te nuinga o ngā pouako me ngā ākonga. Ko te kura hoki, i te nuinga o te wā, te wāhi anake e rongohia ana ngā kupu motuhake o te rēhita pāngarau.

## Ko Tēnei Rangahau

### Ngā Pouako e Ako ana i te Rēhita

Kei te ārohi ngā wāhanga e whai ake nei i pēhea ētahi pouako i ako ai i ngā kupu pāngarau me te rēhita. Tuarua, he aha ngā rautaki i whakamahia e ngā pouako nei hei ako kupu hou. Ahakoa he tokoiti noa iho ngā pouako kei roto i tēnei rangahau, ko te tikanga, i whakaatu ana rātou i te āhua o te horopaki whakaako pāngarau huri noa i te motu. Ka ārohi hoki tēnei pepa ki ngā kupu e āhua uaua ki te pouako te whakaako me te ako.

### Ko te Anga Rangahau

Ko te anga rangahau o tēnei pepa ko te “Kaupapa Māori”. Ko ētahi tino ariā o te kaupapa Māori, ko te whakatairanga i te reo Māori, ko te whakatutuki i ngā wawata ahurea Māori hoki, kia pareā atu te pēhitanga o ngā *dominant discourses* (Smith, 1997). Ko te hiahia o tēnei rangahau kia tautoko mai i te ako mā te huarahi o te reo Māori kia whakamana i te reo Māori me ngā kura Māori. Tuarua kia whakatairanga i te whakatutukitanga o ā tātou ākongā i te pāngarau. Ahakoa kei te noho huna ngā ingoa o ngā kaikōrero me ngā kura, i ahu mai ngā kōrero mō ngā rautaki ako kupu i ngā pouako, nō rātou ngā whakaaro. Nō reira he tino mihi ki a rātou. Ahakoa nō tāwāhi ngā ariā o te SFL, he Māori ngā kairangahau, he Māori ngā kaikōrero, he tirohanga Māori tonu tā tēnei rangahau.

### Ngā Matatika

Ko te mea nui o ngā matatika kei roto i tēnei rangahau, ko te aha ngā hua mō ngā pouako me ngā kura kua uru mai ki te rangahau nei. E whai atu tēnei rangahau i ngā tikanga me ngā uara i whakatakototia e L. T. Smith (1999) rāua ko Cram (2009), arā kia aroha ki te tangata, kia hui kanohi ki te kanohi, kua e takahia te mana o te tangata. Tuarua, kia tuku koha ki ngā kura mā te whakarite i ētahi akoranga whakangungu pouako mō ētahi kaupapa.

### Ngā Kura i Whai Wāhi Mai

Kia ngāwari atu tēnei rangahau kua whakawhāiti ai i ngā kura i whai wāhi mai ki ngā kura rerekē e rua, tētahi he kura ki te tāone paku (kura A), tētahi he kura ki te tāone nui (kura E). Ko te nuinga o ngā kura reo Māori kei roto i ngā tāone pakupaku, kei uta hoki he pakari te hononga ki te hapū, te iwi rānei o te rohe e noho ai te kura. Otirā ngā kura kei roto i ngā tāone nunui, he hononga ki ngā mātāwaka maha. Tēnā pea he rerekē ngā whakaaro ki te reo-ā-iwi. I peka atu te kairangahau ki ngā kura e rua nga wā ki te uiui i ngā tumuaki rātou ko ngā pouako. Kei te whai atu ngā kura e rua i te kaupapa here kia whakaako mā te reo Māori anake. Nā reira, kei te whakaako i te pāngarau mā te reo Māori mai i te tau 1 tae noa, tua atu rānei i te tau 8.

### Ngā Pouako i Whai Wāhi Mai

I tono atu ki ngā pouako i roto i ngā kura e rua e whakaako ana mai i ngā tau 1 ki ngā tau 8 kia whakaae mai kia uiuitia. E 8 nga pouako mai i kura A, 10 mai i kura E i whakaaetia kia uiuitia. I āhei ngā pouako mai i kura A rāua ko kura E ki te whakawhiti kōrero i roto i te reo Māori, te reo Pākehā rānei. Tēnā pea haurua haora te roa o te uiui.

### Ngā Momo Huarahi Kohi Raraunga

E rua ngā momo huarahi kohi raraunga, ko te uiui whai arotohu noa iho (semi-structured) me ngā rōpū arotahi (focus group). I roto i tēnei momo rangahau he hiahia nō ngā kairangahau kia mōhio mai ki ngā whakaaro, ngā whakapono, ngā uara, ngā waiāro o ngā tāngata e uiuitia. Ka taea e ngā kairangahau te whakatairite i ngā kōrero mai i tēnā rōpū me tēnā rōpū kia kitea ngā tauira (patterns). Engari kia tika te haere me āhua ōrite ngā pātai. Anei e whai ake nei ngā pātai.

### Te Tātari Pātai

I uiui ake ki ngā pouako kia hopukina mai ō rātou whakaaro ki te reo pāngarau. Heoi anō i tukua ngā pātai i te tuatahi ki te pepa, tuarua ka noho ai ki te taha o rātou hei rōpū arotahi ki te whakawhitiwhiti kōrero ki ngā pātai e whai ake nei

- I pēhea koe i ako ai i te reo pāngarau?
- He aha ngā rautaki i whakamahia e koe kia ako i ngā kupu whakakotahi/whakariterite (standardised) o te pāngarau?
- Ko te aha ngā kupu uaua ki te ako, he aha i pērā ai?

### Te Tātari Raraunga

#### Ngā Pouako Hei Ākongā

Ko te nuinga o ngā pouako kei roto i ngā kura e rua i haere ki ngā kura reo Pākehā kura ai nā te mea kātahi anō ka puta ngā kura reo Māori e 20 tau e hipa atu. Heoi anō kei te rerekē haere tēnei tū āhua. Kei te putaputa mai te tipuranga tuatahi i whakaako ki ngā kura reo Māori me ngā kura kaupapa Māori ki ngā kura akoranga. Nō reira, hei ngā tau kei te heke mai ka puta te nuinga o ngā pouako i roto i ngā kura reo Māori mai i aua kura, he mōhiotanga nōna ki te rēhita o te pāngarau. Kei roto i tēnei rangahau, i haere te nuinga o ngā pouako ki kura E ki ngā kura reo Māori me ngā kura akoranga reo Māori. Engari kei roto i kura A, i haere te nuinga o ngā pouako ki ngā kura reo Pākehā kura ai, ako kura mahita ai. He uaua mā ngā kura ki uta, ki tāone pakupaku hoki ki te kimi pouako matatau ki te reo nā te mea kei te tū ngā kura akoranga ki ngā tāone nunui o te motu.

#### Te Ako i a Rātou e Mahi ana

I roto i tēnei rangahau “he tino paku” ki te “āhua pai” te whānuitanga o te mōhiotanga o ngā pouako i roto i ngā kura e rua ki ngā kupu pāngarau. Mō te nuinga o ngā pouako ki kura A, ko te wā tuatahi ka tūtaki rātou ki te whānuitanga o te reo pāngarau ko te wā i tīmata ai rātou ki te whakaako mā te reo Māori. E ai ki ngā pouako, i akona te reo pāngarau i a rātou e whakaako ana. He rerekē tēnei i ngā kura reo Pākehā nā te mea i kuraina te nuinga i roto i te reo pāngarau i a rātou i haere ki te kura reo Pākehā.

#### Ngā Rautaki hei ako Kupu/Reo Pāngarau

I ui atu te kairangahau ki ngā pouako i pēhea rātou i ako ai i ngā kupu hou me te rēhita hou kia whai take rātou hei pouako pāngarau. I ui atu hoki kia whakamāramatia mai e rātou ngā rautaki i whakamahia kia kimi ai, kia ako ai kupu hou. Anei e whai ake nei ngā rautaki matua i whakamahia e ngā pouako hei ako kupu me te reo hou. E rua ngā momo rautaki whānui a ngā pouako. Tuatahi, ngā rautaki i whakaritea e rātou mā rātou anō. Tuarua, ngā rautaki i whakaritea mā ngā ākongā. Otirā i whakamahia ngā rautaki e rua e ngā pouako hei ako kupu hou.

#### I te Tuhi Mahere Pāngarau

Ko te rautaki i mahia nuitia ko te tautohu i ngā kupu matua e hiahiaitia e te pouako, e te ākongā hoki i te wā ka whakarite mahere ako. I tiro ngā pouako ki ngā rauemi pāngarau

i waihangatia hei rauemi tino tautoko i te ako i te reo pāngarau. Hei tauira, ko ngā pukapuka Poutama Tau (tiro ki Poutama Tau puka 3, 4, 5, 6). Kei roto i ngā rauemi nei ko ngā kupu matua me ngā momo rerenga kōrero hei tauira mā te pouako. He tino pai ēnei rauemi nā te mea ka kitea e ngā pouako ētahi tauira o te whānui me te hōhonu o te reo pāngarau.

#### Te Whakamahi i te Marautanga Pāngarau

I mua mai i te putanga mai o te papakupu reo pāngarau i te tau 2004, ka kimi kupu ngā pouako i roto i ngā rārangi kupu kei roto i te Marautanga. Ahakoa ngā amuamu mō ngā marautanga nei, o tētahi painga o te marautanga, ko te tautoko a te Kāwanatanga i tona whanaketanga (McMurchy-Pilkington, 2004). Ia tāruatanga o te Marautanga kua whai mai ngā kupu hou, kua puta ngā rauemi hou hei tautoko i te whakamahinga o te Marautanga. Nā reira, ko te tino take o te marautanga pāngarau ko tana whakawhānui, whakahōhonu hoki i te reo, otirā ngā rauemi tautoko me ngā akoranga whakapakari i te mōhiotanga o ngā pouako pāngarau. E ai ki ngā pouako ko tētahi ngoikoretanga o te rārangi kupu kei roto i te marautanga, kāore he whakamāramatanga o te kupu, arā kāore he rerenga kōrero hei whakatauiria i tana whakamahinga. Ko taua whakamahinga ko te “rēhita pāngarau”.

#### Te Whakamahi Papakupu Pāngarau

I te tau 2004 ka puta mai te papakupu pāngarau. Ka whakamahia e ētahi pouako te papakupu. Ko te pai rawa o te papakupu ka kitea e te pouako i te takenga mai o te kupu, he whakamāramatanga o te kupu, te hononga ki te marautanga me ētahi tauira kōrero. Ko ngā tauira reo pāngarau nei he tauira pātai, he tauira tohutohu hoki. Kua wehea ngā momo pātai nei i runga i te āhua o te whakamahinga o te hinengaro. Nā reira, i mua mai i tōna whakaako ka tirohia e ngā pouako ki te papakupu hei kimi kupu me ngā whakamāramatanga.

#### Te Kimi Tūwhiri Reo

I ētahi wā i tūtaki te pouako ki ētahi kupu kāore i te tino paku mōhio ki tōna tikanga. Nā reira i āta pānui i te kupu kia kitea he tūwhiri reo. Hei tauira, kei roto i te kupu *porowha rite* ētahi tūwhiri reo, arā ko te *poro* (block) *tapawhā rite* (square), nō reira ko te “cube” tēnei. Ko ētahi o ngā tūwhiri reo ko te pūtaketanga o te kupu. Arā, i ahu mai ēnei kupu i te kupu tau (number) te *taurua*, *taukehe*, *tau oti*, *tauraro*, *taurunga*. Heoi anō nō te ao tawhito ētahi o ngā kupu pāngarau nei, tēnā pea kāore e mōhiotia e ngā pouako o ēnei wā. Hei tauira, kua whakaritea te kupu “kauwhata” mō te kupu “graph” nā te mea he “anga” ngā mea e rua. Ko te kauwhata o ngā wā o mua he momo anga hei whakairi kānga, whakairi tuna hoki kia maroke ai. Pērā anō te “graph” he momo anga whakairi kōrero. Heoi anō ki te kore mōhio te kaipānui ki te tikanga o te kauwhata o mua, karekau he tūwhiri reo mō te tikanga o te kauwhata kei roto i te reo pāngarau o ēnei wā.

#### Te Wāihanga Kupu Hou

I ētahi wā he uua ake mō te pouako te tino kupu Māori, nā reira ka whakamāoritia te kupu Pākehā mā te hoatu he rangi Māori he tuinga Māori. Ahakoa ko tēnei te tino rautaki waihanga kupu i ngā wā o mua, ehara tēnei i te tino rautaki waihanga kupu hou i ēnei wā. Hei tauira, i ngā wā o mua i whakamahia ngā kupu pērā i te whika, kapa,

koata, hāwhe te aha kē atu. He tuhinga Māori tōna. I runga i ngā tikanga waihanga kupu o Te Taura Whiri o nāianei kua whakatakatoria e rātou me tino Māori te kupu.

### Ngā Rautaki Whakaako Ākonga

E ai ki ētahi o ngā pouako, ka whakaritea rautaki ako kupu, ako reo mō ngā ākonga engari ka whakaritea mōna anō. Nā reira i whakaritea ētahi rautaki ako kupu kia āhei ia ki te ako i te taha o ngā ākonga.

#### Te Whakaako Tōmua Kupu Pāngarau

Ka whakaako ngā pouako i ngā kupu hou kua tautohua i te wā ka tuhia he mahere mā ngā ākonga i mua mai i te tīmatanga o te whakaako i taua kaupapa pāngarau. Tēnā pea ko te kaupapa ako ko ngā āhua ahu-3 (3-D shapes). Heoi anō i mua mai i te whakaako i ngā hanga ahu-3 ka whakaakona ngā kupu pērā i te “*ahu, whānui, mata, tapa, roa, pito, pūtake, akitu*”. I a ia e whakaako ana i ngā kupu hou ki ngā ākonga ka ako hoki ia i aua kupu. Ka tae ki te wā ki te whakaako i ngā ariā o ngā hanga ahu-3, pērā i te poro tapawhārite (cube), i te koeko tapatoru rite (triangular pyramid) hoki, kei a ia a te reo hei whakamārama i ngā ariā. Ko te “rehita” tēnei momo reo.

#### Ngā Rautaki-ā-Waha

Ka whakamahi ētahi pouako i ngā rautaki ako kupu ā waha. E ai ki a Borasi, Siegal, Fonzi, rātou ko Smith. (1998), he mea nui kia hōhonu ake te mōhiotanga o te ākonga i te whakaputa me te tuhi kupu noa iho. Ko te mea nui kia āhei ki te kōrerorero i ngā kupu i roto i ētahi rerenga kōrero whānui, ki roto i ngā horopaki rerekē hoki. Tēnā pea mā te pouako e paku whakarerekē i te rerenga kōrero, tēnā pea mā te ākonga e whakamārama te tikanga o te kupu mā te kōrerorero ā waha. Engari, ko te mea nui mā te pouako e whakatauiria i te reo e whai take ana.

#### Ngā Rautaki Ataata (Visual Strategies)

E ai ki ētahi o ngā pouako, he nui ngā ākonga he pai ake kia ako mā ngā momo rautaki ataata. Nā reira, i whakaritea e ētahi o ngā pouako he whakaataata hei whakapiri ai ki te pātū. Ko te pai o te whakaata kupu, pikitia hoki ka taea e te pouako me ngā ākonga te whakamahi. Nā reira, ka hiahia te pouako ki tētahi kupu, tētahi ingoa, tētahi āhua pāngarau, ka tere tiro ake ki ngā momo whakaata kei ngā pātū o te rūma ako.

#### Ngā Rautaki Tuhi

Ko te katoa o ngā pouako kei roto i kura A, i uru rātou ki tētahi akoranga whakangungu pouako i aro atu ki te whakaako ākonga ki te tuhi pāngarau. Nā reira, ki tēnei kura he rautaki nui tēnei hei ako i te reo pāngarau, arā te rēhita. He nui atu tō rātou tirohanga i te tuhi me te ako kupu anake, i wānanga rātou i te whānuitanga o te tuhituhi pāngarau hei ako i te reo hei ako i hautau pāngarau. Nā reira, i whakaritea he hōtaka tuhituhi pāngarau. Ko te nuīnga o ngā kōrero mō te whakangungu pouako i roto i tēnei kaupapa me tiro ki tā Meany et al. (2012).

### Ngā Kupu Uaua te Ako

Ko tētahi pātai anō i roto i tēnei rangahau i ui atu ki ngā pouako, “he aha ngā kupu uaua ki te ako?” Mō te nuinga o ngā pouako ko ngā kupu o te reo tauanga me te reo taurangi ngā momo reo e uaua ana te ako nā te mea he paku noa iho te wā ka rangona ēnei kupu o waho atu i te ruma ako, ahakoa te reo. Tēnā pea he uaua te ako i ēnei kupu nā te mea kāore ngā pouako i te tino mārama ki ngā kaupapa nei. He ōrite tēnei ki ētahi atu rangahau kua whakahaerehia ki Aotearoa i roto i te reo Māori (Christensen, 2003). Tuarua, tēnā pea kāore i te tino mārama ngā pouako i ahu mai ēnei momo tikanga kupu i whea.

Ko tētahi atu rōpū kupu e uaua ana ki te ako ko ngā momo kupu kāore he paku tūwhiri reo o roto. I ahu mai ētahi o ēnei kupu i te Poutama tau pērā i te *tikanga paremata* (compensation), te *wāwāhi whakarearea* (multiplicative partitioning) te aha kē atu.

### Te Otinga

I roto i ngā kura reo Pākehā o Aotearoa e whakaako ana mā te huarahi o te reo Ingarihi, ko te reo Ingarihi anō te reo tuatahi o te nuinga o ngā pouako. Ako ai ēnei pouako i te rēhita pāngarau i a rātou e kuraina ana, e whakangungua ana rānei hei pouako, e whakauru ana rānei rātou ki ngā akoranga ngaio mā te pouako. Nā te whai mana o te reo Pākehā ki Aotearoa, ka tūtakina hoki te rēhita pāngarau ki ētahi atu wāhi i tua atu i te akomanga pērā i ngā tūmomo pāpāho, i nga momo umanga hoki. Waihoki, mō te nuinga o ngā pouako i roto i tēnei rangahau ko te reo Pākehā tō rātou reo tuatahi, ko te reo Māori tō rātou reo tuarua. Ka rerekē haere pea tēnei tūāhua i te putanga mai o nga ākongā i nga kura kaupapa Māori, i nga kura rumaki hoki.

He rerekē noa atu te horopaki ako i roto i ngā akomanga reo Māori i ō ngā akomanga reo Pākehā. Tokomaha tonu ngā pouako kei ngā kura reo Māori e whakaako ana, i kuraina i roto i ngā kura reo Ingarihi (kāore he kura reo Māori i ērā wā), i kuraina hoki i roto i ngā hōtaka whakangungu pouako reo Pākehā (Murphy, McKinley, & Bright, 2008). Ahakoa te ururu pōturi o ngā kupu pāngarau ki te ao pāpāho (tirohia tā Meany et al., 2012) me te whakatūnga o ētahi hōtaka whakangungu pouako reo Māori, kei te whakamahia tonutia te rēhita pāngarau ki roto i ngā kura. Me te aha, ko te reo pāngarau o te pouako te tauira matua mō te ākongā e ako ana i te pāngarau.

He putanga iho pūtoi ako (pedagogy) o ēnei tū āhuatanga mō te ako me te whakaako i te pāngarau mā te huarahi o te reo Māori. Ki tā Pimm (1987) he mea nui tonu kia nanaomia e ngā pouako me ngā ākongā te rēhita reo pāngarau kia pai ai tā rātou whai māramatanga i ngā whakawhitihitanga kōrero pāngarau ā waha, ā tuhituhi hoki. Ki tā Meaney et al. (2012), ko te mea nui kē kia āta whakaako i te rēhita pāngarau ki ngā ākongā. Otirā, kia taea e te pouako te whakaako te rēhita pāngarau me matatau anō ia ki te reo Māori.

Ako ai ngā ākongā i te rēhita pāngarau kia mārama ai rātou ki te pāngarau, kia taea ai hoki e rātou te whakamahi i te pāngarau (Cocking & Mestre, 1988; Pimm, 1987). Engari anō ko tā ngā pouako he ako i te rēhita pāngarau kia taea ai e rātou te whakaako tamariki. He pūtake rerekē anō tēnei mō te ako i te rēhita pāngarau. Ehara te ako i te pāngarau mā te huarahi o te reo Pākehā i te kōwhiringa mō ngā kura rumaki me ngā

kura kaupapa Māori i runga anō i ngā tikanga me ngā kaupapa here e whakature ana i te ako mā te reo Māori.

Ko te mea nui o tēnei rangahau ko te reo o te pouako te tauira reo e whakaatu ki ngā ākonga i ngā ariā pāngarau. Nā reira kia kaha ngā pouako ki te ako i te reo pāngarau pērā i te hunga kei roto i tēnei rangahau. Ahakoa he ruarua ngā kupu i te tuatahi, he tino kaha nō rātou ki te ako i te reo pāngarau. Nō reira ko te kupu whakamutunga ko te mihi ki ngā kura, ki ngā tumuaki, ki ngā ākonga rātou ko ngā whānau e kaha nei ki te whai ake i tō tātou reo rangatira.

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### Papakupu

Kupu Māori	Kupu Pākehā
āheinga reo	linguistic ability
āhuatanga wetereo	linguistic feature
angitu	success
ariā	theory
ako hanga mōhio	constructivist
haponi	community
hautau	fraction
huatau pāngarau	mathematics concept
horopaki reo maha	multilingual context
matanga pāngarau	mathematics expert
mātauranga wetereo	linguistics
mātauranga wetereo pāpori	sociolinguistics
miramira(ngia)	highlight
ōkawa	formal
pakeketanga	complexity
pāpori	social, socio
pūāhua maha	multiple situation
pūāhua reo	language situation
pūnahanaha	systematic
rēhita	register
reo āhei	functional language
reo arahanga	bridging language

reo ōkawa	formal language
reo whakawhitiwhiti	conversational language
reomahatanga	multilingualism
reorua	bilingual
reotahi	monolingual
rerekētanga ā reo	linguistic variation
rerenga	migrant
tapanga	name, label, term
tapanga wetereo	linguistic term
taukumekumetanga	tension
taumahatanga reo	language burden
tāupetanga	variation
tautohu	identify
tautuhinga	definition
tītohu	phenomenon
tukutahi	simultaneous
umanga	career
urupare	response
waitara	abstract
wetereo ā horopaki	pragmatics
wetereo ā kupu	semantics
wetereo ā takotoranga	syntactic
whakaariā(tia)	intellectualise, theorise
whakakotahi	standardise
whakatutukitanga pāngarau	mathematics achievement
whakawhāititanga	specialty