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# A better start to literacy for bilingual children in New Zealand: findings from an exploratory case study in te reo Māori and English

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## ABSTRACT

This article details findings from an exploratory case study that examined the efficacy of a phonological awareness and vocabulary programme with children educated in a bilingual immersion context of English and te reo Māori (Māori language) in Aotearoa New Zealand. The current paper discusses changes in the development of early literacy skills in English and te reo Māori in two groups of children aged from 5 years 0 months to 7 years 5 months. Twenty-six children from two bilingual classrooms in a rural school participated in a programme implemented by teachers over 15 weeks. The programme included explicit instruction in phonological awareness and vocabulary. One classroom was from Level 1 te reo Māori immersion, and one was from Level 3 te reo Māori/English. Results were analysed at cohort and class levels. Analyses indicated that both groups of children significantly improved in phonological awareness skills, non-word reading, and expressive vocabulary. Correlational analyses indicated that growth in te reo Māori skills was positively associated with growth in English skills. These findings suggest that further investigation into how the explicit teaching of te reo Māori can benefit the development of phonological awareness and print-related skills in English.

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## Introduction

Te reo Māori, as an endangered indigenous language, and the variation in exposure to te reo Māori for Māori children in Aotearoa New Zealand, means that understanding the early literacy skills of bilingual speakers in te reo Māori and English is imperative. This is especially true given the outcomes for children receiving bilingual education extend beyond academic achievement to affect long-term outcomes (Education Review Office 2015). The successful acquisition of literacy skills is underpinned by foundations within oral language (Hjetland et al. 2017; Westerveld 2014). Phonological awareness (awareness of the sound structure of spoken words) is critical to early word reading and spelling success (Gillon 2017). Research has identified a strong mediation effect between phonological awareness skills at age 4–5 and reading ability at age 7 (Russell et al. 2018), attributed to the influence of phonological awareness in developing efficient word-reading skills (Gillon et al. 2019).

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Developing phonological awareness is universal across alphabetic languages, beginning with awareness of larger phonological units, such as rhyme and syllable, moving to smaller units of phonemes, such as initial and final sounds in words (Gillon 2017; Goswami, Ziegler, and Richardson 2005). Differential effects occur following the beginning of reading instruction, with phoneme awareness developing quicker in children with languages containing more consistent spelling-to-sound relationships. Goswami, Ziegler, and Richardson (2005) compared German and English languages in five-year-old children and found that German-speaking children developed phoneme awareness faster than English-speaking children. Phonological awareness has been found to predict word reading skills cross-linguistically, regardless of orthography (Gillon 2017; Krenca et al. 2020). For children learning two languages, the degree of transfer of skills between L1 and L2 may differ depending on their linguistic interdependence or structural similarities (see Melby-Lervåg and Lervåg 2011). Research suggests that more time is required to master decoding skills in less transparent languages (Lindsey, Manis, and Bailey 2003) such as English, although the degree to which phonological patterns are established in L1 may constrain the development of phonological awareness in L2 (Saiegh-Haddad 2019).

Vocabulary may also influence the development of word-level skills and reading comprehension. Vocabulary knowledge at 5 years of age can affect the later development of reading comprehension, directly or indirectly, through its influence on word decoding and recognition skills (Tunmer and Chapman 2012). Breadth and depth of vocabulary knowledge have been identified as predictive of reading comprehension ability (Oakhill and Cain 2012), including in bilingual children. Proctor et al. (2005), in a sample of Spanish-speaking 4th Grade US children, found that vocabulary knowledge exerted a direct effect on reading comprehension and an indirect effect on listening comprehension. These effects may be due to the cross-language transfer of morphological awareness skills that support the interpretation or meaning of unknown words within a language (Sadeghi and Everatt 2015).

## Te reo Māori

Historically, te reo Māori was an oral language, emerging from a branch of Polynesian languages as Polynesians travelled to Aotearoa around 1000 years ago (Tahana and Ballard 2012). The influence of social and political forces including the spreading of Christianity by European colonisers and the translation of the Bible to te reo Māori, saw the advent of a written orthography (Matamua 2016). Te reo Māori currently consists of ten consonants (h, k, m, n, p, r, t, w), including two digraphs (ng, wh), and five vowel sounds (a, e, i, o, u). Long vowel sounds are marked by an orthographic macron above the vowel (ā, ē, ī, ō, ū) or by double vowels (aa, ee, ii, oo, uu). Vowels, but not consonants, may be clustered to create teams, such as ao, au, or diphthongs, such as ai (Matamua 2016; Tahana and Ballard 2012). In te reo Māori, syllables can consist of consonant and vowel combinations or a single vowel. For example, tua (prefix) = tu-a; kaitiaki (guardian) = kai-ti-a-ki (Head 1989). Dialectal differences between iwi (tribal groups) in pronunciation and some vocabulary were subsequently influenced by the English language. However, for fluent speakers of te reo Māori, these differences had little impact on the intelligibility of the language (Tahana and Ballard 2012). Te reo Māori, as an indigenous language, is endangered. Census data from 2018 reported a total number of 185,955 fluent speakers of conversational te reo Māori, equating to only 4% of the total population ( $n = 4,482,135$ ) (Stats 2020).

## Bilingualism in education in aotearoa New Zealand

As children enter education in Aotearoa New Zealand, varied preschool language experiences increase the complexity of developing bilingualism. These experiences are categorised into four groups: children who can (i) communicate predominately and proficiently in te reo Māori, (ii) communicate proficiently in te reo Māori and English (bilingual), (iii) communicate proficiently and predominately in English, and (iv) communicate proficiently in neither te reo Māori nor English (Berryman and Woller 2011). In Aotearoa New Zealand, all te reo Māori and English bilingual

education is state-funded and offered across different levels, representing different percentages of te reo Māori within the classroom. Currently, two curricula underpin bilingual education: the New Zealand Curriculum (Ministry of Education 2007) and Te Marautanga o Aotearoa (Ministry of Education 2017), written in conjunction with Māori educators (Hill 2017). Māori-medium education occurs in Levels 1 and 2.

- Level 1 follows Te Marautanga o Aotearoa, providing 81–100% of the classroom programme in te reo Māori.
- Level 2 follows Te Marautanga o Aotearoa or the New Zealand Curriculum, providing 51–80% of the classroom programme in te reo Māori. At Level 2, te reo Māori is the accepted language of communication and instruction. However, instruction in Level 2 classrooms is often in English, with te reo Māori occurring incidentally (Hill 2017).
- Levels 3–5 follow the New Zealand Curriculum and are culturally immersive programmes rather than bilingual programmes (Hill 2017). Level 3 provides 31–50% of the classroom programme in te reo Māori. Communication is primarily via English.

Outside of these levels, schools may offer no education in te reo Māori or may include te reo Māori only in terms of basic vocabulary, phrases, or songs (Ministry of Education 2020). Children can be placed within any level of te reo Māori and English bilingual education, often despite their previous language experiences. Most Māori children receive minimal exposure to te reo Māori in Level 4 and 5 schools. Hill (2017) reported that 40% of Māori are involved in bilingual education; however, under 7% are in Level 1 programmes. Currently, 326 schools have children enrolled in Māori medium education, with a total of 24,366 children enrolled in Level 1 and 2 programmes of which 96% are Māori, while 220,326 children are enrolled in Level 3–5 Māori language in English-medium education programmes of which 34% are Māori (Ministry of Education 2023).

Educational practices that value and affirm te reo Māori and Māori culture enhance successful outcomes for Māori (Macfarlane et al. 2017). For example, Māori students in bilingual educational contexts were more likely to gain credits within the National Certificate of Educational Achievement (NCEA) and gain University Entrance than those within an English-medium context (Wang and Harkess 2007). Research suggests that bilingual education may benefit dominant and non-dominant language speakers (see Marian, Shook, and Schroeder 2013). However, little research exists regarding developing early literacy skills in te reo Māori and English speakers within a bilingual education context.

## The current study

The current study extends previous research (see Gillon et al. 2019) by examining facilitators of early literacy success in bilingual speakers of te reo Māori and English within a bilingual learning context. They found an integrated phonological awareness and vocabulary approach accelerated the learning of children with lower language skills in English. The study included Māori children within an English-medium education context and focused on improving English early literacy skills. The research explored the potential of a programme that contained explicit instruction in phonological awareness and vocabulary skills in fostering the early literacy development of two groups of children receiving te reo Māori/English bilingual education within a Māori-medium educational setting.

## Research questions and aims

1. Does a phonological awareness and vocabulary programme using te reo Māori vocabulary and phonemes foster the development of early literacy skills in bilingual speakers in Te reo Māori and English?
2. Do associations exist between the development of early literacy skills in te reo Māori and English?

## Methodology

The exploratory case study consisted of a pre-/post-programme framework. The research was underpinned by Kaupapa Māori principles that acknowledge the centrality and legitimacy of te reo Māori, tikanga Māori (culture and customs), and rangatiratanga (self-determination and autonomy of resources) (Smith 2015). These principles guided our collaborative approach with the participating kura (school), in alignment with te Tiriti o Waitangi – the Māori version of the Treaty of Waitangi, which acknowledges the tangata whenua status of Māori as Indigenous people of New Zealand.

The current research occurred in a small rural kura of approximately 140 children in a rural marae (meeting place of a specific hapū or sub-tribe) village in Aotearoa New Zealand. The principal and staff at the kura held existing relationships with the university researchers and invited them to explore how the phonological awareness and vocabulary approach could be adapted for their kura (see Denston et al. 2022). Twenty-six children participated in the study over Terms 2 and 3 of the 2018 school year. The children were from two classrooms of 5–7-year-olds (i.e. Years 0–2). In New Zealand, children enter school when they turn five and may participate in an initial part-year (Year 0) before moving to Year 1 the following year. At the participating kura, te reo Māori and Māori culture underpins the learning of all tamariki (children). Whānau (extended family groups) of children select Level 1 education (81–100% of the classroom programme in te reo Māori) or Level 3 education (31–50% of the classroom programme in te reo Māori). Children in Level 1 receive literacy instruction in te reo Māori, while those in Level 3 receive literacy instruction in English. The initial number of participants comprised 16 children from Level 1 and 12 children from Level 3. After attrition (children leaving the school), the final sample included 15 children from Level 1 and 11 from Level 3. This study met the ethical requirements of the tertiary institution involved. See Table 1 for demographic data.

## Measures

All children were assessed on aspects of early literacy development, including phonological awareness in te reo Māori and English, non-word reading in English, and expressive vocabulary in te reo Māori and English. Phonological awareness in English was assessed using three measures from a computer-based phonological awareness screening and monitoring assessment (Com-PASMA) (Carson, Gillon, and Boustead 2013; 2014; Gillon et al. 2019). Test-retest reliability coefficients were reported as .70 or above (Carson, Gillon, and Boustead 2013; 2014). Phonological awareness in te reo Māori was assessed using an adapted assessment that integrated Māori kupu (vocabulary) and illustrations (see Derby 2019). The relationship between the English and te reo Māori and phonological measures and sound-letter recognition at pre-test was examined using Pearson product-moment correlation coefficient. The analysis identified significant positive correlations within all measures of te reo Māori and English. See Table 2 for correlational data for the measures.

Children received one point for each correct answer for the phonological awareness measures and raw scores were collected. Initial phoneme identity required children to identify a word

**Table 1.** Demographic information for participants.

	Level 1	Level 3
Age		
<i>M (SD)</i>	5.86 (0.60)	6.09 (0.80)
<i>Range</i>	5: 5–7: 2	5: 6–7: 1
Gender		
Female	60.0% ( <i>n</i> = 9)	45.5% ( <i>n</i> = 5)
Male	40.0% ( <i>n</i> = 6)	54.5% ( <i>n</i> = 6)
Total	100% ( <i>n</i> = 15)	100% ( <i>n</i> = 11)

**Table 2.** Pearson product-moment correlations within measures of te reo Māori and English pre-programme ( $n = 26$ ).

	Phoneme ID ENG	Phoneme BL ENG	Sound SG ENG	Sound- letter ENG	Phoneme ID TRM	Phoneme BL TRM	Sound SG TRM	Sound- letter TRM
Phoneme ID ENG	–	.701**	.699**	.717**				
Phoneme BL ENG	.701**	–	.694**	.772**				
Sound SG ENG	.699**	.694**	–	.653**				
Sound letter ENG	.717**	.772**	.653**	–				
Phoneme ID TRM					–	.642**	.625**	.457*
Phoneme BL TRM					.642**	–	.483*	.600**
Sound SG TRM					.625**	.483*	–	.476*
Sound- letter TRM					.457*	.600**	.476*	–

\* $p < .05$ , \*\* $p < .001$ . Note. Phoneme ID = Initial Phoneme Identification, Phoneme BL = Phoneme Blending, Sound SG = Sound Segmentation, ENG = English, TRM = te reo Māori.

beginning with a provided target sound from three pictorial options that included one target and two distractor items. The measure contained two practice and ten test items. For example:

(Te reo Māori) Kuri (dog): This is my friend kuri. Kuri starts with the /k/ sound. Which word starts with the /k/ sound? Options: waea (telephone), **kete (basket)**, whetu (star). (The correct answer is in bold.)

(English) Mouse: This is my friend mouse. Mouse starts with the /m/ sound. Which word starts with the /m/ sound? Options: **mat**, dog, book.

Sound segmentation was assessed by requiring children to segment a target word into syllables (te reo Māori) or individual phonemes (English). The segmentation unit was determined by the main units of sound taught to children in Aotearoa New Zealand, for example, CV, CCV, CVC, CCVC, and CVVC words. Individual phonemes are highlighted when teaching English, but syllables are typically highlighted when teaching te reo Māori and include 2, 3, and 4-syllable words. The measure contained two practice and 10 testing items (te reo Māori), two practice, and 18 testing items (English). The task required children to click on the number of boxes (from a total of five) representing the number of sounds within the word. After four consecutive incorrect responses, the English task was discontinued; however, the lower number of syllable types in the reo Māori measure meant that children completed all the items to ensure that all syllable types formed part of the results. Examples are presented below.

(Te reo Māori): This is a heru (comb). How many sounds do you hear in the word heru? Answer: **2**.  
(English): This is a crab. How many sounds do you hear in the word crab? Answer: **4**.

Phoneme blending required children to blend a word presented in its segmented form and to click on the correct image from three provided pictures (one target and two distractor items). The measure contained two practice and 10 testing items (te reo Māori) and two practice and 15 test items (English). The English task was discontinued after four consecutive errors, but as with sound segmentation, children completed all te reo Māori items in the measure. Examples are presented below:

(te reo Māori): I have a keke (cake), a **ke**te (basket), and a puna (spring of water). Click on the picture that you think I am saying. k – e – t – e.

(English): I have a **dot**, a dog, and a man. Click on the picture that you think I am saying. d – o – t.

Sound-Letter recognition was assessed using Com-PASMA (Carson, Gillon, and Boustead 2013; 2014). The measure contained two practice and eight test items (te reo Māori) and two practice and 18 test items (English). The English task was discontinued after six consecutive errors but children completed all items in the reo Māori measure. Children were presented with a target sound and asked to select the corresponding letter from six possible letters, including one target and five distractor items. Children received one point per correct answer and raw scores were collected.

Non-word reading (adapted from Calder 1992) was assessed by asking children to read a series of CVC non-words (English) that used regular English grapheme-phoneme correspondences. This task included two practice and 10 test items, for example: tob and hud. Children completed all items. Raw scores were collected for the total number of graphemes read correctly (30) and the total number of words read correctly (10).

Expressive vocabulary (adapted from Justice, Meier, and Walpole 2005). The task included two practice items and 20 test items selected from Tier 2 vocabulary, defined as those used within various contexts likely to hold multiple meanings (Beck, McKeown, and Kucan 2002). Ten test items involved elaborated vocabulary explicitly taught within the programme via discussions of meaning and context for use. Five elaborated words were English, for example, waddle and spy. Five words were te reo Māori, for example, kaitiaki (guardian) and whāngai (to nourish or raise). The remaining ten items were unelaborated words not explicitly taught within the programme. The unelaborated words were all English, for example, problem and snicker, because the selected storybooks often contained minimal Tier 2 te reo Māori vocabulary. The measure was scored using a 2-point system with a maximum score of 40. Two points were allocated for a full understanding of the word, 1 for partial understanding, and 0 for no or incorrect understanding. For example:

Target word (English): Waddle – Tell me what waddle means. (Child response). Tell me anything else about waddle (Child response). Two points included a reference to movement from side to side.

One point score included a reference to movement like an animal (penguin or duck).

Target word (te reo Māori): Kaitiaki (guardian) – Tell me what kaitiaki means. (Child response). Tell me anything else about kaitiaki (Child response). Two points included a reference to someone or something that guards or cares for another. One point included a reference to someone or something.

## The phonological awareness and vocabulary programme

The phonological awareness and vocabulary programme commenced following the pre-tests. The programme was adapted from the Better Start Literacy Approach (BSLA) (Gillon et al. 2019). Children received 40 × 30-minute lessons over 15 weeks. Each set of four lessons was framed around a storybook (ten books in total) selected with kaiako (classroom teachers) to ensure they upheld the mana whenua (authority of the land) of the participating kura. Children received a maximum of four weekly lessons, implemented by the kaiako. The elaborated vocabulary and target sounds were sourced from each storybook and included te reo Māori and English. For example, the storybook Pepe & Tute (Day 2018) included the target phonemes, p and t and the elaborated vocabulary puiaki and kaitiaki (te reo Māori) and emerge and survive (English). The first book included four lesson plans and activity resources. The subsequent seven books included three lesson plans and activity resources, with the fourth lesson independently planned by kaiako. The two final books and eight associated lesson plans and activities were planned by kaiako, using self-selected picture books.

Each lesson followed the same format including (i) vocabulary, (ii) phonological awareness, and (iii) transfer to reading and writing. The vocabulary component (approximately 8 min) included the

**Table 3.** Summary of the vocabulary and phonological awareness programme.

Programme component	Summary	Example
Vocabulary	Included a reading, or summarising of the storybook, elaborating targeted vocabulary, retell or discussion by children	Target words for elaboration: puiaki, kaiaki (te reo Māori) emerge survive (English)
Phonological identity	Identifying initial sounds in words. Generating words that began with targeted initial sound	Targeted p sound: pahi (bus), pango (black), puku (stomach) Targeted t sound: tahi (sweep), tama (boy), and tāne (man)
Phonological segmentation	Segmenting four phoneme words, via the use of physical movements (tapping out each sound) or counters on phoneme segmentation boards	As above
Phonological blending	Blending phonemes together to form the target word	p-a-h-i, p-a-ng-o, p-u-k-u t-a-h-i, t-a-m-a, t-ā-n-e
Phonological manipulation	Reading or writing a chain of words that differed by one phoneme	'This word says tama. I want the word rama. What sound changes?' (te reo Māori)
Transfer to reading and writing	Spelling a word to complete the phrase, e.g. oma (run), peke (jump), mahi (work). Reading sentence as a class.	Targeted carrier phrase: He pai ki au ki te _____ ki tōku hoa (I like to _____ with my friend).

elaboration of pre-selected kupu. This was followed by phonological awareness (approximately 18 min), which included activities to develop phoneme identity, segmenting and blending, and phoneme manipulation. The final aspect focused on transferring developing understandings from the phonological activities to reading or writing tasks involving letter-sound correspondences (approximately 5 min). See Table 3 for the lesson format.

Approximately 8 hours of support was provided to each kaiako during the programme. Two sessions were modelled by a research team member with other support including coaching and co-teaching sessions.

Adhering to the Kaupapa Māori principle of rangatiratanga, kaiako chose to orally report their teaching activities to the research team on a fortnightly basis. Kaiako completed the required 40 lessons across the 10 storybooks. They reported a lesson duration of at least 30 min for each lesson, but due to time constraints, not every lesson included a transfer to reading and writing activity. This feedback is consistent with teacher reports from the English medium context (Gillon et al. 2019).

## Results

Initial analyses were conducted to determine whether changes had occurred over the programme period for the entire cohort of children ( $N = 26$ ). To address this, paired sample  $t$ -tests were conducted to determine if differences existed between children's performances at pre- and post-programme testing. For phonological awareness skills, significant differences were found for phoneme identity in English ( $t(25) = -3.878, p < .001, \eta^2 = .38$ ) and te reo Māori ( $t(25) = -3.620, p < .001, \eta^2 = .34$ ), and phoneme blending in English ( $t(25) = -3.561, p < .05, \eta^2 = .34$ ) and te reo Māori ( $t(25) = -4.727, p < .001, \eta^2 = .47$ ). No significant differences were identified for phoneme segmentation in English ( $t(25) = -0.965, p = .344, \eta^2 = .04$ ) or te reo Māori ( $t(25) = -1.395, p = .175, \eta^2 = .07$ ). For sound-letter recognition, significant differences were identified in English ( $t(25) = -4.826, p < .001, \eta^2 = .48$ ) and te reo Māori ( $t(25) = -4.065, p < .001, \eta^2 = .40$ ). Significant differences were identified for English non-word reading at grapheme level ( $t(25) = -2.283, p < .05, \eta^2 = .17$ ) but not at word level ( $t(25) = -.680, p < .503, \eta^2 = .02$ ). For expressive vocabulary, differences were identified in elaborated vocabulary ( $t(25) = -5.762, p < .001, \eta^2 = .57$ ), and unelaborated vocabulary ( $t(25) = -4.010, p < .001, \eta^2 = .39$ ).

Subsequent analyses using paired sample  $t$ -tests were performed for the two classroom groups (Level 1 and Level 3). Eta-squared statistics were performed to determine the effect size following the

**Table 4.** Group performance over time for Level 1 and Level 3.

	Level 1			Level 3		
	Pre M (SD)	Post M (SD)	t-test (df = 14)	Pre M (SD)	Post M (SD)	t-test (df = 10)
Phoneme identity–te reo Māori	5.00 (3.14)	5.87 (3.07)	$t = -1.682$ $\eta^2 = .17$	5.91 (2.51)	7.91** (1.97)	$t = -4.114$ $\eta^2 = .63$
Sound segmentation–te reo Māori	4.53 (2.53)	5.53 (2.70)	$t = -1.334$ $\eta^2 = .11$	5.00 (2.61)	5.55 (2.46)	$t = -.576$ $\eta^2 = .03$
Phoneme blending–te reo Māori	5.47 (2.17)	7.07** (2.15)	$t = -1.863$ $\eta^2 = .52$	5.73 (2.10)	7.27** (1.85)	$t = -2.675$ $\eta^2 = .42$
Sound-letter recognition–te reo Māori	4.00 (2.56)	5.47** (2.32)	$t = -3.290$ $\eta^2 = .44$	3.82 (2.48)	5.36** (1.5)	$t = -2.371$ $\eta^2 = .36$
Phoneme identity–English	5.53 (3.14)	7.13** (3.09)	$t = -2.599$ $\eta^2 = .33$	7.18 (3.22)	9.55** (.93)	$t = -2.833$ $\eta^2 = .45$
Sound segmentation–English	1.67 (1.99)	2.93** (2.69)	$t = -1.683$ $\eta^2 = .17$	6.18 (4.00)	5.91 (4.68)	$t = .251$ $\eta^2 = .006$
Phoneme blending–English	6.80 (3.36)	9.20 (4.26)	$t = -3.595$ $\eta^2 = .48$	9.64 (5.71)	12.45 (4.48)	$t = -1.886$ $\eta^2 = .26$
Sound-letter recognition–English	8.07 (6.01)	11.40** (4.49)	$t = -3.371$ $\eta^2 = .45$	11.00 (6.31)	16.18** (2.60)	$t = -3.468$ $\eta^2 = .55$
Non-word reading–graphemes–English	5.00 (7.14)	5.80 (8.16)	$t = -.727$ $\eta^2 = .04$	11.27 (12.31)	15.45** (10.05)	$t = -2.560$ $\eta^2 = .39$
Non-word reading–words–English	.33 (.90)	.53 (1.58)	$t = -1.382$ $\eta^2 = .12$	2.55 (3.88)	2.73 (3.93)	$t = .276$ $\eta^2 = .007$
Elaborated vocabulary–te reo Māori/English	1.40 (.91)	4.87** (3.04)	$t = -5.030$ $\eta^2 = .64$	2.00 (1.34)	3.55** (1.51)	$t = -4.224$ $\eta^2 = .64$
Unelaborated vocabulary–English	2.27 (1.44)	4.27** (2.22)	$t = -3.022$ $\eta^2 = .39$	3.36 (2.46)	4.73** (1.95)	$t = =2.776$ $\eta^2 = .44$

\*  $p < .05$ . \*\*  $p < .01$ . Note. Cohen's eta squared effect size guidelines: small (0.01), moderate (0.06), and large (.14).

paired t-test and were interpreted following the guidelines set by Cohen (1988): small (0.01), moderate (0.06), and large (.14). Analyses are presented in Table 4.

Analyses identified significant gains in phoneme identity for both Level 1 ( $p < .05$ ,  $\eta^2 = .33$ ) and Level 3 ( $p < .05$ ,  $\eta^2 = .45$ ) in English. Significance differences were identified for phoneme identity in te reo Māori for Level 3, ( $p < .01$ ,  $\eta^2 = .63$ ) but not for Level 1 ( $p = .115$ ,  $\eta^2 = .17$ ), although a large effect size was identified. Significant differences were not identified for either group for the sound segmentation task in te reo Māori or English, although a large effect size in English ( $p = .115$ ,  $\eta^2 = .17$ ) and moderate effect size in te reo Māori ( $p = .203$ ,  $\eta^2 = .11$ ) were identified in Level 1. A significant difference was identified for phoneme blending in Level 1 in te reo Māori ( $p < .05$ ,  $\eta^2 = .52$ ) and English ( $p < .05$ ,  $\eta^2 = .48$ ) and in Level 3 for te reo Māori ( $p < .05$ ,  $\eta^2 = .42$ ) only. No significant difference was identified for Level 3 in English, although a large effect size was identified ( $p = .09$ ,  $\eta^2 = .26$ ). A significant difference was identified for Level 3 in the non-word reading task at grapheme level, ( $p < .05$ ,  $\eta^2 = .39$ ). A moderate effect size was identified for non-word reading (word) for Level 1, ( $p = .189$ ,  $\eta^2 = .12$ ). Significant differences were identified for both groups in the vocabulary task for both elaborated and unelaborated vocabulary.

To determine if the change (post scores minus pre scores) over the course of the programme in the English measures was associated with change over the course of the programme in te reo Māori measures, analyses were carried out for each level using Pearson product-moment correlation coefficient. Sample size is an important factor influencing statistical significance, and for sample sizes less than 30, a moderate correlation may be present, even in the absence of statistical significance (Pallant 2013). Thus, results were reviewed using guidelines for determining effect sizes for correlations; small ( $r = .10$  to  $.29$ ), medium ( $r = .30$  to  $.49$ ), and large ( $r = .50$ – $1.0$ ) (Cohen 1988). Correlations are presented in Table 5.

For Level 1 and 3 children, change in sound-letter recognition in te reo Māori was associated with change in sound-letter recognition in English. Improvements in one language were related to improvements in the other at both levels of language exposure. For Levels 1 and 3, te reo Māori

**Table 5.** Correlations for Level 1 (lower-left diagonal) and Level 3 (upper-right diagonal) – shaded cells indicate cross-language correlations.

	1	2	3	4	5	6	7	8	9	10	11	12
1. Phoneme ID–ENG	–	<b>.684</b>	.161	.381	.374	.458	<b>.819</b>	.599	.491	–.095	.233	.167
2. Phoneme BL– ENG	–.042	–	–.037	.225	.464	.437	.531	.169	.396	–.071	.184	.343
3. Sound SEG–ENG	–.086	.459	–	–.103	–.135	.482	–.137	.059	–.175	.159	–.328	–.492
4. Phoneme ID–TRM	.273	.316	.412	–	.259	–.039	.225	.172	<b>.644</b>	.085	.000	.160
5. Phoneme BL– TRM	.180	.267	.071	.374	–	.361	.083	–.007	.358	.146	.160	.218
6. Sound SEG–TRM	.495	.304	–.068	<b>.530</b>	.077	–	.314	.408	–.009	–.235	–.165	–.394
7. SL REC–ENG	.000	.245	.407	–.003	.374	–.135	–	<b>.821</b>	.392	–.096	.115	.325
8. SL REC–TRM	.170	.419	.414	–.022	.280	–.014	<b>.666</b>	–	.243	–.108	–.315	.108
9. NWR(G)–ENG	.153	.176	.321	.299	.408	–.063	.324	.101	–	.586	.315	.570
10. NWR–ENG (W)	–.256	.059	–.122	–.166	.016	–.263	–.433	–.251	.078	–	.223	.514
11. ELAB	.110	.385	–.026	.053	.064	.101	.012	.383	.354	–.019	–	.244
12. UNELAB	.047	.216	–.210	.015	.105	.240	–.189	–.097	–.065	.050	.397	–

Figures in bold are significant ( $p < .05$ ). Figures in italics are non-significant but show medium correlation sizes ( $r > .3$ ). Phoneme ID = Initial Phoneme Identification, Phoneme BL = Phoneme Blending, Sound SG = Sound Segmentation, SL Rec = Sound-letter recognition, NWR(G) = Non word reading grapheme, NWR(W) = non word reading word, ELAB = elaborated vocabulary, UNELAB = Unelaborated vocabulary, ENG = English, TRM = te reo Māori.

sound-letter recognition improvements showed medium correlations with English phonological skills: phoneme identity for Level 3 children and phoneme blending and sound segmentation for Level 1 children. However, there were less clear cross-language associations between the English sound-letter recognition improvements and te reo Māori phonological measures for both groups of children. For Level 3 children, but not Level 1 children, English non-word reading (grapheme) showed a large correlation with te reo Māori phoneme identification. Level 1 and 3 children demonstrated a medium correlation between English non-word reading (grapheme) and phoneme blending in te reo Māori. There were generally slightly larger cross-language associations between the phonological measures for Level 3 children compared to Level 1 children.

## Discussion

This exploratory case study explored the potential of a classroom programme that included phonological awareness and vocabulary in developing early literacy skills in children who were emergent bilinguals in te reo Māori and English. The programme focused on children receiving Level 1 (81–100% of classroom programme in te reo Māori) or Level 3 (31–50% of classroom programme in te reo Māori) Māori-medium education.

Analyses suggested the programme was generally effective at fostering the development of phoneme blending and sound-letter recognition skills across both languages at both levels of language exposure. However, the same was not evident for non-word reading, where effect sizes suggested that Level 3 children made greater gains at the grapheme level. Level 1 children showed a moderate (though non-significant) effect size for the non-word measure at the word level, suggesting some gains for Level 1 children. Overall, such an approach may have the potential to be effective as a way of supporting literacy-related skills in two languages independent of exposure to those languages in classroom activities.

Significant differences were found for expressive vocabulary across both levels. Using culturally and linguistically appropriate texts may have supported children's development of vocabulary independent of the level of language exposure experienced by the two cohorts of children (see Denston et al. 2022). In the current study, Indigenous knowledge was central to the research, with texts selected that were closely related to the whenua (land) (see Hare 2012; Michell et al. 2008). The texts likely affirmed the children's ability to make meaning within te ao Māori (ways of knowing and being) through learning experiences they found personally meaningful (see Macfarlane et al. 2017). Such growth suggests that opportunities to discuss and explicitly teach vocabulary during

a storybook reading with texts that children relate to are an efficient way language can be fostered. Interestingly, significant differences were also identified for unelaborated vocabulary. This may be indicative of general growth in vocabulary across the period of the intervention. Equally, the programme's activities may have helped children develop their vocabulary through increased language use and exposure to new vocabulary. As vocabulary improves, new vocabulary can lead to recognising additional words in verbal and written forms. The latter may also be supported by the ability to decode new words or parts of words that the approach shows evidence of enhancing.

Correlational analyses found that the growth in phonological awareness skills was associated across the two languages and related to early print skills. These associations appeared more numerous for Level 3 children than Level 1 children. This suggests that growth in skills within one language may reinforce the development of similar skills in the other language. These findings argue for the existence of what has been referred to as translanguageing (see Lewis, Jones, and Baker 2012), given that growth was identified across the dominant and non-dominant languages.

According to Bar-Kochva and Breznitz (2014), children who are developing reading skills in transparent orthographies (such as te reo Māori) should be able to utilise smaller linguistic units, whereas children who read more opaque orthographies (such as English) may need to rely on larger linguistic units. According to Share (1995), phonological awareness can underlie one's ability to convert between graphemes and phonemes, and with increased phonological awareness, the learner will be more likely to use the links between graphemes and phonemes. Equally, the easier the phonological representations are to learn, the faster they can be utilised and support independent reading (see Krenca et al. 2020). Frith, Wimmer, and Landerl (1998) found in their comparison of reading performance of English-speaking (opaque orthography) and German-speaking (a relatively transparent orthography) children that lower levels of reading accuracy were associated with English. English-learning children demonstrated slower non-word reading than their German counterparts. Such differences have been attributed to the effects of transparency in orthography.

Studies have found that reading acquisition occurs at a faster rate in languages with transparent orthographies (see Joshi and Aaron 2006), which may be due to easier decoding strategies when encountering less familiar words; that is, children can use more reliable grapheme-phoneme relationships in their efforts to recognise a new word. Children may develop greater decoding independence than when learning more opaque orthographies. The current findings that phonological skills and sound-letter awareness developed in one language (te reo Māori) are related to improvements in non-word reading in another language (English) suggests that a programme that contains a focus on te reo Māori as a transparent orthography, with explicit instruction in phonological awareness, may benefit the development of te reo Māori and the development of such skills in English, as an opaque orthography. Children may translanguage between the two languages, meaning that teaching and learning strategies within bilingual spaces could support literacy acquisition across both orthographies. Furthermore, teaching decoding strategies in a more transparent orthography may be easier than in a less transparent orthography, making the process of teaching and learning more effective.

Research has found that generalising orthographic representations across languages can result in errors (Krägeloh and Neha 2010). In the current context, the phonology of te reo Māori means that all sounds in te reo Māori can be found in English, but not all English phonemes are evident in te reo Māori. While the current programme was successful, this may be related to the structural similarities between te reo Māori and English being an explicit focus of the programme. Thus, the less structurally similar aspects of English will need to be explicitly taught if a bilingual literacy strategy is to be effective so the bilingual learner knows the differences and commonalities. There are other orthographic differences between te reo Māori and English, including the lack of consonant clusters in te reo Māori (Tahana and Ballard 2012). However, while cognitively challenging, differences in orthographic structures are thought to promote increased metalinguistic awareness in bilingual children (Krägeloh and Neha 2010; Rona and McLachlan 2018). The language repertoire developed through bilingual awareness should provide children with

increased metalinguistic tools, more flexible ways to learn new knowledge, and the ability to communicate effectively with others (Garcia and Li 2014).

The identified associations may reflect the differential contexts and the varied preschool experiences of children in the current case study. A child's literate cultural capital is influenced by early childhood experiences (Prochnow, Tunmer, and Arrow 2015). A mismatch between early childhood contexts and subsequent school experiences can result in literacy learning difficulties (May, Hill, and Tiakiwai 2006). In the current study, children held varied backgrounds, including immersive experiences to little or no experience with te reo Māori. Level 3 children received less exposure to te reo Māori because, unlike in Level 1, wider classroom interactions occurred in English. The current findings support the potential of a programme that targets the development of te reo Māori while simultaneously developing skills in English; however, examining the long-term benefits of a phonological awareness and vocabulary programme for bilingual learners of te reo Māori and English is required. Such research should account for the role that differences in early childhood contexts and contributing language development have on the programme's outcomes.

## Limitations

The current exploratory case study took place within a naturalistic school setting, which posed limitations to the current research. A control group could not be utilised as only one classroom of each level existed within the participating kura, and the need to uphold their rangatiratanga meant that all children should experience the same learning opportunities. While the current study sought insights into the programme's potential for bilingual language development, future larger-scale research should include a matched control group. Limitations also occurred in the assessments used within this case study. There was an absence of an equivalent non-word reading measure in te reo Māori, which was required to demonstrate the application of phonological skills and understand the variables associated with developing print-related skills. In te reo Māori, all vowel-consonant combinations are considered meaningful words; thus, non-words do not exist within te reo Māori. An equivalent measure in te reo Māori must be a low-frequency word reading measure. The English non-word measure also included multiple consonants not found in te reo Māori, such as v, z, b, and g. The inclusion and frequency of their use may have limited our ability to identify gains in English non-word reading for Level 1 children. It is also unclear if the units focused on within the programme could constrain the development of letter-sound correspondences, which would be worthy of future research. The phonological segmentation task in te reo Māori contained items at the syllable level as the main unit of reference for instruction, whereas the programme focused on the individual phoneme level. Using syllables may have confused Level 3 children who received little or no instruction in syllables, unlike Level 1 children, for whom learning syllables is a common strategy for developing te reo Māori; hence, the decision to use syllables in at least one te reo Māori measure.

## Conclusion

Despite the limitations, the findings suggest that a phonological awareness and vocabulary programme that includes explicit instruction in te reo Māori appears to be effective in supporting the development of a transparent language (te reo Māori), and a more opaque language (English) literacy-related skills in 5–7-year-old children. This seems to be despite the differences in the children's background language experiences and differences in language exposure levels during classroom learning. These findings are promising in supporting the development of phonological awareness, print-related skills, and vocabulary in bilingual children with differing levels of language acquisition. Such findings are important to further understanding the development of metalinguistic skills in children acquiring relatively transparent and opaque orthographies and in two languages with dominant (English) and minority language (te reo Māori) status.

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