Improving Preservice Teachers' Phonemic Awareness, Morphological Awareness and Orthographic Knowledge

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Abstract: Few studies have examined the effectiveness of methods to develop preservice teachers' phonemic, morphological and orthographic awareness for spelling instruction. Preservice teachers (n=86) participated in 10 hours of metalinguistic coursework. The coursework focused on: phonological awareness, orthographic awareness, morphological awareness and utilising such information in spelling assessment. Measures from previous research were utilised to compare participants' performance with other preservice and inservice teachers of varying experience and expertise. The research cohort outperformed the preservice comparison group and their scores approximated that achieved by inservice teachers who had participated in 30 hours of professional development focused on building metalinguistic knowledge for spelling instruction. The results suggest that the coursework was effective at building students' phonemic, morphological and orthographic awareness and this information could be applied to support analysis of spelling errors. Implications for the effective preparation of literacy teachers within preservice programmes are discussed.

Introduction

Strong phonological, morphological and orthographic awareness (collectively termed metalinguistic knowledge for spelling instruction throughout this paper) is considered essential for the successful development of children's early reading and spelling ability (Gillon, 2004; Konza, 2014). Much research has focused on describing preservice and inservice teachers' relatively low levels of metalinguistic knowledge for spelling instruction and the barriers this may present for the explicit teaching of decoding and encoding skills (Carreker, Joshi, & Boulware-Gooden, 2010; Carroll, Gillon, & McNeill, 2012; Moats, 1994, 2014; Stainthorp, 2004; Washburn, Joshi, & Binks-Cantrell, 2011). There is a need to move beyond the description of teachers' knowledge and focus research efforts on developing and evaluating methods of enhancing teachers' knowledge in efficient and effective ways. This exploratory study examined the impact of preservice coursework on building student teachers' metalinguistic knowledge for spelling instruction and selection of teaching approaches for spelling.

Teachers' Metalinguistic Knowledge for Spelling Instruction

Three major metalinguistic abilities are thought to underlie spelling performance. Phonological awareness is the ability to identify and manipulate the sounds structure of words (Gillon, 2004). For example, if a child is trying to spell the word *chip*, they need to be

able to identify that it starts with a /ʧ/sound. Orthographic awareness includes letter-sound knowledge (e.g., sh makes a /ʃ/ sound) and knowledge of spelling patterns within words (e.g., 'ay' typically represents the /eI/ sound at the end of a syllable) (Apel, 2011). Morphological awareness includes knowledge about the meaningful parts of words including word roots (e.g., dieter, dietician) and affixes (e.g., uneasy, bussed, lazy etc.) (e.g., Wolter, Wood, & D'zatko, 2009).

Despite recommendations that teachers should possess metalinguistic knowledge that enables explicit teaching in skills such as phonological awareness and phonics (Konza, 2014; National Institute of Child Health and Human Development, 2000), a large body of literature indicates low teacher knowledge in these areas across a number of English speaking contexts (Carroll et al., 2012; Coltheart & Prior, 2006; Spear-Swerling & Brucker, 2003; Stainthorp, 2004; Washburn et al., 2011). For example, Carroll et al. (2012) examined the phonological awareness knowledge of teacher aides, preservice teachers, classroom teachers, early childhood education teachers and speech-language pathologists (SLPs). All groups except for the SLPs showed low levels of phonological knowledge at the phoneme level. Analysis of the participants' performance on phonemic awareness tasks revealed the difficulty teachers would have providing explicit instruction in decoding and encoding. Classroom teachers scored an average of 4.35 out of 10 correct in the phoneme counting subtest (e.g., how many sounds are in 'through'). Instruction in the alphabetic principle relies on teachers scaffolding students to map between the spoken production and written representation of a word. If a teacher is inaccurate in the identification of sounds within words, such scaffolding is likely to be haphazard.

Research has also increasingly focused on examining preservice teachers' metalinguistic knowledge for spelling instruction (e.g., Carroll et al., 2012; Coltheart & Prior, 2006; Fielding-Barnsley, 2010). Overall preservice teachers' metalinguistic knowledge for spelling instruction mirrors that described for in-service teachers with generally low performance in these tasks (e.g., Carroll et al., 2012). There is evidence that some growth in metalinguistic knowledge for spelling instruction occurs over the course of a teacher preparation programme, but graduates generally finish training with inadequate knowledge to provide explicit teaching in encoding and decoding processes. For example, Carroll et al.'s (2012) study included both first and final year preservice teachers within a three year teaching degree. The third year students scored an average of 3 out of 10 items correct in the phoneme counting task compared to an average of 2 out of 10 items correct for the first year students. Further research is needed to devise effective methods to enhance students' growth in this knowledge over their teacher preparation programmes.

Approaches to Build Preservice Teachers' Metalinguistic Knowledge

Researchers have started to examine approaches to enhance preservice teachers' metalinguistic knowledge for spelling instruction. Stainthorp (2004) examined the impact of a session which provided feedback about students' (n = 38) performance in a phonological awareness task and reviewed the importance of explicit teaching of key forms of metalinguistic knowledge in reading instruction. Participants' pre-intervention performance showed relatively strong rhyme and syllable awareness compared to phonemic awareness. At follow-up assessment (6 months later), participants had significantly stronger phonemic awareness. Evaluation of subtest scores, however, suggested their phonemic awareness would be insufficient to provide explicit instruction in the classroom (e.g., the group average on the phoneme counting task was under 50% accuracy at post-intervention).

Martinussen, Ferrari, Aitken and Willows (2015) examined the impact of a multimedia enhanced lecture on preservice teachers' (n=54) phonological awareness knowledge. The phonological awareness measure was short (i.e., 11 items) and included skill items (i.e., 4 items that assessed phonemic awareness) and conceptual items (e.g., define phoneme). Participants improved from an average of 56.3% to 71.4% on the measure immediately following the lecture. Examination of the students' maintenance of knowledge over time was not conducted. There was also no breakdown regarding the performance in each item, so it is difficult to compare participants' skills post-lecture to other studies involving preservice teachers.

Although the above studies are promising in that they show that preservice teachers' metalinguistic knowledge for spelling instruction can be improved relatively quickly, they have a number of limitations. Within both interventions, the content was covered within a one-off workshop or session. This delivery model may not provide students with time to master the content (rather than just to improve) or relate that knowledge to other content within their literacy education courses and/or practicum experiences. Presentation of the content in this manner could also imply that the content is an 'add on' rather than core information in their preparation as reading and spelling teachers. Finally, the lack of comparison groups and the re-administration of the same task to evaluate effectiveness means that post-workshop scores may have been overinflated by test-retest effects.

Initial efforts have been made to establish the impact of longer periods of coursework for preservice teachers. Purvis, McNeill and Everatt (2016) evaluated the effectiveness of 7 hours of lecture time (embedded within a literacy education course) focused on metalinguistic knowledge for spelling instruction for 121 preservice teachers. There was significant growth in students' phonemic awareness, morphological awareness and orthographic awareness using the same measure at pre- and post-assessment. Students with stronger spelling skills (n=24) at pre-assessment on an experimental task responded more favourably to the teaching than students with weaker spelling skills (n=24) even after controlling for pre-assessment metalinguistic ability. Similar to previous research, limitations in students' metalinguistic knowledge for spelling instruction were still evident following the course. Participants scored 71.4% on the phoneme counting subtest, 50% on the morpheme counting subtest and 65% on the orthographic knowledge subtests. It would be useful to evaluate the course content delivered over more hours to see whether that can increase its effectiveness.

The purpose of developing preservice teachers' metalinguistic knowledge for spelling instruction is to enhance their teaching practices in the assessment and teaching of these foundational skills, including how they support children to integrate such knowledge when reading and writing. A practical focus to evaluating preservice teacher's metalinguistic knowledge for spelling instruction in response to course content is therefore appropriate. Carreker (2007) developed a spelling instruction selection task for this purpose. In the task, teachers are presented with 12 groups of children's spelling errors (3 words in each group) with each group containing examples of errors exemplifying the same underlying spelling difficulty (e.g., 'sep' for 'step', 'back' for 'black', 'sip' for 'slip'). Teachers are then asked to select 'the most appropriate' instructional task for the errors given from a set of nine options (e.g., teaching a child to segment blends into individual phonemes by moving a counter for each sound in words containing blends). Using this assessment task, Carreker, Joshi and Boulware-Gooden (2010) compared the phonological awareness, morphological awareness and spelling instruction selection of preservice teachers, and inservice teachers who had not participated in any coursework focused on building metalinguistic knowledge for spelling instruction with in-service teachers who participated in 30, 60 or 120 hours of specialist coursework. Generally, teachers with more professional development experience performed better on the assessment measures. Examination of the results of the groups who received

professional development suggested that the impact of the intervention levelled out for teachers who had received greater hours of instruction. For example, there was not a big difference in phonemic awareness or morpheme awareness knowledge across the in-service groups who had participated in 30, 60 or 120 hours of coursework. Isolated findings from this study suggest that not only are intense training models (e.g., 120 hours) unrealistic to integrate within general teacher education programmes, but they may not produce significantly greater teacher outcomes. It is important to highlight that is inappropriate to draw firm conclusions about the number of hours of coursework required to build knowledge from this one study. Other studies focused on building preservice teachers' metalinguistic knowledge for spelling instruction have shown some shifts in knowledge (albeit not approaching mastery) can occur following 2-7 hours of study (Martinussen et al. 2015, Purvis et al., 2016 & Stainthorp, 2004). Further research is thus required to examine whether growth in knowledge and emerging ability to apply that knowledge may be possible to achieve over a shorter teaching period that has the potential to be integrated into teacher preparation programmes.

It is also important that researchers consider the relevance of scores achieved in metalinguistic tasks for preservice teachers' capacity to provide explicit instruction in reading and spelling for young children. Comparison of the scores achieved by preservice teachers following completion of coursework focused on metalinguistic knowledge for spelling instruction to other teachers with various levels of experience and expertise in similarly focused coursework may be a useful method of giving practical meaningfulness to such data. For instance, it is unknown what level of phonemic awareness knowledge is needed for a teacher to deliver explicit instruction in the alphabetic principle.

The Current Study

The current study evaluated the impact of 10 hours of content focused on metalinguistic knowledge for spelling instruction embedded in a literacy education course for preservice teachers. The ten hours of instruction was selected given: (1) Purvis et al.'s (2016) research that indicated 7 hours was insufficient to build this type of knowledge that is required for explicit classroom instruction, and (2) to establish whether similar levels of metalinguistic knowledge for spelling instruction can be achieved within a shorter period of input given Carreker et al.'s (2010) results that showed a plateauing of teaching effects across participants who received 30, 60, or 120 hours of instruction. Participants' phonemic awareness, morphological awareness and spelling instruction selection ability was examined following the course and compared to a previous research cohort (Carreker et al., 2010). Specifically, the following research questions were addressed:

Do preservice teachers who participate in 10 hours of lectures focused on metalinguistic awareness for spelling instruction and its connection to literacy assessment and teaching have stronger phonemic awareness, morpheme awareness and spelling instructional selection skills than:

1. Preservice teachers who have not received focused metalinguistic knowledge for spelling instruction content within their training?
2. In-service teachers who have not received specific professional development focused on metalinguistic awareness for spelling instruction and its connection to literacy assessment and teaching?
3. In-service teachers who have received 30 hours of professional development focused on metalinguistic knowledge for spelling instruction and its connection to literacy assessment and teaching?

Methodology
Participants
Experimental Group

Preservice teachers in their first year of a three year undergraduate teaching degree were invited to participate in the study. Participants were recruited when they were beginning their first of three literacy courses within the degree programme. Of the 92 students enrolled in the course, 86 (93.5%) consented to participate in the research and completed the post-course assessment measures. The research sample consisted of 15 males and 71 females.

Ethical approval was granted by the relevant institutional Ethics Committee. Informed consent was gained for all participants.

Comparison Groups

Three groups of participants from Carreker et al. (2010) were utilised to compare the performance of the research cohort to other groups with varying levels of teaching experience and professional development in metalinguistic knowledge for spelling instruction. The comparison groups were based in the United States of America.

1. Preservice teachers (n = 36) who had not received course content focused on metalinguistic awareness for spelling instruction and its connection to literacy assessment and teaching. There was no detail provided about the length of university study completed by this group during data collection. All participants in this group were female. This group is referred to as the 'comparison preservice' group throughout the paper.

2. In-service teachers (n = 38) who had not completed specific professional development focused on metalinguistic awareness for spelling instruction and its connection to literacy assessment and teaching. These teachers reported 3 to 20 years of teaching experience within general and special education contexts. All participants in this group were female. This group is referred to as the 'inservice without PD' group throughout the paper.

3. In-service teachers who had completed 30 hours of professional development (n = 56) focused on metalinguistic awareness for spelling instruction and its connection to literacy assessment and teaching. These teachers reported 3 to 20 years of teaching experience within general classrooms. All participants in this group were female. This group is referred to as the 'inservice with PD' group throughout the paper.

Course Content Focused on Metalinguistic Knowledge

The participants in the experimental group received 10 hours (5 x 2-hour lectures) of instruction (out of 40 hours of a literacy course) focused on building their metalinguistic knowledge for spelling instruction and applying this knowledge to evaluate and support children's ability to use word-level strategies in their reading and spelling. Other key course components of the course that were not evaluated in the current study included: (1) theoretical models of literacy development, (2) introduction to key reading approaches within New Zealand educational settings (e.g., shared reading, guided reading), (3) oral language assessment and development and (4) preparing students for their first professional practice. The course utilised a blended model to support students' learning. Accompanying readings, video clips and interactive activities focused on metalinguistic knowledge were included on

the course's website. Video recordings of each lecture could also be accessed multiple times through the site.

The 10 hours of lecture content was similar to the format and content described in Purvis et al's (2016) research that focused on a previous cohort of students within the degree programme. Three further hours of content were included in the current study to attempt to improve students' metalinguistic learning for spelling instruction and application to practical contexts within the course. A breakdown of the time spent focused on each main component and example activities are included below.

Phonological Awareness.

Approximately 4 hours was spent focused on phonological awareness. The instruction concentrated on the following primary areas: definition of terms (phoneme, onset-rime etc.), exposure to consonant and vowel phonemes within New Zealand English, the role of phonological awareness in theoretical models of literacy development, building students' personal phonemic awareness knowledge, analysing children's reading and spelling errors from a phonological perspective.
Examples of activities included: multiple small group and interactive activities that required participants to segment and blend words into their constituent phonemes, role playing how to draw children's attention to sounds in words within shared reading activities, phonological analysis of children's spelling errors (i.e., identifying the number of sounds plausibly presented).

The majority of content focused on building students' awareness at the phoneme level. This focus was chosen given previous research showing preservice teachers from the same degree programme performed near ceiling on syllable and rhyme awareness tasks prior to participation in literacy coursework (e.g., Carroll et al., 2012) and strong evidence that phonemic awareness is the most important aspect of phonological awareness to be explicitly taught in the early primary school years (see Gillon, 2004 for review).

Orthographic Awareness.

Approximately two hours was spent building students' orthographic knowledge. The instruction focused on the following primary areas: phoneme-grapheme knowledge and orthographic pattern awareness (Apel, 2011). Examples of activities included: mapping speech to print; recognising common ways to represent consonant and vowel sounds; identifying long and short vowels; words sorts to become familiar with common orthographic patterns (e.g., final 'tch' versus 'ch'), consonant doubling rule etc.

Morphological Awareness.

Approximately two hours was spent building students' morphological awareness. The instruction focused on the following primary areas: definition of key terms such as free, bound, inflectional (e.g., -s, -ing) and derivational morphemes (e.g., -ible, -ly); the link between morphological awareness and vocabulary knowledge; the link between morphological awareness and literacy development. Examples of activities included: breaking words down into free and bound morphemes, building word families (words that share a free morpheme), morphological analysis of spelling (e.g., 'fastest' represented as 'fastist').

Spelling Analysis and Selection of Appropriate Teaching Focus.

Approximately two hours was spent on instructional planning for spelling. This instruction occurred last and aimed for students to integrate their increased metalinguistic knowledge to analyse and plan for spelling instruction. There were 17 spelling samples used in the activity which consisted of responses to a 20 word spelling task completed by children aged 6-7 years. As detailed above, spelling analysis and teaching had been targeted in earlier lectures with a focus on one element of metalinguistic knowledge (e.g., phonological analysis of spelling attempts). The students worked in small groups to score the 17 samples, provide a descriptive analysis of spelling errors, group children according to instructional focus and to detail what the instructional focus in the first lesson would be for each group. Randomly selected student groups reported their findings to the whole cohort on three occasions (i.e., after the time given to complete the assessment analysis, grouping and instructional targets was completed). Feedback was given by the lecturer at these points and opportunities for students to raise questions were given. The lecturer also moved around the student groups throughout the entirety of the activity to facilitate learning throughout the task. The spelling samples that were used in the session were uploaded to the course website so the students could review the activity following the lecture.

Measures

The post-course measures were incorporated into the final examination to determine the students' metalinguistic knowledge for spelling instruction after completing the course. The measures were not completed at the start of the course given the large body of literature detailing the generally low performance of pre/in-service teachers on metalinguistic tasks and the need to reduce test-retest effects. Consistent with international findings, pre-course testing involving earlier cohorts of students within the same degree programme has shown a generally low performance on metalinguistic tasks (Carroll et al., 2012; Purvis et al., 2016). For example, Carroll's evaluation of first and third year students (data taken before metalinguistic content for spelling instruction was integrated into the degree) showed phoneme counting tasks were completed at 55% and 68% accuracy in each group. Further, Purvis's pre-teaching course results also revealed low performance with participants scoring 52%, 24% and 39% in the phonemic awareness, morpheme knowledge and orthographic knowledge tasks respectively. The comparison groups utilised in the current study had also participated in a one-off evaluation.

The post-course measures were identical to those employed in previous research so that the students' performance could be compared to other preservice and in-service teachers with various levels of experience and exposure to metalinguistic content. All assessment measures were re-scored and re-calculated by an independent reviewer (a doctoral student in literacy education) to ensure the accuracy of results. The measures included the following tasks:

Identification of phonemes. (Carreker et al., 2010). In this task, students were required to identify the number of phonemes in 10 target words. For example, 'jump' has four phonemes: /ʤ/ /ʌ/ /m/ /p/. The stimulus items consisted of words containing three to five phonemes. Raw scores out of 10 were collected for analysis.

Identification of morphemes. (Carreker et al., 2010). In this task, students were required to identify the number of morphemes in 10 target words. For example, 'keeper' has two morphemes (keep-er). The stimulus items consisted of words containing one to three morphemes. The items included in the task were chosen to include a range of words with similar numbers of syllables but varying morphological complexity. Multiple words with the

–ed bound morpheme were included, each with varying levels of morphological complexity (e.g., jumped, inhaled). Raw scores out of 10 were collected for analysis.

Spelling instruction selection. (Carreker, 2007). In this task, students were required to identify the most appropriate teaching focus for particular spelling errors. On the left hand side of the page a list of 12 groups of spelling errors (with three examples of each error type) was presented and the student identified one of nine listed activities that was the most appropriate instructional focus. For example, for the errors 'lookt' for 'looked', 'churchez' for 'churches' and 'campen' for 'camping', the most appropriate instruction would be 'to teach inflectional endings' rather than other options such as teaching phoneme awareness. The task provides a preliminary means to explore whether students can apply some of their metalinguistic knowledge to a practical task. It is important to acknowledge that this task is not a direct measure of teacher competency in spelling assessment or instruction. It does give us some insight, however, into students' emerging ability to apply their growing phoneme, morpheme and orthographic knowledge in a more practical task. The definition of what was 'the most appropriate' spelling instruction within the task was clear-cut from the errors described. For example, a child using these errors 'lookt' for 'looked', 'churchez' for 'churches' and 'campen' for 'camping' would clearly not benefit greatly from identifying sounds in blends etc given that ability was clearly shown in the example attempts. The methodology for the assessment was chosen to enable an insight into this emerging knowledge for the whole cohort of students. Although the task was effectively multiple choice, the use of 9 potential options as correct items for each items limited over-inflation. It is not assumed to provide an assessment of students' competence in teaching and/or assessing spelling. Further information about the development of this measure can be viewed in Carreker (2007) and Carreker et al., (2010). Raw scores out of 12 were collected for this analysis.

Intervention Fidelity and Attendance

A number of fidelity checks were completed to ensure adherence to the intervention content described above. The recorded lectures and online course materials were independently reviewed by a doctoral student in literacy to validate the time spent on each topic. The analysis showed 100% adherence to the amount of course time devoted to teaching phonological awareness, orthographic awareness and morphological awareness knowledge respectively.

Checks were also made to ensure that the items used in the post-intervention measure were not directly targeted within the course content. One item (10%) within the phoneme counting and morpheme counting tasks was directly included within the course content. The word 'jump' and 'jumped' were broken down into their constituent phonemes and morphemes following discussion of an error within a writing sample that a student had collected where a child had spelled 'jumped' as 'jumpt'. No items in the spelling instruction measure had been directly taught within the course content.

Attendance was collected for the 5 lectures and showed that 78% of student attended all five lectures. Of those students who were absent from a lecture, 82% accessed the lecture recording via the course's website. Thus, there was only a small portion of students who did not attend all five lectures (in person or virtually) focused on metalinguistic content for spelling instruction. Analysis of the course website for the target content showed that 82% of students had accessed the lecture recordings and/or associated activities on at least one occasion throughout the 10 week course.

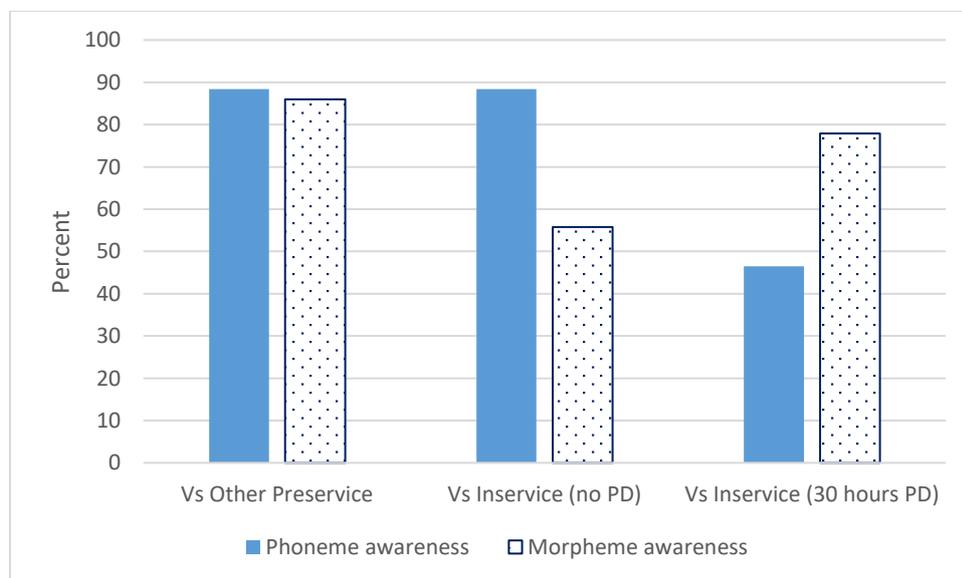## Results
Phoneme and Morpheme Identification

A comparison of the groups' performance (percent correct) on the phoneme identification and morpheme identification tasks was conducted (see Table 1). The comparison showed that the experimental cohort out-performed the comparison preservice group in phonemic awareness and morphological awareness knowledge. The experimental group outperformed the in-service (without professional development) group in phonemic awareness. They performed similarly to the 'inservice with PD' and 'inservice without PD' groups in the morpheme awareness task.

	Experimental (n = 86)		Other preservice (n = 36)	In-service without PD (n = 38)	In-service + 30 hrs PD (n = 56)
	M	*SD*	*M*	*M*	*M*
Phoneme ID	78.8%	(17.5)	49.7%	57.3%	85.5%
Morpheme ID	72.9%	(18.6)	51.1%	70.2%	64.5%

Note: Phoneme ID = phoneme identification task (10 items); Morpheme ID = morpheme identification task (10 items); Other preservice = preservice teachers who have not had metalinguistic content; In-service without PD = In-service teachers who have not received professional development in metalinguistic content; In-service + PD = In-service teachers who have participated in 30 hours of professional development focused on metalinguistic content.

Table 1: Group comparison on performance (percent correct) in phoneme identification and morpheme identification tasks.

The number of participants in the experimental group who performed above the mean of each of the comparison groups in the phonemic awareness and morpheme awareness tasks was also determined. This analysis showed that the performance of the experimental cohort across these measures was most similar to the 'inservice with PD' group (see Figure 1).

Note: Other preservice = comparison preservice group had not received metalinguistic content (n=36); Other in-service = in-service teachers who had participated in metalinguistic professional development (n=38).

Figure 1: Percent of Experimental Group who performed above the mean of each comparison group in phonemic awareness and morpheme awareness tasks.

A qualitative analysis was also undertaken to compare the groups' performance on the phoneme identification and morpheme identification tasks descriptively. Figures 2 displays the percent correct achieved for each item on the phoneme identification tasks by the research cohort, preservice comparison group and the 'in-service without PD' group. The graph shows that the research group had a particular strength in segmenting words with blends (e.g., trim, brush, string) in relation to the comparison groups. Further analysis revealed 17% of the research cohort scored 100% of items correctly (compared to 0% in the preservice comparison group and 5% in the 'in-service without PD' group.
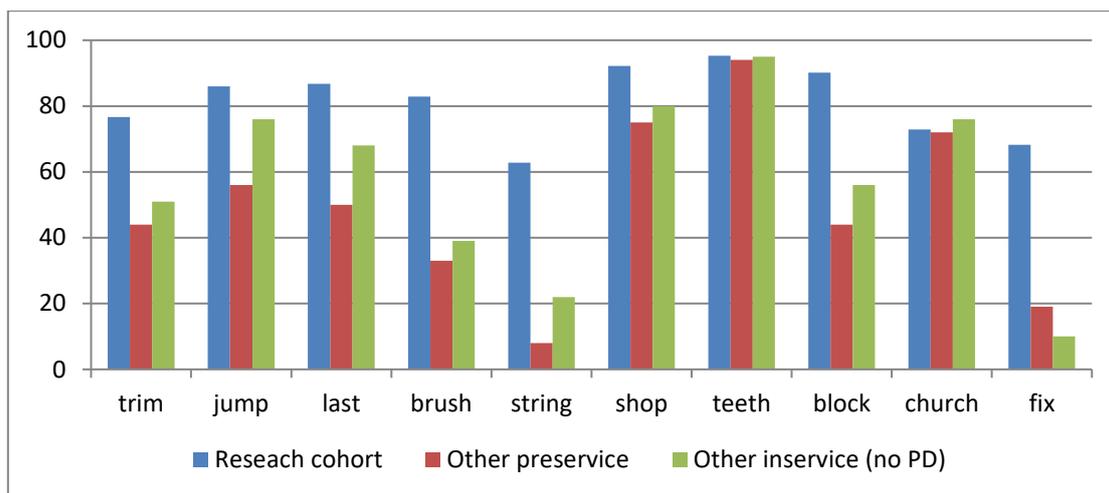
Note: Other preservice = comparison preservice group had not received metalinguistic content (n=36); Other in-service = in-service teachers who had participated in metalinguistic professional development (n=38).

Figure 2. Item by item comparison between groups on the phoneme identification measure (percent correct).

Figure 3 displays the percent correct achieved for each item on the morpheme identification tasks by the research cohort, preservice comparison group and the 'in-service without PD' group. The performance of the experimental cohort was more varied in this task. For example, they performed strongly in relation to the comparison groups on the items 'salamander' and 'supervisor', but poorly on the item 'inhaled'. Further analysis revealed 5% of the research cohort scored 100% of items correctly (compared to 2.6% in the preservice comparison group and 2.8% in the 'in-service without PD' group.
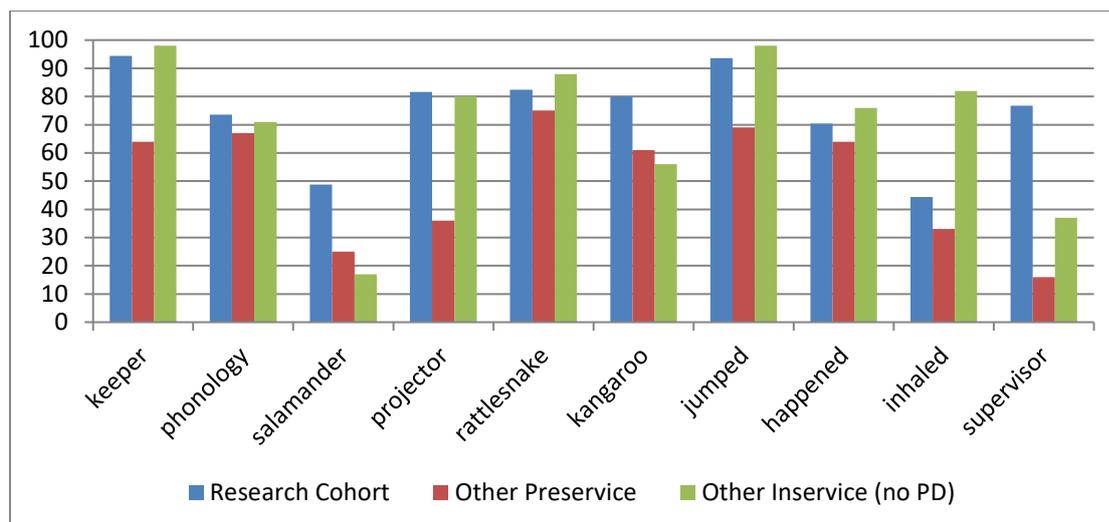
Note: Other preservice = comparison preservice group had not received metalinguistic content (n=36); Other in-service = in-service teachers who had participated in metalinguistic professional development (n=38).

Figure 3. Item by item comparison between groups on the morpheme identification measure (percent correct).

Spelling Instruction Selection

The research cohort scored an average of 63.7% (23.9) in the spelling instruction selection task. This is in comparison to the 54.5% and 63.6% scores achieved by the in-service without PD' group and the 'in-service with PD' group respectively. The comparison with the performance of the other preservice group is limited given their average percent correct was not reported in the Carreker et al. (2010) study. Descriptive analysis revealed that 58% of participants from the research cohort scored more than 50% on the spelling instruction assessment (versus 25% for the comparison preservice group and 50% of the 'in-service without PD' group).

Discussion

This study examined the phonemic awareness, morphological awareness and spelling instruction selection skills of 86 preservice teachers following completion of 10 hours of course work focused on metalinguistic knowledge. Participants' performance was compared to preservice and inservice teachers who had not completed content focused on metalinguistic knowledge for spelling instruction, and inservice teachers who had completed 30 hours of professional development in the area. The study was novel in its attempt to contextualise the relevance of students' level of metalinguistic knowledge for their capacity to select appropriate spelling tasks. The coursework evaluated in the study was also delivered at a higher intensity than previous research involving preservice teachers.

The research questions sought to ascertain whether the experimental group would present with weaker or stronger skills across measures than the three comparison groups. Analysis of the scores in the phoneme identification task suggested the coursework was effective at building knowledge. The phonemic awareness knowledge of the research cohort was stronger than the comparison group of preservice teachers (78.8% versus 49.7% respectively). The research cohort's phonemic awareness knowledge was also stronger than the 'inservice without PD' group and comparable to the 'inservice with PD' group. Comparison with the results presented in Purvis et al. (2016) also provides useful information

regarding the effectiveness of the coursework. The research cohort's phoneme identification knowledge was slightly higher than the 72.9% accuracy achieved following 7 hours of coursework in the Purvis et al. study. Different words were used in the phoneme identification tasks in the Purvis study and the current study which limits this comparison.

The results suggested that the coursework was also effective at building students' morpheme awareness. The experimental cohort out-performed the preservice and inservice group who had received 30 hours of professional development. The experimental group also performed comparably to the inservice group who had not undertaken professional development. There is still some question around the participants' competency in morphological knowledge following the course given their accuracy of 72.9% in this measure. It is also surprising that the 'inservice with PD' group appeared to struggle more with morpheme identification than the 'inservice without PD' group. Together these results suggest that methods to teach morphological awareness to preservice and inservice teachers may need further refinement. More instructional time than the 2 hours allocated in the current study may also be needed to build preservice teachers' morphological awareness knowledge to a desired level.

Analysis of the performance in the spelling instruction assessment showed the experimental cohort out-performed the 'inservice without PD' group and performed similarly to the 'inservice with PD' group. Considering the practical nature of the task, the research cohort's performance is promising and indicates their ability to apply their stronger metalinguistic knowledge to support teaching decisions was emerging. It is important for future research to continue to address the impact of coursework focused on metalinguistic knowledge for spelling instruction on students' teaching in practical terms. For example, it would be useful to evaluate whether students were able to incorporate their knowledge into their teaching on professional practice within their degree.

The current findings have a number of implications for the preparation of teachers. The results signal the importance of integrating phonemic and morphological awareness content into general literacy coursework for students. Further, an appropriate amount of course time must be devoted to the content to enable students more time to build knowledge and integrate that knowledge with other coursework whilst considering what is feasible within teacher education programmes. Longer term follow-up of participants is needed to ensure that students maintain and ideally continue to grow their knowledge in this area through later experiences within their teacher preparation programme.

Given the exploratory nature of the study, some limitations must be taken into account when considering the findings. As there was no pre-test administered, it is difficult to ascertain the extent of growth in metalinguistic knowledge for the experimental cohort over the study. It is, however, highly unlikely that the participants presented with strong metalinguistic knowledge for spelling instruction at the outset of the coursework considering the large body of literature indicating preservice teachers' low knowledge in this area. This body of literature showing poor performance in metalinguistic knowledge for spelling instruction also includes the description of previous cohorts of students from the same degree programme as the current participants (Carroll et al., 2012; Purvis et al., 2016). The lack of inclusion of a pre-course measure also had the advantage that the current results were not open to test-retest bias that has been a limiting factor in other studies. It would be useful if future studies included different versions of pre and post-tests that are matched for metalinguistic complexity to avoid this limitation.

There were also some limitations in the analyses that were able to be conducted given the comparison groups were taken from published data. The lack of reporting of standard deviations in the comparison study meant that statistical significance of the differences between groups were unable to be established. Further, the mean accuracy of the comparison

preservice group in the spelling instruction selection task could not be determined. There were also important differences across groups that limited the comparisons made. The use of comparison groups based in the United States and New Zealand is a limitation in the study and limits the ability to generalise across groups. The gender balance across the groups was also not even which provides further limitations to comparisons. Future studies should look to recruiting multiple comparison groups so that the analysis is not restricted by these factors.

Implications for the number of teaching hours that are optimal to build preservice teachers' metalinguistic knowledge for spelling instruction must be considered alongside other areas of knowledge and practice that are necessary to be effective literacy teachers. Contact time within teacher preparation programmes is limited and further work to optimise how this time is spent to get the best outcomes for students is needed.

Overall these findings suggested that the coursework was effective at building participants' metalinguistic knowledge for spelling instruction to a comparable level to inservice teachers who had completed professional development on such content. Future studies using more controlled methodology are needed to replicate the findings, refine the components of the course content and establish the optimal number of hours of training to ensure the application of knowledge within practical settings. The shift to exploring the value of various approaches to prepare preservice teachers to provide explicit spelling instruction will mark an important step in enhancing early spelling development for all children.

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