



## To what extent does children's spelling improve as a result of learning words with the look, say, cover, write, check, fix strategy compared with phonological spelling strategies?

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### ABSTRACT

The ubiquitous weekly spelling test assumes that words are best learned by memorisation and testing but is this the best way? This study compared two well-known approaches to spelling instruction, the rule based and visual memory approaches. A group of 55 seven-year-olds in two Year 3 classrooms was taught spelling in small groups for three lessons a week, 20-min per lesson, over ten weeks. In the first intervention, students learned statistically likely spelling strategies for vowel sounds, syllable breaking strategies, and the doubling rule. In the second intervention, students used a look, say, cover, write, check, fix strategy, listed words in alphabetical order, and wrote them in sentences. The control group completed non-spelling activities. Results showed that although both intervention groups learned to spell taught words better than the control group, the rule-based approach had greater transfer to spelling of new words for both proficient and less proficient spellers.

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There are many different ways to teach spelling but many of them reflect one of two ideas about spelling: one, that it is based on rules; two, that it is based on visual memory (Kreiner & Gough, 1990). The first idea, to teach rules, is appealing because a limited number of rules should help with the spelling of many more words than the number of rules, however rules can be complex in that the same sound can have more than one spelling (e.g. the /oo/ in boot, soup, crew, or /eh/ in red, tread, said). Also, some sounds are spelled using less common spelling patterns, e.g. /f/ spelled as “ph”; /k/ spelled as “ch”. In the present study, to reduce this complexity, we taught only two or three of the most common ways to spell a sound and used suggestions by Kessler and Treiman (2003) to use words that followed the same pattern as in “side, ride, hide”. The second idea, to use rote learning rather than rules, could be considered appealing for two reasons: firstly, because the actual spelling of the word is remembered through practice rather than having to think of which rule it follows and constructing the spelling from rule knowledge; secondly, because there are many words in English that

have inconsistent and irregular spellings so that rote learning of these words would appear to be more efficient.

In the present study we selected words from published stories following the recommendation of researchers that one way to improve spelling is to engage in reading of text (Graham, 2000; Krashen, 1989). To incorporate this idea in the study we read stories to all the children as part of their spelling lessons so that all groups were exposed to the same spelling words through reading of text. The control group did not receive spelling instruction like the other groups but the students did read a story each lesson and that gave an opportunity to learn the spellings of words implicitly through reading.

Spelling instruction appears to have a positive impact on ability to spell. In a meta-analysis of more than 50 studies, using effect size (ES) as a way to measure how well intervention groups compared with control groups, Graham and Santangelo (2014) found that: spelling instruction was better than no instruction  $ES = .54$ ; more spelling instruction was better than less spelling instruction  $ES = .70$ ; teaching of spelling was better than spelling being “caught”  $ES = .43$ ; spelling instruction transferred to writing  $ES = .94$ ; gains from spelling instruction were maintained over time  $ES = .53$ ; spelling instruction improved phonemic awareness,  $ES = .51$ ; spelling instruction improved reading  $ES = .44$ . These findings suggested that spelling instruction does have positive effects. What the meta-analysis did not show, however, was which instructional approach was likely to be most effective.

The aim of our study was to assess whether a traditional spelling approach used in many New Zealand classrooms, namely a weekly corrected test using a rote learning strategy, was more effective than teaching students a set of spelling rules and showing how these could be used to spell words. Our rule-based approach was similar in design to a study by Hilte and Reitsma (2011) who addressed this issue. They provided 222 seven-year-old Dutch children with additional computer-assisted spelling instruction focused on the “doubling” rule, that is, to double the consonant that follows the first short vowel sound in a two-syllable word, as in “rabbit”. Some children received rule-based instruction and some no-rule instruction. The researchers compared their progress both with each other and with a control group of 209 children who received no additional spelling instruction. Each child received 20 min of instruction on a computer for four sessions. To illustrate the instruction, the child might be shown a target word like “hopped” on the computer screen. In the rule group they were told the doubling rule, that is, told to double the consonant when they spelled the word. In the no-rule group they were not told the rule. After seeing the word on the screen, they spelled it. If it was correct they were shown a green light and if it was incorrect they were shown a red light. Some children were given a wider range of exemplars of the rule and others were given a limited number of examples. Children were assessed on the words they were taught and also on transfer words that they had not seen before. The results showed no difference between the rule and no-rule groups on trained words whether in a small set of exemplars or a larger set. In addition, both groups spelled the trained words and transfer words better than the control group who did not receive the word training. One finding was that children only needed one or two practices to improve in spelling of trained words – this is similar to the corrected test effect (Alber & Walshe, 2004; Griffith & Leavell, 1995; Horn, 1947; Turner, Rafferty, Sullivan, & Blake, 2017; Wirtz, Gardner, Weber, & Bullara, 1996). Another finding was that the rule and no-rule groups achieved similar gains for trained words whether with a small set of exemplars or a large set. A third finding was that the rule and no-rule

groups made similar progress for the small set of transfer words, but for the larger set of exemplars, the rule-based group did better on transfer words than did the no rule group.

Kemper, Verhoeven, and Bosman (2012) reported different findings to those of Hilte and Reitsma (2011). They taught a morphological rule and an orthographic rule to first grade children including children with and without spelling difficulties. The no-rule group studied the target words but were not told the spelling rule that applied to the words. The rule group were given the same words to learn but were told the spelling rule. The control group did not receive instruction. The researchers found that rule-based training was effective for children with and without spelling difficulties for trained words. The rule-based training generalised to untrained words but only for the children without spelling difficulties. For children in the no-rule condition and the control group the training had no effect on trained or untrained words. The results suggested that rule-based training was effective for children without spelling difficulties in terms of transfer to new words but not for children with spelling difficulties. No-rule training was not effective at all. They concluded that although children do learn the spelling of words through practice and exposure to print this is rote knowledge and not rule knowledge. Rote knowledge is unlikely to transfer to the spelling of new words whereas rule-based knowledge will do this.

Our study addressed the same issue about whether children would learn to spell words more effectively with a rule-based or no-rule based approach – but in English. Similarities between our study and the Hilte and Reitsma (2011) study were that the children were of a similar age, were randomly assigned to groups, were also in three different experimental conditions, and were assessed on trained words and transfer words. Our study differed in that spelling ability was included as an independent variable. In addition, the control group was given an alternative intervention, that is, reading a story plus comprehension, vocabulary, and punctuation activities. The teaching was done by tutors in the classroom setting using small groups rather than by interface with a computer program. The intervention in this study was for a longer period of time, over 10 weeks with three 20-min lessons each week. There were more spelling rules taught than just the doubling rule. The words were chosen from children's stories and these stories were read as part of the lessons. The study also included student feedback about the lessons given at the end of the study.

#### Research questions

- (1) Would the rule-based group and the no-rule based group differ in their learning of trained words compared with the control group?
- (2) Would the rule-based group and the no-rule based group achieve higher scores for spelling of transfer words than the control group?

## Method

### *Participants*

The participants were from two Year 3 classrooms in a decile five school in a regional city in New Zealand. [Decile 1 is the lowest category in a scale used by the Ministry of Education (Norris, Bathgate, & Parkin, 1994) to determine levels of funding for schools with more funding going to lower decile categories. Decile 10 is the highest category on the scale]. The school was selected because it had a diverse population with over 40 nationalities

represented, was large (a roll of 590 students at the beginning of the year and 660 students at the end of the year), and had at least two Year 3 classrooms. The school was approached by the researchers who were seeking two Year 3 teachers who would be willing to have their classes participate in the study. The deputy principal, who was approached by the researchers, then approached four Year 3 teachers at the school to determine if they would be willing to have their class participate in the study. Two teachers agreed to have their classes participate.

One classroom had 27 students (10 boys and 17 girls) and the other classroom had 30 pupils (12 boys and 18 girls), a total of 57 students (mean age 7 years 7 months). Consent was given by 55 parents and children. A total of 55 students (26 in one classroom and 29 in the other) participated in the study. Of the 55 students who participated in the study, 22 were boys and 33 were girls. Forty-six students spoke English as their first language and nine were English language learners. Thirteen students were European, 27 identified as Maori, and 15 as "other". Other included Middle Eastern, Japanese, Indian, African, Fijian, Chinese, Samoan, and South East Asian.

Prior to commencing the study consent was sought from the participating classroom teachers, parents and the children in the two classrooms. One researcher met with the two teachers in July to explain the study in more detail and answer any questions.

### *Pretest measures*

The following norm-referenced spelling measures were used for screening. All assessments were administered in a class setting.

#### *Wide Range Achievement Test – 4*

The spelling subtest of the *Wide Range Achievement Test – 4* (WRAT4, Wilkinson, 2006) has two forms, Green and Blue. Each form consists of two sections. The first section is letter writing where children write their name and 13 dictated letters. The second section is spelling which consists of 42 words. Green words range from *go* to *mnemonic* and the Blue words range from *on* to *pusillanimous*. Children aged seven or younger completed both sections and children aged eight or older completed the second section. When more than 10 consecutive spelling errors were made, testing stopped. The WRAT4 test took about 20 min to administer. Each word was presented individually, then in a sentence, and then individually. Children completed the Green spelling form at screening. Internal reliabilities using Cronbach's alpha for ages 7 and 8 respectively for the Green form were .87 and .86 and for the Blue form were .82 and .87.

#### *Test of Written Spelling (5th ed.) (TWS-5)*

TWS-5 (Larsen, Hammill, & Moats, 2013) is a norm-referenced test with two equivalent forms, Form A and Form B. Both forms consist of 50 words. Form A words range from *yes* to *affidavit*; Form B words range from *stop* to *liaison*. Children completed Form A for screening. It took 20–25 min to administer. Items were scored from the basal level (spelled five words in a row correctly) to the point where the student made five consecutive errors or until all words had been attempted. Reliabilities were over .90 for each form of this test. Each word was presented in the same way as for the WRAT4.

### Diagnostic Spelling Test

The *Diagnostic Spelling Test – Irregular Words (DiSTi)* (Kohnen, Colenbrander, & Nickels, 2012) assessed the ability to spell irregular words. Irregular words are words where letter-sound relationships cannot be consistently applied (e.g. *the, their, this*). *DiSTi* consisted of 74 irregular words ranging from *good* to *mayonnaise*. Testing stopped when five consecutive errors were made. The *Diagnostic Spelling Test – Nonwords (DiSTn)* assessed ability to spell over 40 sound-letter relationship rules. The “*DiSTn* evaluated which sound-letter-rules a person can apply when spelling nonwords” (Kohnen et al., 2012, p. 1). The measure consisted of 74 nonwords, from *mip* to *zoish*. All 74 words were administered.

### Weekly spelling tests

In Week 1 all participants were post-tested on 10 focus words. In Weeks 2–10 participants were pre- and post- tested on the 10 focus words. In Week 2 participants were post-tested on five transfer words and from Weeks 3–10 participants were pre- and post- tested on five transfer words. The pretesting of the 10 words took place at the beginning of Lesson 1 of each week and the post-testing occurred at the end of the third lesson each week.

At the end of the study, students were asked to give some feedback about what they had learned from the lessons and also what they thought they would like to know more about. Students were given a one-page questionnaire and completed their responses by hand.

### Procedure

The norm-referenced screening measures were administered by the classroom teacher. One researcher was present when the testing took place, roaming around the room to ensure all students understood the procedure. The measures were administered over three sessions with no individual session being longer than 40–45 min. The assessments were marked by two individuals, one researcher and one tutor.

Following the pretests, the children in each room were placed in one of two groups based on spelling ability (i.e. low-spelling or high-spelling) using data from the WRAT4 pretest on the basis of a median split. Within each ability group, children were then randomly assigned to one of three instructional subgroups: low-spelling or high-spelling strategy group; low-spelling or high-spelling list group; or low-spelling or high-spelling book reading control group. There was a total of six subgroups per classroom; twelve groups in total.

For 10 weeks, three times a week for 20 min, the six groups in each classroom were taught by trained tutors. Tutors 1 and 2 had MEd degrees and were trained teachers. Tutor 3 was in her final semester of a BTch degree. Tutors attended four training sessions, ranging between one and 1.5 h. Tutors were trained by the researchers. In addition to this, the tutors met with one of the researchers prior to the first lesson each week to make sure they were clear about the lessons they were to teach that week. Tutors taught each group (i.e. strategy, list or book reading group) for a minimum of three weeks (see Table 1) and then switched to another group. This was done to control for possible tutor effects. The number of participants in each group, by room, is shown in Table 2.

**Table 1.** Rotation of tutors.

	Strategy group	List group	Book reading group
Weeks 1–4	Tutor 1	Tutor 2	Tutor 3
Weeks 5–7	Tutor 2	Tutor 3	Tutor 1
Weeks 8–10	Tutor 3	Tutor 1	Tutor 2

**Table 2.** Number of participants in each group.

	Strategy ( $n = 18$ )	List ( $n = 19$ )	Book reading ( $n = 18$ )
High spellers – room 1	5	5	5
High spellers – room 2	5	4	4
Total of high spellers	10	9	9
Low spellers – room 1	4	5	5
Low spellers – room 2	4	5	4
Total of low spellers	8	10	9

### *Materials for teaching*

The lesson plans for each group were prepared by the researchers. There were three lesson plans written for each group, each week, for 10 weeks. A total of 90 plans was prepared.

### *Strategy, list and book reading groups*

Each week the strategy, list and book reading groups were read the same story recommended by the publishers as suitable for their age (7–8 years) using the shared reading approach. The shared reading approach is an instructional approach, during which the children can see the words as the teacher reads the book aloud. Children can either have their own copy of the book or the teacher can use an enlarged book. The 10 weekly focus words were in the story that was read. All participants were exposed to the same words but the teaching focus of each group was different. In the strategy group the participants were taught a spelling rule that related to the focus words. In the list group the children were taught how to spell the focus words using the six-step strategy of look, say, cover, write, check, fix; put the words in a sentence; put words in alphabetical order. In the book reading group the children focused on different tasks each lesson: vocabulary strategies using words in the story; how to diagram the structure of stories (characters, setting, plot and theme); different kinds of punctuation marks. All groups including the control group were able to see the trained words during the shared reading of each story.

Transfer words were not in the story but followed the pattern that was being taught to the strategy group participants. The purpose was to see if learning the strategy spelling rule, or learning to spell words using the six-step method of look, say, cover, write, check, and fix transferred to words that were not taught words but followed the same pattern as the focus words.

### *Strategy group*

The three 20-min lessons followed a similar pattern each week. The first lesson of the week began with a pre-test of the 10 focus words and, from Week 3, five transfer words. Students were then introduced to a spelling strategy and/or reviewed a previously taught strategy.

In the second lesson of the week the spelling rule was reviewed and part of the selected story that contained the 10 focus words was read to the children. In the third lesson the rule was reviewed and the rest of the story was read, followed by a post-test of the 10 focus words. From Week 3 the five transfer words were also post-tested (see Table 3 for an overview of the strategies taught). To help children learn the rules we provided a chart called the “Big 8” spelling strategies, which presented the long vowel spellings, the doubling rule and syllable breaking – see Table 4. Tutors also taught students “turtle talk”, to say words slowly so as to separate each of the phonemes in a word (Gough & Lee, 2007).

### List group

The three weekly lessons followed the same sequence for 10 weeks. The list group were taught the six-step strategy of look, say, cover, write, check, and fix. The focus words each week were the 10 focus words from the story that all participants read, which were the same words the strategy group were focusing on. In lesson one students used the six-step strategy to spell the focus words. In lesson two, part of the selected story was read to the students, using the shared reading approach, and students were asked to identify the focus words in the story. Students then put some of the words in a sentence. In lesson 3 students used the six-step strategy to spell the focus words and then put the 10 focus words in alphabetical order. At the end of lesson 3, students were post-tested on the focus and transfer words.

**Table 3.** Overview of the strategies/rules taught.

Week	Spelling strategy/rules taught	10 focus words	5 transfer words
1	Focus on silent e rule: as in <b>mate, Pete, side, hole, mute</b>	came, plate, hiding, inside, placed, striding, smiled, Jones, caretaker, hole	
2	Recap silent e Focus on doubling rule (double the consonant followed by a single vowel to keep the vowel short)	chatted, buddy, snuggle, patted, filled, running, dinner, sitting happened, shipping	
3	Recap doubling rule Focus on long e sound as in <b>eve; bee; sea</b>	better, feeling, flapped, teacher, rubbish, seemed, rattled, sneaked, treetops, trees	beetle, sleeping, leap, creep, beast
4	Recap long e sound as in <b>eve; bee; sea</b> Focus on long a sound as in <b>pay; paid</b>	way, always, saying, hallway, train, trail, straight, heaps, cheek, screamed	plain, mainly, spray, laid, tray
5	Focus on long o sound as in <b>coat; snow; stone</b>	nose, know, notebook, snowman, slowly, stone, grows, snow, closed, coat	bone, fellow, goat, blow, float
6	Focus on long i sound as in <b>hide; high; by</b>	bright, smile, might, size, night, inside, sighed, driver	delight, thigh, dynamite, cycle, appetite
7	Focus on r controlled vowels as in <b>far, port, proper</b>	are, corner, property, whispered, carpet, airport, cucumber, marshmallow, enormous, muttered	spanner, forgot, caterpillar, explore, remember
8	Focus on syllable breaking	suddenly, playtime, forgotten, pikelet, watery, collect, exercise, careful, skipping, dentist	hunters, sometimes, discover, plastic, wallet
9	Focus on short u and long u sounds (blue, blew, use)	chug, puff, uncle, under, crew, drew, screwed, blue, rescue, used	thump, sunk, threw, cashew, true
10	Focus on ou/ow sound and multi-syllable words	mouse, mouth, allowed, town, power, garden, corner, discovered, newspaper, allergic	powder, drown, ground, voucher, mouth

**Table 4.** The “Big 8” spelling rules.

The Big 8 spelling rules	
<b>Turtle Talk</b>	sh-o-p  s-p-ar-k b-r-igh-t
<b>Short vowel sounds</b>	at egg in on up
<b>Split vowel digraphs</b>	ate eve time hope cute
<b>Consonant digraphs</b>	ch - church sh - ship wh -when th - that
<b>Vowel digraphs</b>	ai, ay – rain, ray ee, ea – keep, meat ie – pie, sigh oa – oat, boat ue, ew – blue, new
<b>r-controlled vowels</b>	ar - car er - her ir -sir or - for ur - fur
<b>Syllable splitting</b>	car-pet mag-net-ic a-corn jo-king
<b>Rabbit rule</b>	rabbit dinner cotton ladder

### ***Book reading group***

Each week the three weekly lessons followed the same sequence. The first lesson of the week started with pretesting of the target words. From Week 3 students were also pretested on the five transfer words. In lesson 1, students focused on vocabulary in the selected story. In the second lesson, students were taught about the structure of narrative text. In the third lesson students made use of the story to study punctuation. At the end of the third lesson students were retested on the focus and transfer words.

### ***Data analysis***

The children were taught in small groups and the unit of analysis in the study was the small group mean (Shaughnessy, 2003). There were three intervention groups (strategy, list, book



reading control). Children were assigned first to low or high spelling ability, then placed in matched triplets, and the students in each triplet were then randomly assigned to conditions. There were two classrooms in the study and this subgroup design was replicated in each classroom. This design created six subgroups in one classroom and six in the other.

Due to some initial complications, the weekly pre-post tests for the 10 taught spelling words did not begin until Week 2, so the statistical analysis was based on the pre-post assessments for nine weeks of the study. The maximum score for the 10 taught words over the nine weeks was 90. The weekly pre-post assessments for the five transfer words that were not taught were not begun until the third week, so analysis of the transfer words was based on pre-post assessments for eight weeks. The maximum score for the five transfer words over eight weeks was 40. Effect sizes were calculated using Cohen's *d*. Using this metric, an effect size of .80 or higher is considered a large effect.

## Results

There was equivalence among the strategy, list, and control groups at pre-test. There were no statistically significant differences between the three intervention groups in terms of gender, ethnicity, age (Strategy:  $M = 7.72$ ,  $SD = .39$ ; List:  $M = 7.73$ ,  $SD = .34$ ; Control:  $M = 7.69$ ,  $SD = .27$ ) or in terms of the spelling assessments (WRAT4, TWS-5, Irregular words, and Non-words) – see Table 5 for means and standard deviations for spelling tests. Thus, as far as possible, the randomly assigned control group and intervention groups were equivalent.

During the study there was some absenteeism. Not all children in the study were at school for the weekly pre- and post- tests due to illness and other factors. Numbers completing pre- and post- tests varied between 48 and 52 for each weekly assessment.

### Outcome results

In order to take account of the possible effects of spelling ability and classroom, a series of repeated measures ANOVAs was carried out to see if there were any interactions of ability or classroom with conditions (strategy, list, control) for the spelling measures but there were none. This indicated that the effects of the instruction were similar for each ability group and across the two classrooms. Since ability and classroom did not add anything to the analyses we report only the group results.

The first research prediction was that the groups who received spelling instruction (strategy and list groups) would achieve greater gains for spelling words taught in lessons than would the control group. Means, adjusted means, and standard deviations are shown in

**Table 5.** Pretest means and standard deviations for WRAT4, TWS-5, irregular words and pseudowords.

Variables		Strategy	List	Book
		Pre	Pre	Pre
WRAT spelling	<i>M</i>	9.10	8.56	8.67
	<i>SD</i>	3.84	3.62	4.07
TWS spelling	<i>M</i>	16.30	15.98	16.43
	<i>SD</i>	6.38	5.57	6.16
Irregular words	<i>M</i>	14.58	15.06	16.35
	<i>SD</i>	10.00	9.71	12.53
Pseudowords	<i>M</i>	20.65	16.85	18.80
	<i>SD</i>	6.86	11.30	10.63

Table 6. An ANCOVA was carried out with condition (strategy, list, control) as the independent variable and total post-test scores as the dependent variable. The total of pretest scores over the nine weeks was entered as the covariate to control for pretest differences in spelling. There was a significant effect of condition on taught words,  $F(2,8) = 20.98$ ,  $MSE = 37.41$ ,  $p = .001$ . Effect sizes were: Strategy versus Control = 4.27; List versus Control = 4.54; Strategy versus List = .48. Follow up contrasts showed that children who received strategy or list training with the taught words made greater gains than did the control group. There was no significant difference between children who received strategy training and children who received list training – the pattern of results is illustrated in Figure 1.

The second research prediction was that the group who received strategy instruction would achieve greater gains for transfer words than would the list or control groups. Means, adjusted means, and standard deviations are shown in Table 6. The ANCOVA analysis showed a significant effect for condition on the transfer words,  $F(2,8) = 8.57$ ,  $p = .010$ . Effect sizes were: Strategy versus Control = 2.07; List versus Control = .27; Strategy versus List = 2.13. Follow up contrasts showed that the children who received strategy training made significantly greater gains than did the control group and the children who received list training. There was no significant difference in mean scores between the children who received list training and the control group. The pattern of results is illustrated in Figure 2.

### Further analyses

In order to explore the relationship between ability to spell pseudowords and ability to spell irregular words a correlation analysis of the data was carried out from the four different spelling measures. The correlations are shown in Table 7. These indicated that ability to spell irregular words and pseudowords was significantly correlated with the WRAT4 and TWS-5 measures. What was not clear from the correlations was whether or not ability to spell irregular words predicted ability to spell pseudowords or vice versa. To explore the relationship further, a scatterplot was generated to show the relationship between non-word and irregular word spelling – see Figure 3. The scatterplot suggests that if the student could spell many pseudowords then they may or may not be able to spell many irregular words. Being able to spell pseudowords was no guarantee of being able to spell irregular words. However, there were no instances of high scores for irregular words and low scores for pseudowords. This suggested that in order to be able to spell irregular words students needed to be able to spell pseudowords, that is, be able to spell phonologically. Students without good pseudoword spelling skills were not good at spelling irregular words. Learning to spell irregular words seemed to need phonological spelling ability as a foundation (Burt & Heffernan, 2012).

An analysis was also done of questionnaires given to students asking for their feedback about the lessons. The general instruction was: "Write down your thoughts about the lessons

Table 6. Means and standard deviations for taught words and transfer words.

Variables		Strategy group			List group			Book reading group		
		Pre	Post	Adjusted	Pre	Post	Adjusted	Pre	Post	Adjusted
Taught words	<i>M</i>	41.92	71.48	70.88	39.30	65.14	66.86	42.50	45.96	44.84
	<i>SD</i>	22.30	14.99		21.95	22.03		27.62	27.54	
Transfer words	<i>M</i>	15.00	20.86	20.33	13.94	15.60	16.02	14.31	15.50	15.60
	<i>SD</i>	10.20	8.59		8.88	9.18		11.16	9.96	

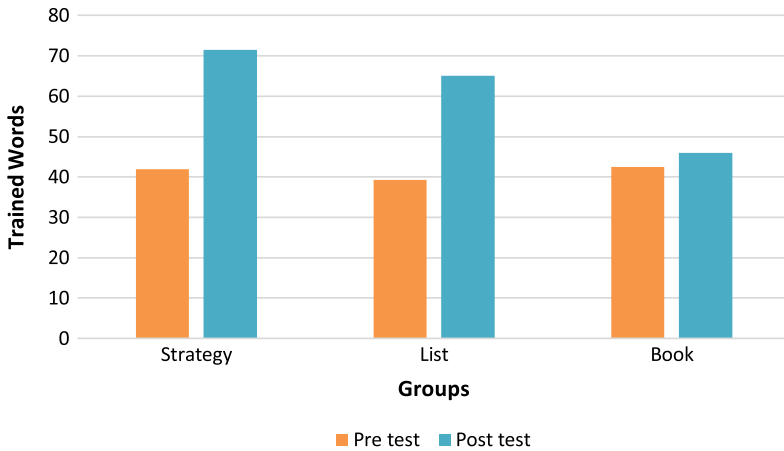


Figure 1. Mean scores for trained spelling words.

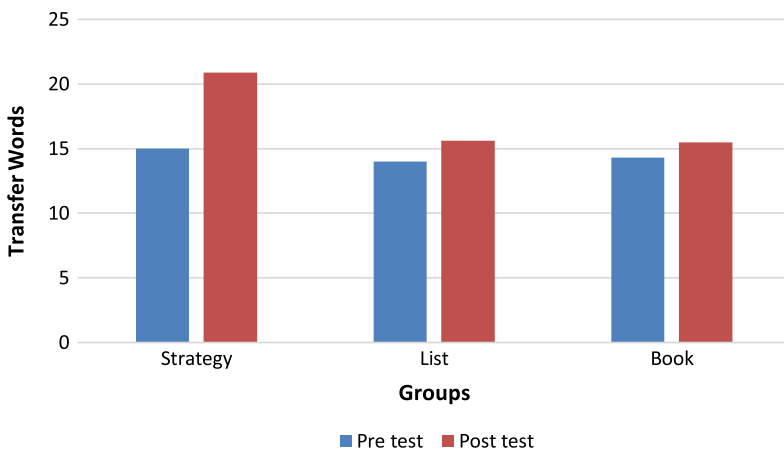


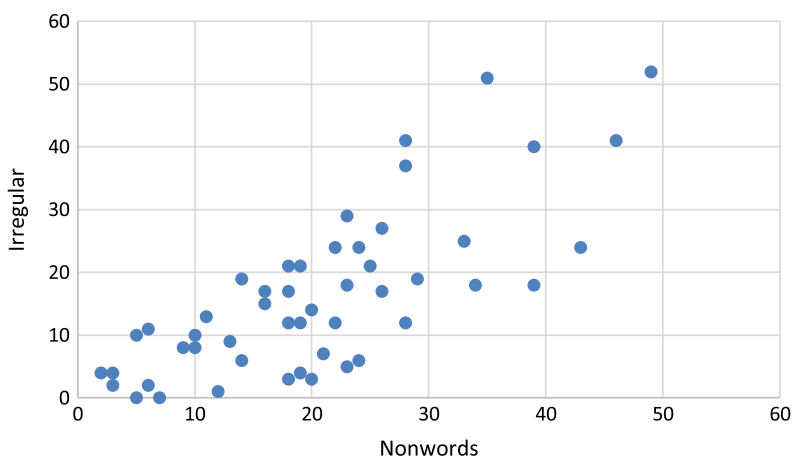
Figure 2. Mean scores for transfer spelling words.

Table 7. Correlations among the pretest results for norm-referenced spelling tests.

	WRAT	TWS	Irregular	Non-words
WRAT4	–	.92**	.92**	.80**
TWS-5		–	.89**	.85**
Irregular			–	.76**
Non-words				–

Note: WRAT4 = Wide Range Achievement Test, TWS-5 = Test of Written Spelling; \*\* $p < .01$ .

you have been having each week.”The first question was, “What things have helped you the most?” Students in the strategy group wrote things like: the rabbit rule, the doubling rule, the magic e, vowels like a e i o u, clapping the syllables. One student in the strategy group wrote; “clapping the selabls of how you now the sounds. And also the rabbit rule and the magic e and the a e i o u thing.” Another student wrote: “Rabbit Rull, magic e, vowlles”. In the list group, students mentioned: look, cover, write, check, writing sentences, alphabetical



**Figure 3.** Scatterplot showing spelling of irregular words compared with non-words.

order. Comments included: “Alphabetical order – fun because I like putting words in order I didn’t know how to do it before. My writing has gotten a bit faster”; “Sounding out words, spelling words, putting the words in alphabetical order”; “Well ... The look cover starjey [strategy]. Told me new word and how to spell them.” In the book group students mentioned punctuation, story analysis, and vocabulary. Comments included: “Nouns, captells, pichites [pictures]”; “Learning stuff I don’t know commas, speech marks, exclamation marks”; “The reading process – understanding the story”; “The meaning of some words that we didat know before”; “I like lerning abat characters and the plot.”

The second question was: “What things would you like more help with?” Students in the strategy group mentioned vowel sounds, spelling hard words, long words, writing sentences. Comments included: “Writing – because it is hard to stay on the lines”; “I need help with my spelling and writing”; “The big and short vowel”; “I need the most help with how to spell hard words and how I know what the rule is”. In the list group students mentioned putting words in alphabetical order and sounding out words. Comments included: “Harder word like pikelet because those type of words get me stuck. I need help.” In the book group, students mentioned punctuation and spelling. Comments included: “comers, verbers, spelling, acgtivers [adjectives]”; “learning to spell long and short words when there difficilet words”.

## Discussion

The theoretical question of whether to teach spelling either by focusing on rules or learning by rote memory is an important one for today’s classrooms. In New Zealand, the teaching of literacy skills is predominantly through a book reading approach with less emphasis on phonological teaching of decoding skills. This might be why, based on surveys of teacher practices in spelling, teachers appear to be divided as to whether to use a rote learning approach to spelling, with lists of words to be assessed each week, or an approach that focuses on phonological patterns (McNeill & Kirk, 2014).

In regard to the first research question, the results showed that the list group and the strategy group both achieved higher scores in spelling of trained words than students in the control group. The control group did not spell the trained words as well as the strategy

and list groups even though there was an opportunity for implicit learning in that they had seen the words in the story they had read. In regard to the second research question, as to whether knowledge gained in the lessons would transfer to new words (transfer words) that had not been trained, the results showed that the strategy group improved more than both the list group and the control group.

The results were consistent with the findings of Hilte and Reitsma (2011) that explicit teaching of a spelling rule not only improved learning of trained words but also enabled transfer to spelling of novel words. Our findings were also consistent with Kemper et al. (2012) who found that teaching rules explicitly helped with spelling of taught words and transfer words. Our results differed in that our no-rule group did learn to spell the trained words. This might have been because we used the look, say, cover, write, check, fix strategy for the no-rule group, which has previously been found to be effective (Erion, Davenport, Rodax, Scholl, & Hardy, 2009; Jaspers et al., 2012; Zielinsky, McLaughlin, & Derby, 2012).

Our results differed from the first experiment in Kemper et al. (2012) in that with implicit instruction they found no improvement at all for higher or lower ability spelling groups for either trained words or untrained words. In contrast, we found that in the no-rule (implicit) condition both higher and lower ability spelling groups were able to learn trained words but were not able to transfer this knowledge to untrained words. When Kemper et al. (2012) provided explicit instruction both groups improved on trained words but only the higher ability spelling group showed evidence of transfer and then only to spelling of pseudowords, not untrained words. In our study, when we provided explicit instruction of rules we also found that both groups improved on trained words but we also found transfer to untrained words. This difference may be due to the fact that in their study they taught a morphological rule whereas we taught orthographic phonics rules. In their study the morphological rule may have been harder to learn implicitly and even when taught explicitly it may have been harder to generalise this knowledge to untrained words.

Another possible explanation for the gains made by the intervention groups in learning of trained words, apart from the use of the look, say, cover, write, check, fix strategy, was that they were able to practise the words several times. This is known as the test effect (Roediger & Karpicke, 2006) or the corrected test effect (Alber & Walshe, 2004; Griffith & Leavell, 1995; Horn, 1947; Turner et al., 2017; Wirtz et al., 1996). In corrected test strategies, the focus words are dictated to students. After spelling the words, students check their answers while the teacher dictates each correct spelling letter by letter and they put a check mark alongside those words that are correct. They then re-take the test. Horn (1947) reported significant improvements in spelling using this approach. Similar positive results were reported by Turner et al. (2017), although in their study children used proofreading marks to correct the misspelled words and then rewrote the misspelled word. Jones et al. (2016) also found that when students were given a spelling test, corrected it, and were tested again a few days later, they improved their spelling. Hilte and Reitsma (2011) also noted that children in their study who practised a smaller set of words only needed one or two practice sessions. It seemed that this practice helped students to acquire a better specified mental representation of the words to be learned. Thus, the results for the focus words for both groups may have been due to the corrected test effect rather than the training method used. Future research could assess whether the two different kinds of training offered more than the corrected test effect by having a further group that did not receive training but did receive the same

amount of test practice, that is, spelled the words when dictated to them, checked their answers against the correct spellings, and then corrected their mistakes.

In regard to the second prediction, we reasoned that in the rule-based group learning a rule about spelling would generalise to new words not taught during the lessons. In contrast, the list group was not made aware of the rule so were less likely to transfer their specific knowledge of taught spellings to other words with similar spelling patterns that they had not been taught. This turned out to be the case. Our result was similar to Hilde and Reitsma (2011) who found the rule-based group achieved higher scores for transfer words. The transfer effect of the training in our study seemed evident in some of the errors made by children in the rule-based group in that they showed an awareness of more plausible spellings such as “flote” for “float” rather than a less plausible spelling like “flot”. Our finding of transfer to untaught words was also similar to Kemper et al. (2012) where higher ability spellers in the rule-based group were able to generalise their learning to pseudowords. In their study the result only applied to better spellers whereas in our study this effect also applied to less proficient spellers.

The results of our study suggest that a rule-based strategy for teaching spelling is preferable to one that is not rule-based. This is because it will enable children to learn studied words but will also enable them to transfer their learning to new words that have not been taught. The no-rule based approach was effective for studied words but the effects of the training did not transfer to new words. The transfer effect is important simply because there are so many words in English to be learned. Learning a small list of words each week in rote fashion as is usual in many classrooms will not enable the student to generalise learning to new words. The rule-based approach, however, teaches students some principled rules for spelling of words. They can therefore make more informed choices about possible spellings when it comes to spelling words they have not learned before. As a result, their spellings are either correct, or if not correct, at least plausible, for example, “cote” rather than “cot” for “coat”.

The follow-up correlational analysis showed that the norm referenced spelling tests were highly correlated with each other and with irregular word and pseudoword spelling. A scatterplot analysis of scores for irregular words and non-words suggests that students with higher scores for pseudoword spelling might or might not be able to spell irregular words, but if they have lower scores on pseudoword spelling they are unlikely to be able to spell many irregular words. These correlational results suggest, consistent with other research (e.g. Burt & Heffernan, 2012; Gough & Walsh, 1991) that pseudoword spelling skill, which requires rule-based spelling knowledge, is important for spelling irregular words, although it is not sufficient. Kemper et al. (2012) found that rule-based training produced gains in pseudoword spelling, so it may be that rule-based training is an important first step in learning to spell both regular and irregular words. This approach would be likely to give confidence to students in spelling the regular parts of irregular words. They could then use this foundational knowledge to build further knowledge of the irregular parts of words, which could be done through extensive reading and writing (Burt & Heffernan, 2012; Gough & Walsh, 1991).

The present study did not assess the possible transfer effects of training to spell irregular words but some evidence of transfer was reported in a study of an aphasic pupil by Brundson, Coltheart, and Nickels (2005). They found that as a result of training to spell irregular words like “brooch”, “colonel”, and “cough” there was some transfer of spelling pattern in attempts

to spell words with a similar pattern, e.g. spelling “tough” initially as “taf”, then after some training as “taugh”, and finally as “tough”.

The feedback from children about the lessons indicated that they enjoyed them. In the strategy group children liked learning different rules such as the rabbit rule and silent e rule. In the no-rule group, children enjoyed the look, say, cover, write, check, fix approach and the putting of words in alphabetical order and writing them in sentences. In the book group, the children enjoyed learning about vocabulary, story structure, and punctuation. Although some might argue that spelling instruction is not an enjoyable activity, children’s feedback in this study did not support this.

In summary, the results of this study suggest that the rule-based strategy and the no-rule memorisation strategy both were equally effective for learning a specific list of taught words and were significantly better than simply being exposed to the spellings of the same words through reading. The reason for this may be partly due to the corrected test effect. Children learn words better if they are tested and then self-correct their mistakes. Teaching rules along with corrected test practice, however, helped not just in learning studied words but in transferring this knowledge to the spelling of new words.

In terms of practical implications, it can be argued that English spelling is more regular than is sometimes supposed, and that teachers can easily develop students’ knowledge of common spelling rules (Henry, 2010). Teaching the “Big 8” spelling rules as in this study would likely be of benefit. In this digital age of the spell checker some may argue that spelling instruction as implemented in our study is not necessary but Graham, Harris, and Chorzempa (2002) found that poor spellers were only able to correct about a third of their errors using spell checkers. A further argument for spelling instruction is that the feedback from students in this study suggests that spelling instruction is not seen as hard work or skill and drill. Students enjoy learning spelling strategies like the doubling rule, the silent e marker, syllable breaking, and common spelling patterns for short and long vowel sounds.

Finally, our analysis of a scatter plot comparing ability to spell irregular words with ability to spell pseudowords showed that the ability to spell irregular words only occurred when the student had adequate skill in spelling pseudowords, which is more likely to happen if the student is taught rule-based strategies as was done in this study. Pseudoword spelling skill relies on ability to engage in rule-based spelling. To conclude, teaching students to spell with principled spelling rules seems more effective in terms of spelling development than learning to spell without rules as in the rote learning approach.

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