

Charlotte Hindley and Sharon Baker



Meeting the Translation Challenge

Rationale

- Westbridge TSA – R&D
- Previous involvement in the ‘Closing the Gap’ research – The impact of weekly spelling tests on pupils’ recall
- TSA continually considering how pupils best learn spellings
- Opportunity to work on Wellcome trust funded project in Neuroscience
- Keen to combine Neuroscience research with our interest in spelling

NEUROSCIENCE for Teachers

Applying research evidence from brain science

Richard Churches, Eleanor Dommett and Ian Devonshire

Foreword by Baroness Susan Greenfield CBE

National College for Teaching & Leadership

A preliminary study into the effects of a weekly spelling test on retaining spellings

Introduction
Weekly spelling tests have been commonly used in primary and secondary schools without research based evidence as to whether they help pupils progress in learning and remembering how to spell. Teachers and Senior Leaders within Westbridge Teaching School Alliance were sceptical as to the impact of a weekly test on pupil's progress in remembering spellings. With the inclusion of spelling lists within the English programmes of study for the National Curriculum 2015, we wanted to research whether spelling tests have a part to play in our school strategies for learning spellings.

Method
Participants
Westfield Community School and Westbridge Teaching School Alliance were selected to participate in the research. The research was conducted in two schools. All classes are similar in size and year 6 classes in both schools were randomly allocated to either the experimental or control group.

Procedure
Eighty words were taken from the year 5/6 word list of the new national curriculum. All pupils were given a pre-test of the 80 words. The words were then split in eight groups of ten. All pupils completed spelling activities in class to learn the ten words of the week. The experimental class each school was also given the words as a word list at the start of the week to take home and learn for a test at the end of the week. Weekly spelling scores were recorded. At the end of eight weeks all pupils completed a post test of the same 80 words in the pre-test. Pre and post tests were carried out by the trial co-ordinators.

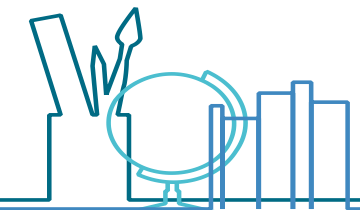
Research design
A between-subject design with a pre and post-test was used. To address the aims of the research the independent variable was defined by two conditions:

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graph LR
    A[Four Year 6 classes] --> B[Randomisation of classes into control and intervention groups]
    B --> C[Control - Current practice]
    B --> D[Intervention - Spelling test]
  
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IV Level 1 – Weekly spelling lessons using existing practice in school (control condition)
IV Level 2 – In addition to the existing practice a weekly list of spelling was taken home to learn and tested each week.


Abstract
The trial co-ordinators wrote context sentences for each of the eighty words drawn from the National Curriculum spelling list for Years five and six. Words were divided into groups of ten and the context sentences containing the words were given to class teachers on a weekly basis to be used within the schools agreed teaching strategies for spelling. In addition the pupils from the two intervention groups received the same list to take home. Pre and post - test recording sheet was produced and scores were recorded in an Excel spreadsheet.



Combining retrieval practices with LCWC improves pupils' progress in spelling

Research Design

- Building on previous research, interested in multiple choice testing as a learning experience
- Within participant design
- Pre and post-tests
- IV level 1 (Control) – no multiple choice testing, LCWC
- IV level 2 (Intervention A) – multiple choice testing
- IV Level 3 (Intervention B) – teaching method used in control condition (LCWC) in conjunction with multiple-choice testing



Combining retrieval practices with Look, Cover, Write, Check improves pupils' progress in spelling

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INTRODUCTION

There is evidence that exposure to a multiple-choice test which children do not know the answer to can improve the learning of that information on a later occasion (Jin and Spill, 2015). This work has suggested that when children do not know the correct thing they attempt to retrieve other related information in order to answer why the other answers are not correct and ultimately select the most likely answer. This is the form of retrieval practice known as a 'best learning' or 'learning what to look for'. At the same time, strategies like Look, Cover, Write, Check (LCWC) have been shown to be effective in teaching spelling (Carter, 2010). This may well be effective because they encourage the holding of new information in working memory and the repetition of that information in a short key phrase for rehearsal (Churches et al., 2017).

METHOD

Participants

Westfield Community School and Park Bridge Academy together form the Westbridge Learning School Alliance. The two primary schools share the same curriculum in English with high levels of cross-curricular application. The research was completed in Year 4 across both in each school. Classes were already stratified in reading ability and mixed gender groups, but were split into three learning groups. In the control condition, the three learning groups were each randomly allocated to the order in which they experienced the three conditions. A total of 156 children took part in the study. There were 52 girls and 104 boys. The results are based on 88 participants (20 boys and 68 girls).

Procedure

Pupils completed a pre-test of all 30 words three weeks before the trial, to reduce possible learning from the pre-test.

- The control condition consisted of ten spellings, using Look, Cover, Write, Check (normal classroom practice).
- Intervention A consisted of ten spellings, using multiple-choice test as a learning event. Pupils were given the correct answer at the end of each multiple-choice test.
- Intervention B consisted of ten spellings, using the control condition - unless coupled with a Look, Cover, Write, Check sheet together with a multiple-choice test as a learning event.

There was a wash-out period of one week between each condition to reduce any carry-over effects (see Churches and Corbett, 2018). At the end of each condition, pupils were assessed on the ten words they had learnt through words held in context, as used in the pre- and post-tests.

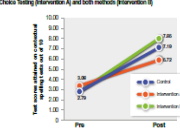
Materials

The research focused on 30 words from the National Curriculum spelling list for Years 4 and 5. The words were divided into three groups of ten. Control consisted of the words used with Look, Cover, Write, Check sheets and multiple-choice sheets were created for the first. These versions of the multiple-choice testing sheets were created so that the pupils saw the words in a different order to each of the three reading sessions, to try to reduce the risk of pupils simply reading words when they were not correct.

RESULTS

Gain scores were calculated from pre- and post-test scores in the graph below (Figure 5).

Figure 5. Pre- and post-test spelling test scores for LCWC (Control) compared with Multiple Choice Testing (Intervention A) and both methods (Intervention B)



An effect size table (see Churches and Corbett, 2018) indicated that the effect sizes at these conditions were small but significant ($p < 0.05$) and therefore unlikely to be caused by likely causes. The ANCOVA was followed by separate one-tailed t-tests where adjusted Bonferroni significance levels were used (Table 6).

Table 6. Comparisons between the pre-test study conditions

	Control v Intervention A	Control v Intervention B	Intervention A v Intervention B
Effect size (d)	0.38	0.18	0.51
CI (95%)	0.20 - 0.24	0.01 - 0.30	0.40 - 0.60
p-value	0.00*	0.01*	0.01*

Testing also differed significantly from normally ($p < 0.05$) and normally and testing ($p < 0.05$) (Figure 6). There were no other significant differences.

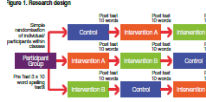
* Significant with alpha = 0.0067
* Not significant and analysis was carried out using Bonferroni.

THE RESEARCH DESIGN

A within-participant design with pre- and post-test was used. The pre-test was conducted prior to randomisation. It was then the pupils in the upper and the lower bands were analysed separately (based on the results of the pre-test). The dependent variable was multiple-choice testing and effect size (Cohen's d) was calculated for each condition.

- IV level 1 (Control) - no multiple-choice testing, LCWC
- IV level 2 (Intervention A) - multiple-choice testing
- IV level 3 (Intervention B) - teaching method used in control condition (LCWC) in conjunction with multiple-choice testing

Figure 1. Research design



LIMITATIONS

The initial sample size of 156 children was reduced to 88 due to attrition as a result of pupil absence. No further methods in the study were then used to address learning or other socio-economic background which may not be representative of the whole population.

Recommendations for future research

Future research may wish to explore the combination of approaches to more detail and also possible negative effects of multiple-choice testing with very young pupils, additionally, both replicating the study and exploring other subject areas within primary school.

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Combining retrieval practices with LCWC improves pupils' progress in spelling

Results

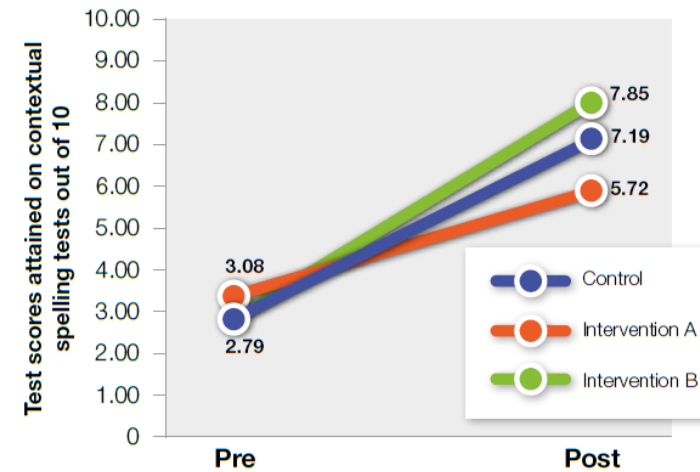
- Intervention B significantly better progress rates
- Intervention A negative effect on spelling
- 47% of children preferred multiple choice testing as a learning method

Impact

- Replicated in different context – Multiplication
- Intervention also had negative effect on recall
- Children unable to infer using existing knowledge with spellings and times tables
- Impact in schools: Whole school reward scheme linked to testing and informed practice

Gain scores were calculated from pre- and post-test scores in the graph below (Figure 2).

Figure 2: Pre- and post-test spelling test scores for LCWC (Control) compared with Multiple Choice Testing (Intervention A) and both methods (Intervention B)



An initial two-tailed Friedmann’s ANOVA indicated that the effect across all three conditions was small but significant ($W = 0.19, p < .001$) and therefore unlikely to be caused by family-wise error. The ANOVA was followed by separate one-tailed Bonferroni adjusted Wilcoxon signed-rank tests (Table 1).

Table 1. Comparisons between the present study conditions†

	Control v Intervention A	Control v Intervention B	Intervention A v Intervention B
Effect size (r)	-0.38	0.16	0.51
CI (95%)	-0.50 – 0.24	0.01 – 0.30	0.40 – 0.60
p-value	.015*	.001*	.001*