A randomised controlled trial of spaced learning in a primary school context
Study A: KS1 parallel replication (geography)

METHODS

Participants, sample size and randomisation
Participants were all pupils of St John’s CE Primary School. There were 120 participants in total: 60 in Year 1 and 60 in Year 2. The existing classes were already stratified for equal numbers of boys, girls, abilities, SEND and autumn- and spring- and summer-born. These whole classes were randomly allocated to the control or the intervention (one for each year group).

Procedures
All classes were taught one geography lesson on the Weather and Physical Features of the Arctic. This subject was chosen because it is not part of the current curriculum and so could be taught as a stand-alone lesson. The participants were taught by their usual teacher and the lesson took place in their own classroom. The control class was taught through a traditional massed learning method, while the intervention group was taught using spaced learning.

The content of parallel lessons was the same, but in the spaced learning condition it was repeated and presented in different ways at a greater speed. Both lessons took one hour in total. The control group lesson was in three sections: input, related activity and plenary, without any breaks. The experimental group was taught in the following sections: 10 minutes teaching, 10 minutes distraction, 15 minutes teaching, 15 minutes distraction, 15 minutes teaching. Distractions included meditation, singing and dancing; these were chosen by the teacher.

Materials (and apparatus)
Teachers were supplied with lesson plans, PowerPoints and worksheets for all lessons. Teachers were also supplied with a 10-question pre-test and post-test question sheet for the children (based on the lesson content) and an answer sheet for the TA to mark from. The classroom layout was as normal in all lessons.

RESULTS

Pre- and post-test results for massed and spaced learning in the KS1 geography lessons can be found in Figure 2.

Preliminary assumption testing showed that analysis across all pupils’ results, and for Years 1 and 2, could be carried out using Quade’s F test with pre-test scores as the covariate (a form of non-parametric ANCOVA) (Table 1†). All effects were positive and ranged from small to moderately small.

Table 1. Non-parametric ANCOVA results and effect sizes (np² with Cohen’s d equivalent)

<table>
<thead>
<tr>
<th>N/m</th>
<th>Effect size (np²)</th>
<th>Cohen's d</th>
<th>p-value</th>
<th>CI (90%)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>All pupils</td>
<td>117</td>
<td>0.019</td>
<td>[0.29]</td>
<td>0.066</td>
</tr>
<tr>
<td>Year 1</td>
<td>57</td>
<td>0.0004</td>
<td>[0.04]</td>
<td>0.443</td>
</tr>
<tr>
<td>Year 2</td>
<td>60</td>
<td>0.04</td>
<td>[0.43]</td>
<td>0.065</td>
</tr>
</tbody>
</table>

Pupils were asked to rate how much they enjoyed each of the different approaches on a 7-point Likert scale. A two-tailed Mann-Whitney U test indicated a very small r = 0.05, CI (95%) = 0.03 to 0.05 non-significant (p = .882) preference for spaced learning compared to massed learning.

* Test identification and analysis were carried out using StatsWizard®.
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CONCLUSIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH

Spaced learning in KS1 has a small non-significant impact on learning. While this study focused on the acquisition of subject knowledge, future research could potentially focus on more practical skills such those needed in computing. For example, KS1 children could benefit from spaced learning of skills such as switching on, logging or coding, as the quick repetitions with spaces between could potentially enable children to encode these skills into long-term memory. Whereas the effect in the parallel replication (Study B) was significant for all KS2 pupils, the overall effect in this study approached significance.