Research into multisensory strategies to support SEND students' memories for subject specific vocabulary

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Memory is an area of key interest for many students. It is a recurring strand in my study skills programme, which supports SEND students in preparation for examinations and beyond.
This led to my post-graduate research: An enquiry into the effective use of multisensory strategies to support SEND students' acquisition, retention and retrieval of subject-specific vocabulary in conjunction with the independent use and transfer of multisensory strategies.

Multisensory strategies to support memory are widely recognised as amongst the most effective approaches for all students[1] and especially those with dyslexia. Research demonstrates that central determinants in the ability of students to achieve grades 4 or higher in the three core subjects include their socio-economic status and vocabulary, with the latter impacting on literacy skills[2].

A Year 8 intervention group, consisting of 12 students, utilised multisensory strategies to revise 15 key words students encountered in history lessons on the dissolution of the monasteries. A mixed-methods approach combined qualitative and quantitative data to answer three questions. Pre- and post-multisensory strategy vocabulary tests (PPSVTs) were used during the intervention to establish progress whilst students captured their evaluations in contemporaneous notes. Following the multisensory intervention, students and staff stakeholders answered online questionnaires.

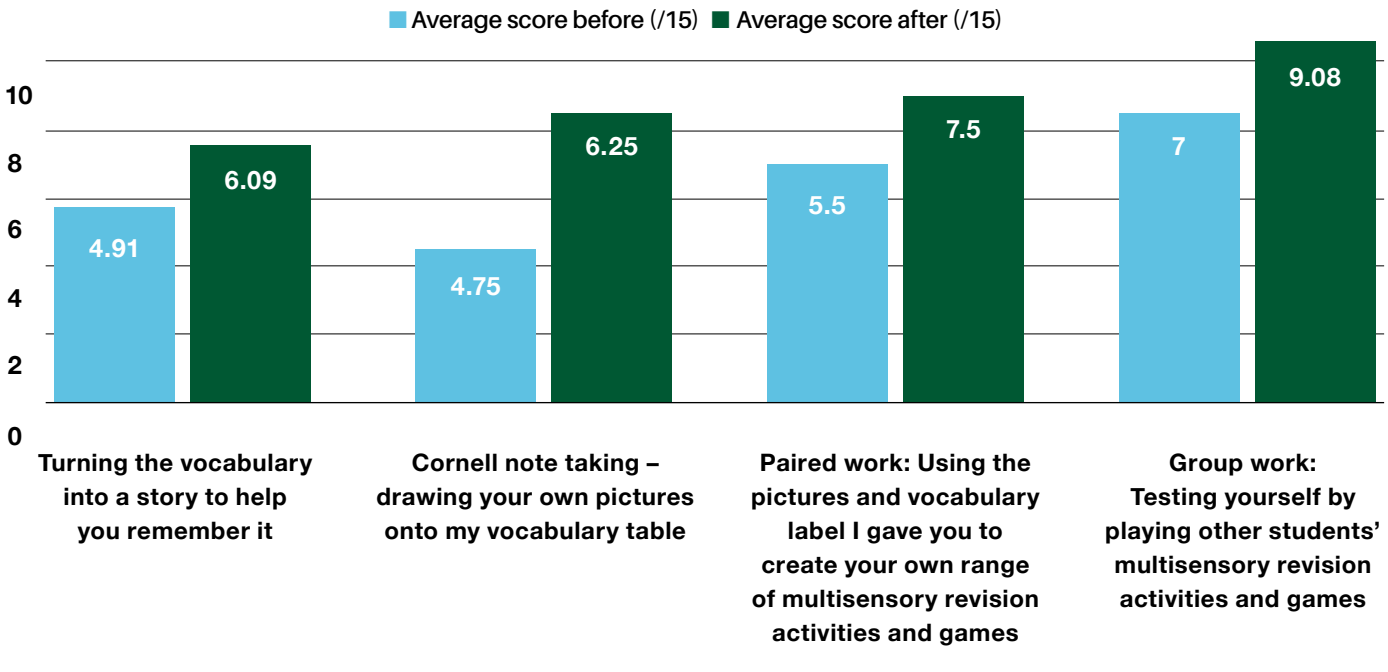
Research question 1:

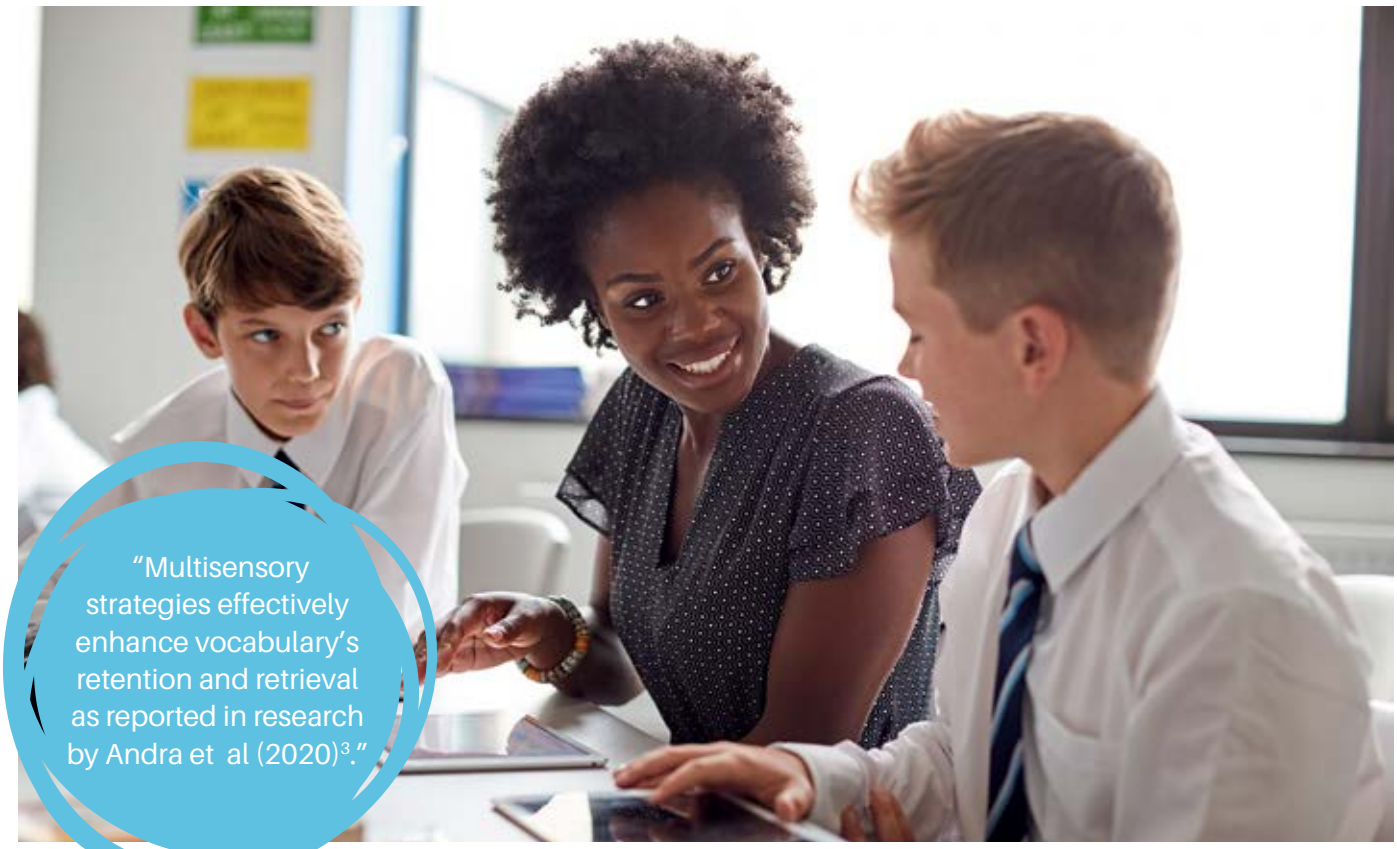
What are the most effective multisensory strategies to support the acquisition, retention and retrieval of subject-specific vocabulary for SEND students?

Four multisensory strategies were trialled, assessed for progress and rated by the participants and Chart 1 shows the change in mean score after using each of the strategies.

Despite efforts to mediate for the practice and testing effects with the use of PPSVTs, to ensure analysis was based on progress for each strategy, the steady increase in their results is striking. The results suggest that the strategies and tests are working cumulatively.

Chart 1: Average scores before and after using the multisensory strategies





"Multisensory strategies effectively enhance vocabulary's retention and retrieval as reported in research by Andra et al (2020)[3]."

Thus students should be encouraged to select strategies on the basis of their task appropriacy, not a belief that a particular multisensory strategy will always optimise their learning. Table 1 shows ratings out of five for each of the strategies.

Enjoyment is generally rated slightly lower than effectiveness by the students. The exception is group work, where they tested themselves by playing peers' games. The higher rating of enjoyment is likely to be a motivating factor increasing the probability of the strategy's use.

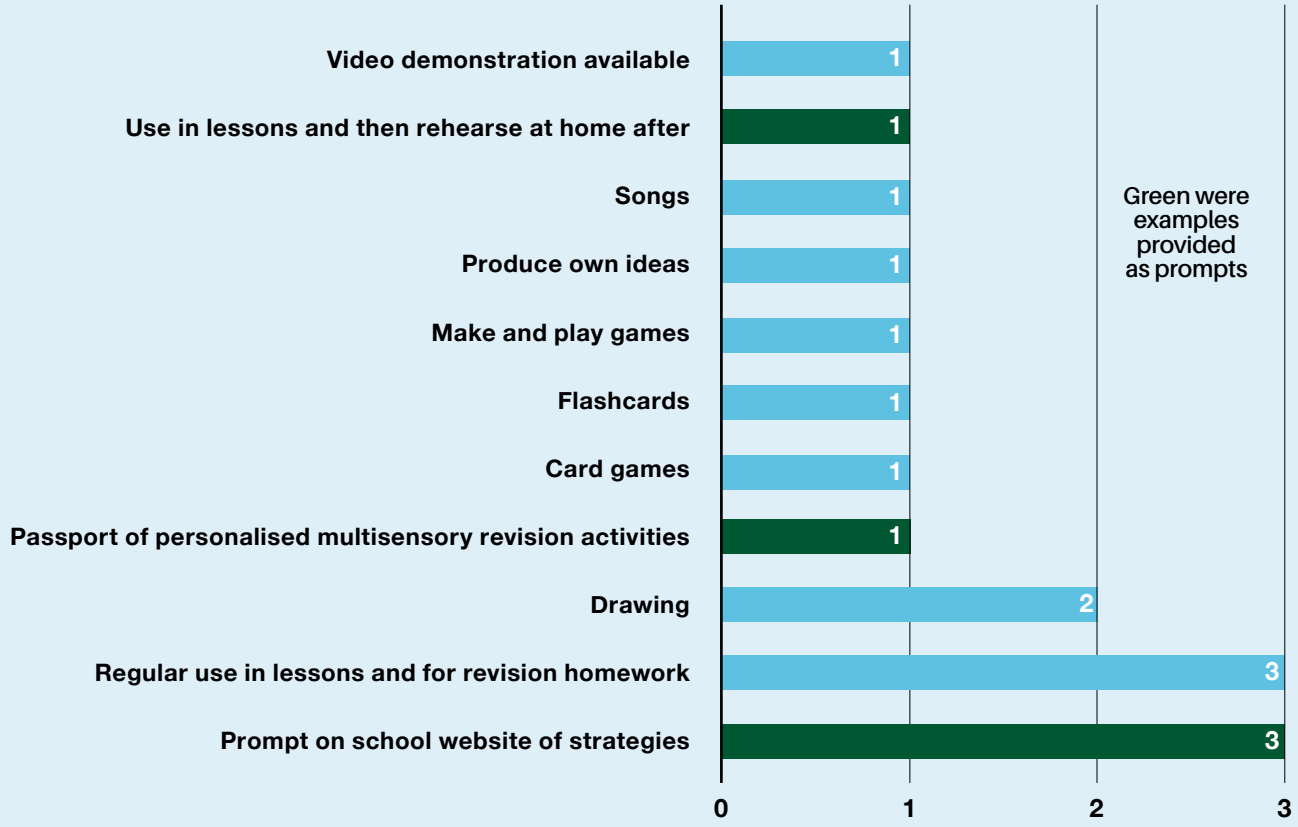
Key results:

- Multisensory strategies effectively enhance vocabulary's retention and retrieval as reported in research by Andra et al (2020)[3].
- Staff and students endorsed the pair and group visual, auditory and kinesthetic activities as most effective.
- Steady progress of the students during the intervention reflects 2008 research[4] into the strong impact of repeated testing on vocabulary retention.

Table 1: Student identification of effectiveness, enjoyment and frequency or transfer compared for each multisensory strategy

	How much did the strategy help you?	How much did you enjoy the strategy?	Percentage of students who used strategy to revise for other subjects
Turning the vocabulary into a story to help you remember it	3.2	3.1	42%
Cornell note taking – drawing your own pictures onto my vocabulary table	3.9	3.6	17%
Paired work: Using the pictures and vocabulary label I gave you to create your own range of multisensory revision activities and games	4.5	4.3	50%
Homework: Creating your own multisensory vocabulary revision activity or game	3.9	3.6	17%
Group work: Testing yourself by playing other students' multisensory revision activities and games	4.4	4.5	25%

Chart 2: What would help you to use these strategies in your own revision at home?



Research question 2:
How can students be supported to engage actively and independently with multisensory revision and retrieval strategies?

A questionnaire sought to identify approaches to encourage independent use and the results are shown in Chart 2.

A meeting to analyse all the data and devise solutions was held with the students and then the staff stakeholders, producing the tabulated results. Eight of the twelve student participants were present with their responses expressed as percentages and results are shown in Table 2.

Key results:

- All staff recommended different strategies to support students, emphasising different preferences, perhaps reflecting varying subject demands
- Neurotypical staff stakeholders ranked turning the vocabulary into a story highest whilst the largely neurodivergent students ranked it lowest. Despite consideration of issues such as the practice and testing effects, the students' progress scores and data discussion confirm it as the weakest strategy for this population
- The student data discussion was mature and insightful with imaginative solutions including marketing homework positively and peer prompting
- Despite the students' appreciation of the benefits of the multisensory strategies, they rarely used them independently or transferred them to other subjects unprompted
- The student questionnaires revealed their request for more supportive measures, often reflecting existing research:
  - Enhance the impact of distributed practice[5]
  - Increase the range of multisensory strategies
  - Repetition priming through ensuring regular revisiting[6]
  - Resources for the school website alongside a physical record for SEND students
  - Regular use in lessons and revision homework.

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Research question 3:
How can students be enabled to transfer these strategies to other subjects?

A key challenge addressed in the questionnaire was identifying barriers and solutions to enable students to transfer strategies (See Chart 3).

The dominant reason identified by students behind the absence of transfer for each strategy was a failure to consider its use.

Table 2: Challenges discussed and solutions offered by students and staff

Strategy	Challenges to use	Solutions to overcome the challenges
Turning info into a story	1. Story distracts from content content – 63%. Cognitive load and story recall.	1. Not useful 63%. Lower cognitive load multisensory strategy to allow narration/summary: poster/story map.
Cornell note taking	1. Time to draw beautifully 88% Drawing difficulties with fine motor control. 2. Unpopular. "Perhaps perceived as an 'occasional tool' as such extended work is rare."	1. Mindset; focus on speed for recall not beauty 75%. Emphasise headlines/key words/ summaries in place of drawing. 2. Videos to demonstrate. Reminders when revision is covered.
Paired work using pictures and labels to create games	1. Limits of imagination and experience 38%. 2. Pairing difficulties.	1. Choose own groups with reliable peers 50%. 2. Pairings "to ensure productivity". Encourage teamwork.
Extended homework to create own multisensory games	1. Lacking sufficient resources and time 75%. 2. Knowledgeable adult supporting 38%. "Creating work from scratch is high challenge." 3. "'Homework' is a chore and should be marketed differently" 38%. 4. "Despite benefits of personalisation, ready-made tools are more likely to ensure GCSE revision."	1. Resources home from school 50%. Divide jobs in groups 38%. Choose own groups with reliable peers 50% 2. KS3 study club. Teacher/partner support to organise ideas in class. 3. Renaming: 'Improvement opportunity for the future' 38%. 'Extra credit work' with prize/rewards programme 63%. 4. Embedding strategies in KS3 may increase independence.
Group work playing multisensory games created by peers	1. Organisation: remembering to bring work in 50%. 2. Variable quality of outcomes produced. 3. Curriculum pressures with volume of content.	1. Remind peers in group 38%. Bring in before and stay at lunch to complete if needed 50%. 2. Supportive resources. Support in revision clubs. 3. Play and record games for homework or at lunch to play more peers' games.

Chart 3: Why the strategy was not used in other subjects (rating /6)

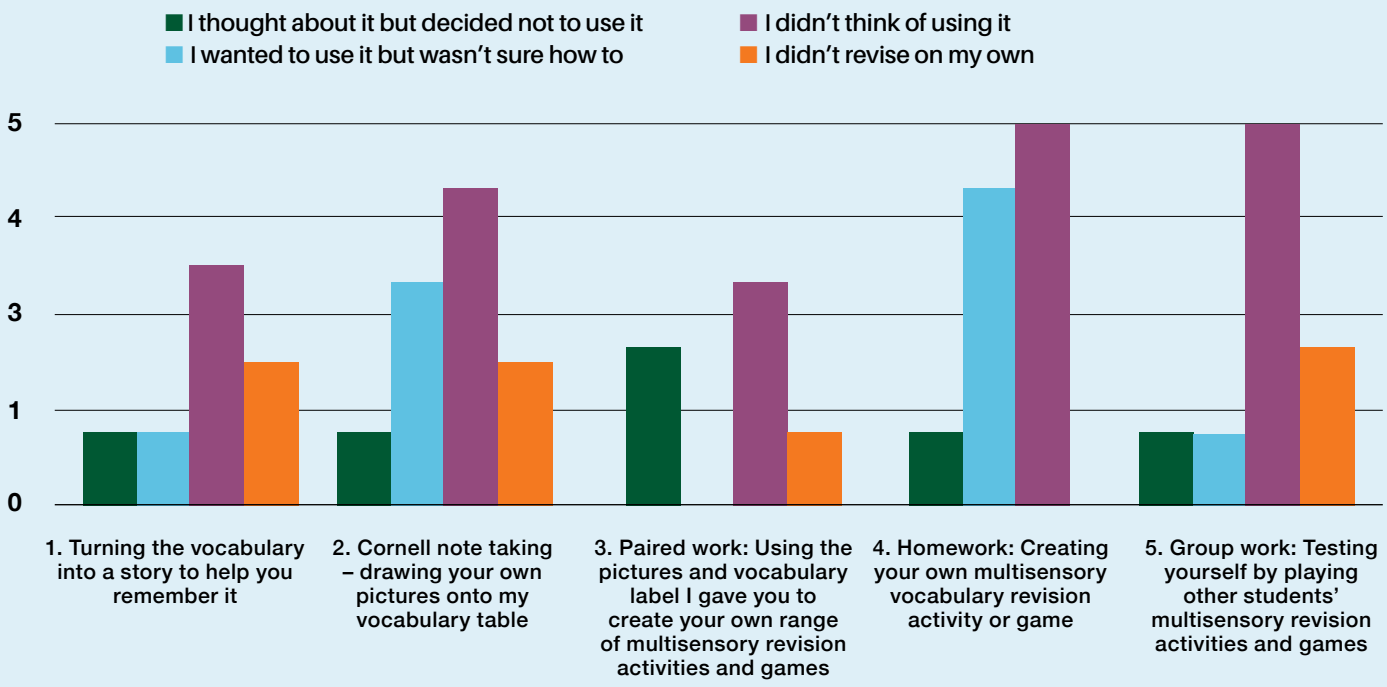
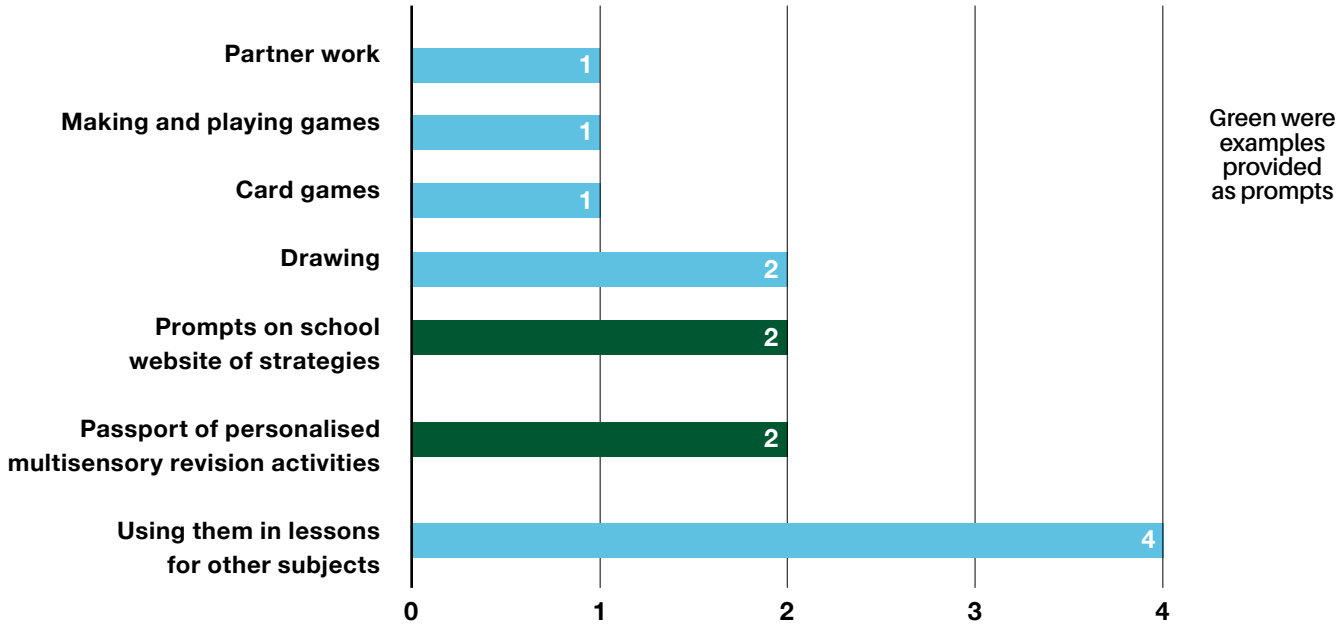


Chart 4: What would help you to use these strategies in other subjects?



This reason was common for most of the strategies and illustrates that additional support is necessary to enable transfer.

These results, alongside the students' suggestions (as shown in chart 4), highlight their need for greater confidence to embed the strategies securely for independent application and transfer.

Unprompted, four of the students stated that rehearsing the multisensory strategies in other subjects would support their transfer beyond study skills.

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Key results:

- Support required by the students to achieve transfer to other subjects is closely linked to the requirements for independent use.
- Opportunities to use the strategies in lessons for other subjects was the principal assistance required.
- Many students only complete set revision and would benefit from this involving a greater range of strategies.
- Adapted resources were shared with the history department to support transfer in revision lessons. The intervention's impact was reported as 'invaluable' with a greater number of intervention students using the key vocabulary in their history examinations.

Conclusion:

Students made strong progress whilst using the strategies. They recognised this progress and reported their enjoyment. However, the transfer of the multisensory strategies to other subjects and their independent use in examination revision was limited. Cross-curricular collaboration, additional exemplar resources and regular use to enhance students' confidence and familiarity will support their independent use and transfer. The students' confidence flourished, not only through the enhancement of their results, but also their involvement in the research process[7]. Their insightful engagement as student research participants was impressive and constructive.

References:

1 Mathias, B., Andra, C., Schwager, A., Macedonia, M. and von Kriegstein, K. (2022). Twelve- and Fourteen-Year-Old School Children Differentially Benefit from Sensorimotor- and Multisensory-Enriched Vocabulary Training. *Educational Psychology Review* [online] Volume 34, p.1740. Available at: Twelve- and Fourteen-Year-Old School Children Differentially Benefit from S...: EBSCOhost [Accessed 7 Apr. 2023].

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3 Andra, C., Mathias, B., Schwager, A., Macedonia, M. and Von Kriegstein, K. (2020). Learning Foreign Language Vocabulary with Gestures and Pictures Enhances Vocabulary Memory for Several Months Post-Learning in Eight-Year-Old School Children. *Educational Psychology Review*, [online] Volume 32 (3), p.840. Available at: Learning Foreign Language Vocabulary with Gestures and Pictures Enhances Vo...: EBSCOhost [Accessed: 19 Nov. 2022].

4 Karpicke and Roediger, 2008 cited in Baddeley, A., Eysenck, M.W. and Anderson, M.C. (2020). *Memory*. 3rd ed. Abingdon: Routledge, p.127.

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7 Tormanen, M., Takala, M. and Sajaniemi, N. (2008) Learning disabilities and the auditory and visual matching computer program. Support for Learning [online], Vol. 23 (2), p.84. Available at: Learning disabilities and the auditory and visual matching computer program...: EBSCOhost [Accessed 17 May 2023].