RETRIEVAL PRACTICE:

MYTHS, MUTATIONS & MISTAKES

REFLECTING ON GREAT TEACHING

Evidence Based Education

INTRODUCTION

Understanding the role of memory in the learning process is essential for all educators. It is important for those planning and designing lessons to be aware of the limitations of working memory and recognise how regular retrieval practice can strengthen long-term memory.

Retrieval practice involves recalling already-learned information from long-term memory to make that learned information easier and quicker to retrieve in the future. You can read our eBook on memory and learning **here** to find out more about working memory and the cognitive systems of learning.

Retrieval practice is a strategy supported by evidence and can be used to enhance learning and progress, both inside and outside of the classroom. The benefits of retrieval practice for long-term learning are among the most secure findings in educational psychology (Brown et al., 2014); therefore it is not surprising that many schools have enthusiastically embraced retrieval practice.

Retrieval practice is not considered to be a formal assessment strategy because the emphasis should be on regular low-stakes retrieval practice conducted to support learning, not measure it.

This eBook includes examples of potential mutations, myths and mistakes linked to retrieval practice, with advice as to how they can be avoided. This aims to ensure retrieval practice is used to help, not hinder, learning.

Mutations:

Any evidence-based classroom strategy can be vulnerable to lethal mutation, a term coined by Ed Haertel (Brown and Campione, 1996). Lethal mutation describes the process when teachers that do not understand the principles behind evidence-based classroom practices modify ideas and techniques to such an extent they become far removed from the original concept or suggestion that it is no longer effective, or even counter-productive—a "lethal mutation". Lethal mutations can occur with the implementation of retrieval practice just as they can with any classroom intervention.

Myths:

Myths also emerge in education based on assumptions or false beliefs that have managed to become widespread. A well-known example of a myth linked to learning is that students learn better via their preferred style, despite a lack of evidence to support this (Brown et al., 2014); this is now considered to have been thoroughly 'debunked'.

Academics in education have invested time challenging myths linked to learning. Daisy Christodolou argued in her book Seven Myths About Education, "much of what teachers are taught about education is wrong, and they are encouraged to teach in ineffective ways" (2014). Myths have evolved around the use of retrieval practice in schools, in terms of how and when it is applied in the classroom.

Mistakes:

It is vital when introducing and embedding any evidence-based strategy that classroom teachers and leaders at all levels continually reflect on their practice and policies. Schools can have grand expectations when it comes to implementing retrieval practice, but it is vital to provide teachers with enough time to learn about retrieval practice.

Failure to provide time to plan how to use this strategy in lessons and failure to provide opportunities to reflect on it can lead to mistakes and mutations. If retrieval practice is a teaching and learning priority in a school, then it should be a professional development priority too.

MYTH: RETRIEVAL PRACTICE IS THE FINAL PART OF THE LEARNING PROCESS

The Learning Process Model, accredited to Arthur W. Melton in 1963, states the three main stages of learning are encoding, storage and retrieval.

| Attention & Encoding | → | Storage | → | Retrieval |

This is a helpful model for teachers and leaders to be aware of. Each stage is important during the learning process, and it clearly shows how retrieval practice cannot occur until information has been encoded (i.e., transferred from working memory to long-term memory). This model would suggest that, once students can retrieve information from long-term memory, it is the final part of the learning process. This, however, is not true!

Once students can recall information, they are often required to apply that knowledge, for example in an extended essay or examination question, and will need to transfer their knowledge across different contexts. An example can be vocabulary instruction; once a student can recall the meaning of a term, they then need to apply that term by using it correctly in a sentence and be able to use it accurately in their verbal and written answers.

It is also important that students can understand key terms in a different context too. Retrieval practice is a vital part of the learning process, but not the final part.

MYTH: FREE RECALL IS ALWAYS THE BEST METHOD OF RETRIEVAL PRACTICE

Free recall, the act of retrieving information from long-term memory without any cues or prompts, is an effective form of retrieval practice; it has been suggested that it is the 'best' type of retrieval practice. But to suggest it is always the best approach, regardless of context, is a myth. Professor Robert Bjork has stated that "the more involved or difficult the act of retrieval—provided it succeeds—the larger the benefits in terms of recall" (Jones, 2021). Free recall is often the most challenging act of retrieval because cues are absent, hence the greater benefits. Professor Jared Cooney-Horvath builds on this by noting "the more effort required by an individual to dredge up a memory without external support, the stronger the memory will become" (Jones, 2021). Their advice is based on evidence and should encourage all teachers to aim to provide free recall opportunities for their students.

However, studies that have specifically looked at retrieval practice with young learners (primary/elementary) have suggested that younger children can struggle with free recall and should be provided with cues and prompts by their teacher to ensure initial retrieval success. Antonio Jaeger et al. (2015) conclude from their study, "the results suggest that cued recall tests can elicit very robust testing effects in young children, even when complex, educationally-relevant materials are used as stimuli". This paper argued for cued recall to be used with younger learners to promote successful retrieval practice.

Jeffrey Karpicke et al. (2016) argued, as a result of their experiments, that free recall tasks were "not feasible for promoting learning of educational texts with elementary school children". At the core of this myth (or misconception) is that there is one overall best method of retrieval practice.

There are pros and cons to using different retrieval practice tasks. For example, a multiple-choice quiz can lead to a greater chance of retrieval success and is workload-friendly for a teacher in terms of creation and marking; however, it lacks the challenge of free recall and does not allow opportunities for extension and elaboration. On the other hand, free recall can lead to numerous benefits, but would be more likely to lead to retrieval success after initial retrieval practice tasks involving cues. Contextual factors, such as age and subject, need to be considered too. Teachers should aim to use a range of retrieval practice tasks and questions, not just one singular approach.

MYTH: RETRIEVAL PRACTICE MUST BE WRITTEN

Unlike formal assessment, the concept of retrieval practice being 'low-stakes' means that there should be no need to record results and scores. The evidence of retrieval practice being used in the classroom should be visible when students know more, remember more and grow in confidence with their ability to recall learned information.

There are plenty of retrieval tasks that do not involve writing but instead can be conducted verbally. Evidence has shown that retrieval practice can be used to support younger learners (primary/elementary), but those younger students may not have the ability to communicate their recall through writing and can only do so verbally. In the study of modern foreign languages, verbal recall is vital to the development and progression of being able to use a language confidently and correctly. Practical subjects often rely on verbal retrieval practice, as logistically it would prove difficult to undertake written retrieval practice tasks in a lesson.

Students with learning disabilities and difficulties should be given the opportunity to recall information, both verbally and through their written responses, as they may be able to cope with one more than the other; if they are encouraged to do both, they are likely to achieve retrieval success. Learners with English as an additional language should be provided with opportunities to verbally recall information, in addition to written responses, to support their progress and chances of retrieval success.

MYTH: EVERY LESSON MUST START WITH RETRIEVAL PRACTICE

There can be a conflict in a school environment between the need to promote consistency across the curriculum, with different subjects and age ranges, and also recognising the importance of context and nuance across those subjects and age ranges. Starting every lesson with retrieval practice has become embedded into many school policies... and there are good reasons for doing so.

Barack Rosenshine advises teachers to "begin a lesson with a short review of previous learning: daily review can strengthen previous learning and can lead to fluent recall". The guidance for teachers from Rosenshine is based on principles from cognitive science, and is sound advice. However, there will be exceptions where starting a lesson with retrieval practice might not be possible, practical or the best option. It should not become a non-negotiable to start every lesson with retrieval practice.

A good example could be a practical food and nutrition lesson. During this lesson, students are required to cook a dish using ingredients from scratch under timed conditions, therefore it would make more sense to begin the lesson promptly preparing the food. At a later point in the lesson, perhaps when students are waiting for their food to cook, students could then complete a retrieval practice task.

During a physical education lesson, the instructor needs to ensure students are changed into their sports attire in order to begin a physical warm up. Retrieval practice can occur throughout the lesson (for example, verbally after demonstrations), which would support the overall flow of the lesson.

There are more examples where a teacher should be trusted to use their professional judgment and expertise to decide when retrieval practice is used in a lesson. The key point is that retrieval practice takes place, and all students are provided the opportunity to retrieve information from long-term memory.

MUTATION: ONLY USING RETRIEVAL PRACTICE AT THE START OF A LESSON

This mutation is explicitly linked to the myth above: when retrieval practice is used at the start of a lesson, but is only carried out at that point in a lesson. Retrieval practice has been deemed as one of the most effective teaching and learning strategies (Dunlosky, 2013); therefore, it deserves more attention than simply a short task at the start of a lesson.

Science teacher and author Adam Boxer (2021) has suggested different opportunities for teachers to maximise the benefits of retrieval practice. Boxer does suggest using retrieval practice at the start of a lesson, with teachers embedding fixed-point quizzing. This involves routine quizzes based on prior learning, before moving onto new content.

In addition to the start of a lesson, Boxer suggests the use of questioning before and during explanations. This involves asking students questions on prerequisite knowledge to develop links and ensure students are ready to progress to learning new content. He writes: "Interleaving questions while students are practising is an excellent opportunity to introduce retrieval, break algorithmic problem-solving and show the interconnectedness of topics" (2021). Finally, Boxer encourages teachers to make use of homework as a further retrieval opportunity.

MUTATION: ADOPTING A 'ONE-SIZE-FITS-ALL' APPROACH TO RETRIEVAL PRACTICE

Examples of nuance between different subjects and age ranges have already been highlighted in this eBook. Retrieval practice can appear similar across different subjects; for example, most (if not all) subjects can use multiple-choice questions to elicit evidence of learning via retrieval practice. The difference will naturally be the content of the questions.

Retrieval practice can appear similar across different age groups and subjects, and this will support an overall consistent approach. However, insisting retrieval practice appears the same from one classroom to another is not taking into consideration the unique context of each classroom.

The key principles and evidence base linked to retrieval practice should be common knowledge among a staff body. However, it will then be for teachers (perhaps in teams associated with either year groups or departments) to then discuss, implement and reflect on the use of retrieval practice within their context.

MISTAKE: NOT ASKING STUDENTS TO RECALL INFORMATION FROM MEMORY

A key element of retrieval practice is to recall information from long-term memory. If students can view their class notes, textbooks or have information visible on the board or via classroom displays, this dilutes the level of challenge and therefore reduces the overall effectiveness of retrieval practice.

It can be challenging to recall information from long-term memory, but regular retrieval practice aims to improve recall and can support the student and teacher to identify gaps in learning, ultimately so that those knowledge gaps can be closed in the near future. Students should not be allowed to find the answers during retrieval tasks; this can be done at a later stage when self-assessing or checking, but not during the recall.

MISTAKE: NOT ENSURING RETRIEVAL PRACTICE IS LOW-STAKES

Retrieval practice is referred to in academic literature as the 'testing effect'. This term is not as mainstream, perhaps due to the connotations of testing—the word itself implies a level of high-stakes implications. Retrieval practice, in contrast to a high-stakes assessment, should be low-stakes, or even "no-stakes". Low-stakes should equate to low-stress, unlike a high-stakes final examination or test, which can come with high degree of pressure. This pressure would not be advisable or sustainable as an established classroom routine.

Retrieval practice uses testing as a learning strategy, rather than an assessment strategy. The low-stakes nature of retrieval practice should be made clear to students in the classroom, in addition to parents or carers at home. It should be explained what retrieval practice **is** and what it **is not**. Establishing regular retrieval practice tasks as a classroom routine will assist the low-stakes element; students will become accustomed to regular quizzing and should understand how it can support their learning. Teachers do not need to rigorously monitor or record data, and the use of praise or sanctions should be cautiously considered too.

MISTAKE: PRIORITISING TASK DESIGN OVER QUESTION DESIGN

A benefit of retrieval practice is that it is a versatile strategy that can be used in a variety of creative and innovative ways that can be engaging in the classroom. It is important that teachers do not neglect question design in favour of designing or delivering a range of retrieval-based tasks. Good question design is central to effective retrieval practice in the classroom.

Retrieval practice should not be led wholly by classroom activities—instead, time should be dedicated to careful question design. Creating high-quality questions that effectively focus the learners' attention on the desired learning can be difficult and time-consuming. An efficient means of designing (and, crucially, sharing) good questions can be achieved through collaboration between colleagues.

FINAL THOUGHTS

Other mistakes worth noting with retrieval practice include the following:

- Not involving all learners in the retrieval process (for example, using a "hands up" approach and only selecting some students to respond or allowing students to answer in pairs or groups). The use of mini whiteboards is one way to ensure all learners are involved in the act of retrieval.

- Not providing enough time for meaningful feedback and reflection. Allowing time for feedback and reflection can help students focus on gaps in knowledge and avoid repeating mistakes during future recall.

- Not achieving a "desirable level of difficulty" (Bjork and Bjork, 2011). This can happen when retrieval tasks or questions are too easy. If they do not require effortful recall or are too challenging, the questioning may prevent retrieval success.

The *Great Teaching Toolkit: Evidence Review* suggests anyone, at any stage, can get better at anything (Coe et al., 2020). Developing a sophisticated and clear understanding of learning and memory is a great step in becoming an even greater teacher. Retrieval practice has the potential to be an effective evidence-based strategy in the classroom, but it is also vulnerable to mutations, myths, and mistakes. Through learning about these—and working to avoid them—teachers are better prepared to effectively implement this potentially powerful strategy.

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To cite this eBook, please use:
Evidence Based Education (2023). Retrieval practice: Myths, mutations and mistakes.