

Are we expecting too much from retrieval practice?

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Abstract Retrieval practice is an effective method for supporting learning, which has led to researchers calling for its incorporation into teachers' regular classroom practice. Recent educational policy shifts in England reflect a growing emphasis on the use of retrieval practice as a learning strategy by educators. While research is largely from controlled studies in laboratories and classrooms, this article reflects on how teachers in England apply retrieval practice in their everyday teaching environments. Results reveal that teachers are regularly using retrieval practice in their teaching. However, they report using retrieval practice for outcomes beyond the 'testing effect', which raises questions about the role of retrieval practice in classrooms.

A learning strategy that has gained significant interest in schools in recent years is that of retrieval practice. On the face of it, retrieval practice appears to be an intuitive and easy-to-implement strategy for a teacher, as it requires students to actively retrieve (through either recall or recognition) information from memory to improve the later retrieval of that information. This deliberate act of 'testing' memory has been shown to support improved test performance when compared with other strategies, such as re-reading or restudy, which is often referred to as the *testing effect*.

The testing effect

The benefits of 'testing' memory have been well known for over 100 years; however, the research exploring the effectiveness of the testing effect has only increased rapidly in recent decades. This renewed research interest in testing as a means of enhancing learning is widely credited to Roediger and Karpicke (2006). In a typical testing effect study (Figure 1), there is an *initial learning stage* where the participants learn information from presented learning material. Following the initial learning stage, researchers can introduce and manipulate a time gap before the next stage. This next stage is the *intervention stage*, where participants are usually assigned to different groups. For a simple comparison study, participants will either be assigned to a control group, who restudy/re-read the learning material, or a treatment group, who undertake recall or recognition tasks based on the learning material. Again, a time gap can then be introduced and manipulated, which is often referred to as the *retention interval*. The final stage is the

final test, where all participants undertake a recall or recognition test based on the learning materials, and the differences between the test scores can be compared in relation to the intervention stage.

What is arguably remarkable about the testing effect is that the mere act of taking an interim test leads to increased performance in the final test, particularly at longer retention intervals, when compared with other strategies. Some of the early criticisms of the testing effect were that it may not translate to educational settings and would only be helpful to the rote learning of limited information. However, many subsequent studies have shown that retrieval practice does support learning across different educational contexts, ages and subjects, which has led researchers to recommend that retrieval practice is used by educators in their classrooms.

Retrieval practice in the classroom

The testing effect is now more commonly referred to as *retrieval practice* in both professional and research literature. The renaming was designed to make a clear distinction between 'testing' as a learning opportunity (retrieval practice), rather than an assessment opportunity (topic tests, formal exams, etc.). Additionally, it reflects that the testing effect can be obtained with a wide range of formats that would not be traditionally considered as test formats. In this sense, testing refers to the 'testing of memory', rather than using specific test formats.

Despite the strong evidence for advocating the use of retrieval practice in classroom settings, many classroom-based studies are still highly controlled



Figure 1 Graphic representation of a typical study into retrieval practice (adapted from Cepeda et al., 2008)

and usually compare retrieval practice to other strategies, such as re-reading. In a recent Education Endowment Foundation (EEF) review, Perry *et al.* (2021) found large variability in the impact of retrieval practice across classroom-based studies. However, the current policy direction in England has been to advocate for using retrieval practice in teaching. This is most clear in the Ofsted (2024) inspection handbook, which states that they (Ofsted) will evaluate:

the extent to which teachers ... consider the most important knowledge or concepts that pupils need to know and focus on these, and prioritise feedback, retrieval practice and assessment.

Despite this clear policy steer for schools and teachers to use retrieval practice in their teaching practice, there is an absence of policy guidance on how to translate/adapt findings from controlled studies on retrieval practice for the classroom. Given this lack of clarity, it becomes the responsibility of schools and individual teachers to establish their own practices and policies in relation to retrieval practice.

What is happening in classrooms?

Given the potential problems with the transferability of research conditions/protocols to classroom-based settings (Perry *et al.*, 2021), attention now needs to be given to the way in which retrieval practice is being developed in authentic situations. The remaining part of this article draws on both my recent teacher survey related to retrieval practice (Bates and Shea, 2024) and Ofsted's *Science Subject Report* (Ofsted, 2023). 153 teachers responded to the teacher survey, which asked them about how they are using retrieval practice in the classroom. It must be noted that the survey responses were from teachers from a range of phases (e.g. primary and secondary) and subject backgrounds, which may not be representative of responses for secondary science teachers. However, when compared with the findings in the *Ofsted Science Subject Report* (Ofsted, 2023), three common themes emerge, which are discussed below:

- regularity of use;
- selection of activity type;
- the reason for using retrieval practice in the classroom.

Regularity of use

From the survey responses, all teachers reported that they use retrieval practice regularly in their practice, with 96 teachers (63%) reporting they use it in every lesson. 80 teachers (52%) reported that they

had to use retrieval as part of a school policy. Ofsted corroborated this finding, reporting that science teachers frequently used retrieval practice as part of a whole-school or departmental approach. This is clearly a positive finding in relation to schools and teachers adopting evidence-based strategies; however, it remains unclear whether this regularity of use of retrieval practice is actually effective. For example, McDaniel *et al.* (2011) found that providing students with a 'review' quiz 24 hours before a 'unit test' (end-of-topic test) resulted in higher unit test performance when compared with pre- and post-lesson quizzing. Additionally, the provision of a single review quiz before each unit test resulted in a higher 'end-of-semester' (end-of-term) test when compared with repeated pre-lesson, post-lesson and review quizzes. This finding is also supported by Cepeda *et al.* (2008), who found that although both the gap and retention interval (Figure 1) influenced the final test performance, a shorter retention interval (7 days) had the largest effect irrespective of the length of gap. Agarwal, Nunes and Blunt (2021) found something similar in that there was no clear benefit for one retrieval practice schedule over another, but shorter retention intervals (1 to 3 days) were more effective. Therefore, the use of retrieval practice in the classroom does not necessarily need to occur with high regularity, such as multiple times a week, if consideration is given to using effective retention intervals before important assessments. Another potential issue with regular retrieval practice is that, if the same topic is the subject of the retrieval practice during the learning of that topic, then this may lead to improved performance in the short term and may not translate to learning in the long term (Cepeda *et al.*, 2008).

Things to think about

There needs to be a balance between the amount and timing of retrieval practice. Too much retrieval practice at the wrong time may lead to improved performance in the short term but not improved learning in the long term. You may be using precious lesson time on an inefficient use of retrieval practice. Consider using retrieval practice after a sequence of lessons rather than after each lesson. Consider scheduling revision lessons with a short retention interval and use retrieval practice strategies in the revision lesson.

Types of activities

The dominant format for retrieval practice reported by teachers was quizzes or questions requiring short-answer responses (recall), which may not be the case for secondary science classrooms. However, Ofsted states that most science teachers

used low-stakes quizzing, but do not stipulate the nature of the format of these quizzes (i.e. short-answer, multiple-choice, etc.). This reporting of what could be considered as a narrow range of formats is not necessarily a concern, as the reported formats have been shown to be effective for retrieval practice. However, the purpose of the renaming of the testing effect as retrieval practice was partly to recognise the wide variety of formats that can enhance learning. This provides teachers with the possibility of using a wider range of activities for retrieval practice in the classroom without reducing its impact. Interestingly, only 22% of teachers reported using verbal questioning and 16% reported using free recall (such as brain dumps) as formats for retrieval practice. Although this may well be the case in the classroom, it does raise questions about teachers' awareness of different formats being considered retrieval practice or whether the survey responses were not explicitly clear in differentiating the types of activities used. For example, Ofsted reports on the use of questioning and multiple-choice questions under assessment for learning (AfL) and not as retrieval practice, which suggests that teachers may be using a range of strategies for purposes other than retrieval practice. Again, this may not be a concern as the activity may be supporting learning in other ways. However, it may be important to understand where there may be opportunities for retrieval practice more broadly in lessons.

Things to think about

Retrieval practice is about creating opportunities for students to 'test' their memory. Therefore, any activity or task that requires students to think about the answer without accessing materials that can easily present the answer provides retrieval practice opportunities. The focus on 'formalised' approaches to retrieval practice, such as regular quizzing at the start of lessons, may hide the fact that more informal retrieval practice opportunities are present in lessons.

Reason for using retrieval practice

The teacher survey revealed that teachers were motivated to use retrieval practice for four main reasons:

- to retrieve prior learning;
- to link prior learning to new learning;
- for assessment for learning;
- to support classroom behaviour.

Teachers reporting being motivated to use retrieval practice as a means of retrieving prior knowledge is not entirely surprising given the fact that the primary benefit of retrieval practice is to support

the retention and later retrieval of already learnt information. What may be surprising is that this was not the most common response. The most reported reason was using retrieval practice to link prior learning to new learning (generative learning). Ofsted reported that, for secondary science, many schools used retrieval quizzes that only asked questions about isolated facts and did not seek to develop interconnected knowledge. It is important to note that retrieval practice has been shown to support concept learning and problem-solving but in itself is not a generative activity. However, it seems sensible for teachers to be thinking about how specific strategies, such as retrieval practice, can link to and/or be integrated into other teaching strategies to support learning. For instance, recent work has shown that using retrieval practice in combination with other learning strategies, such as explanation or example generation, is effective for learning (McDaniel, 2023).

Ofsted makes a clear distinction between assessment as learning (retrieval practice) and assessment for learning (AfL). However, in their characterisation of retrieval practice, there seems to be a confusion with AfL. It is therefore important to make a clear distinction between the activity/task and its purpose. For example, questioning and multiple-choice questions are considered formats for retrieval practice; however, they are categorised as formats for AfL in the Ofsted report.

Ofsted also states that retrieval practice was effective when coupled with feedback, which involved teachers circulating to check responses and provide feedback or additional work based on any gaps or errors. Feedback typically does increase the effectiveness of retrieval practice; however, in laboratory-based studies this is usually provided to the study participants by informing them whether their responses were right or wrong only (*feedback*) or by including the correct answers after informing them whether their responses were right or wrong (*corrective feedback*). The provision of feedback to students and/or additional work is more characteristic of AfL as the teacher is adapting their teaching/instruction as a direct result of the student responses. This is an important distinction to make, as retrieval practice should be seen as an opportunity for learning and not one for assessment (Agarwal and Roediger, 2018). Clearly, tests and retrieval practice can be used formatively; however, this is seen as an indirect benefit (Roediger, Putnam and Smith, 2011) rather than the main direct benefit, the testing effect. A potential danger of this conflation is highlighted by Ofsted, who reported that teachers were spending too much lesson time teaching the answers to the retrieval practice. From the survey,

84% of the teachers stated it was important to know how well their students performed on the retrieval practice activity, and, if the students did not perform as expected, 46% of teachers reported they would reteach content in the same lesson and 35% would reteach in a future lesson. The issue here is that using lesson time for reteaching/teaching answers may be redundant as corrective feedback following retrieval practice is sufficient to address low retrieval practice performance. Additionally, if the teaching/reteaching is passive, then this is more akin to a restudy/re-reading opportunity, which is an ineffective strategy.

Things to think about

Many activities and tasks that are commonly used in the classroom can be used for a range of different purposes. When thinking about retrieval practice, the purpose of the activity should remain focused on its ability to support student learning and not as an opportunity to assess. When using retrieval practice activities, include high-quality corrective feedback and do not use it as a formative assessment if this was not the intended purpose.

Conclusions

Retrieval practice has received increasing interest and attention in recent years, in both research and educational communities. The number of studies, which cover a vast array of conditions (such as ages and subject matter), continues to demonstrate the robustness and effectiveness of retrieval practice. Given this, there is a strong rationale for schools and teachers to be using retrieval practice in the classroom and it is positive that many teachers are using retrieval practice regularly. However, returning to the original question, are we expecting too much from retrieval practice? Reflecting on the findings from the teacher survey and Ofsted's *Science Subject Report*, there is an argument that we could be expecting too much from retrieval practice.

Expecting too much

The main benefit from retrieval practice is that it enhances the retention and later retrieval of the 'tested' information. The fact that teachers are using it regularly in their classrooms for reasons beyond this primary direct benefit of the testing effect is potentially problematic and may frame retrieval practice as a 'catch all' and/or 'silver bullet' strategy, which it is not. The fact that teachers reported using retrieval practice as a way to support behaviour management, link to new learning and as AfL is not necessarily controversial; however, there is very little research into how retrieval practice works

with other aspects of classroom practice to support these ideas. It is also likely that the same outcomes could be achieved using strategies other than retrieval practice, but more research is needed to explore this.

The use of retrieval practice in every lesson may not be an efficient use of lesson time, as doing more retrieval practice does not necessarily lead to increased learning in the long term. Providing opportunities for repeated retrieval practice clearly can increase learning; however, if this takes place over a short period of time (short gaps), then learning may be limited in the long term (long retention interval).

Retrieval practice should be viewed as an opportunity for students to learn, rather than for the teacher to find out what the students know and to adapt teaching as a result. Therefore, there is no need to elicit or record student answers but there may be good reasons to do so, such as assuring that all students are engaging with the task. However, the apparent conflation of retrieval practice with AfL demonstrates that if students initially perform below an expected level then teachers are seeking to compensate for this by reteaching content or teaching the answers. Given that the benefit of retrieval practice is demonstrated in the long term, the immediate reteaching/teaching could be a redundant activity that could take away precious lesson time from new learning.

Considerations for practice

Irrespective of our expectation of retrieval practice, it is clear that it is a potentially powerful learning strategy that teachers should be considering (and clearly are) using in their teaching practice. However, there are some areas to consider where more efficient and effective practice could be developed.

Firstly, given that a wide range of different formats of retrieval practice have been shown to be effective, this gives scope for teachers to use much more variety in the activities they use (matching, word fill, brain dumps, etc.). It may also be that these activities are being used regularly but teachers are just not aware that these formats would be considered as retrieval practice, such as verbal questions and answers.

Secondly, Ofsted makes a key point about schools using retrieval practice at the expense of AfL. Given that teachers are also using retrieval practice as AfL, there needs to be a clear differentiation between the two. It may be more beneficial to use retrieval practice less to facilitate more purposeful AfL, with retrieval practice being used every three to four lessons or weekly, rather than in every lesson.

Finally, the success of retrieval practice is also linked to the quality of the questions being asked. If teachers are only seeking to quiz on basic facts, as reported by Ofsted, then students may struggle to transfer this to more complex and unfamiliar areas of the curriculum. Therefore, when designing the retrieval practice activity, a more coherently structured and progressive set of questions may better support learning.

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