

Interweaving geography: retrieval, spacing and interleaving in the geography curriculum

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Retrieval, spacing and interleaving

The advantages of *retrieval practice* in the classroom setting are well established. Since Ebbinghaus, writing in the nineteenth century (Ebbinghaus, 1885), we have been aware that interrupting the process of forgetting helps to make memories more durable; every time we bring something back from our long-term memory into our working memory, we make it easier to retrieve in the future.

A related concept is that of *spaced practice*. This is the idea that we can secure the advantages of retrieval practice by returning to things we have studied at regular intervals and breaking up the study of a topic over time rather than studying it in a block (*massed practice*). Spaced and retrieval practice can have a powerful impact on students' ability to recall what was taught in geography lessons and use it in different scenarios. In an experiment by Roediger and Karpicke (2006) students were split into three groups, all of whom were studying the same information over four sessions:

- The first group studied the information in all four sessions.
- The second studied the information for three of the sessions; in the final session they tried to recall as much as they could.
- The third group only studied the information in the first session. In the next three sessions they tried to recall as much as they could.

Despite only having been introduced to the tested material once, the third group performed significantly better in the test. The first group, who hadn't used retrieval practice at all, performed the least well. Karpicke and Grimaldi (2012) point out that retrieval, usually practised through low-stakes quizzes of previously taught material, results not only in the ability to reproduce the tested answer by rote, but also in *meaningful learning*, which they define as:

... the ability to use past experiences in the service of the present. If a person has learned something, it means they are capable of using information available in a particular context, referred to as retrieval cues, to reconstruct knowledge in order to meet the demands of the present activity (p. 401).

This definition of meaningful learning, the ability to apply what you know to new scenarios, is fundamental to geography: known models are tested or known case studies interrogated to draw out wider conclusions. We are not simply reproducing information but developing our geographical understanding: moving beyond the

'Trivial Pursuit view of geography' warned against by Peter Jackson (2006) while recognising the need to be knowledgeable about our world – in order, as he says, to think geographically.

Like many teachers, I have embraced retrieval practice in my classroom through the use of low-stakes quizzes at the start of lessons. I have found the most effective and efficient method to approach these is to put ten questions on a PowerPoint slide (with the questions drawn from previous topics as well as the one we are currently studying) and then putting the answers on the next one. Students can then quickly mark their own answers (helping to keep it low-stakes). I have also used spaced practice when setting homework tasks and often set activities requiring students to answer questions about topics they have previously studied, rather than on work they have just done.

Over time, though, I have become increasingly interested in the way retrieval and spaced practice could become embedded into geography curriculum design rather than left as a relatively *ad hoc* bolt-on. I have seen an approach to this, termed *interleaving* by the teachers concerned, which involves teaching geographical topics non-sequentially: this might mean tectonics on Monday, urbanisation issues on Wednesday and river processes on Thursday, before returning to tectonics the following Monday. However, I see several problems with this approach.

Mark describes how he has used retrieval, spacing and interleaving approaches to support meaningful learning in geography.



Figure 1: Making learning meaningful through retrieval and spaced practice. **Photo:** © Geographical Association.

Firstly, students aren't necessarily taking advantage of retrieval practice as they may be introduced to something entirely new about each of these topics, not revisiting the things they learnt the week before. Secondly, if we are referring back to things studied in the previous week, the spacing is likely to be too far apart to support optimal learning. Ebbinghaus's early research suggests that forgetting is too rapid to allow long gaps between retrieval opportunities. Finally, although there is a lot of research on the benefits on interleaving, this isn't what the term refers to. Interleaving, as described by Firth (2018), refers to the studying of related, or easily confused, content, side by side rather than separated into different sessions. As such, we might study two contrasting case studies of responses to a tectonic hazard in the same lesson to help draw out the differences between the responses in each case. There is no evidence that interleaving largely unrelated material (such as tectonics and urban challenges) leads to any particular benefits.

Interweaving

It was while reading Alex Standish's chapter on 'The place of regional geography' in *Debates in Secondary Geography* (2018) that it occurred to me there was a more natural way to accrue the benefits of retrieval and spaced practice in the curriculum: through the *interweaving* of regional and systematic geography. He distinguishes these approaches thus:

Systematic geography focuses on one geographical phenomenon or 'layer' of the earth's surface at a time and explores how it varies with respect to other geographical layers. Regional geography examines the totality of geographical phenomena or layers, and how they are related, at a given locale or region. (Standish, 2018, p. 68)

The 2014 National Curriculum has restored a focus on regional geography, requiring students to:

... extend their locational knowledge and deepen their spatial awareness of the world's countries using maps of the world to focus on Africa, Russia, Asia (including China and India), and the Middle East, focusing on their environmental regions, including polar and hot deserts, key physical and human characteristics, countries and major cities (Department for Education, 2013, p. 2).

The approach we have taken in our department is to weave in strands of previously studied systematic geography into the study of these regions. This gives students opportunities to retrieve information and to apply it in new situations leading to meaningful learning. Our aim is not only to make what they learn more durable, but also to move from a culture of doing (where topics are studied in isolation, rarely to be referred to again until it revision time) to a culture of learning, where students build up the 'big picture' of geography and see the synoptic links that underpin what can seem a disparate list of topics.

An example of interweaving – year 8

Students start the year with tectonic processes. They study plate movement, apply this to different forms of volcano and look at why different volcanic eruptions have different impacts.

This tectonic thread emerges again in the next topic, a regional study of East Africa. Here they look at the Great Rift Valley in terms of its formation and impact on the people who live there. They contrast this to their previous studies of the experience of people in Iceland. In this regional study they also pick up the threads of development studies from year 7, in particular their work contrasting the UK and Uganda, and the thread on world climate and biomes. They begin to look at how these elements interact in this region.

The tectonic thread continues into the next unit, looking at the formation of distinctive landforms. It informs their understanding of how our local landscape, the Wealden Anticline, formed.

Their final topic of the year is a regional study of the island of Haiti, with the aim of understanding why this is the most underdeveloped country in the western hemisphere (World Bank, 2019). This topic draws together the various threads they have studied over the past two years. They consider the role of tectonic activity, as well as that of tropical storms, on development. The threads on development come together with a particular focus on trade and globalisation.

This approach has allowed us to show our students that geography is a distinct discipline where different elements of the subject are studied for a purpose. They now know that what they study in one lesson will be important for what comes later and that there is an expectation that they remember it so that they can apply it again.

For us as teachers it has meant that we can plan for these links much more explicitly. While the naturally synoptic nature of our subject means the threads were always there, we can now plan to take advantage of them. We do this by ensuring that quizzes pick on the aspects of previous topics that are most relevant to what will be studied next (such as quizzing about Iceland before studying the Great Rift Valley) and by setting homework that doesn't only ask them about previous topics but which asks them to tie some of the threads together (such as explaining how tectonic processes have shaped the south east of England).

An example of interweaving – GCSE

We have also begun to use a similar approach at GCSE. When we introduced the 2016 specification (AQA) we taught Urban Challenges as one large unit in year 10 and then Economic World as another large unit in year 11. Now, we teach the UK's Changing Economy in year 10 and follow this by looking at the urban challenges faced in London in light of these changes. Students make much more meaningful connections between the topics and start to think synoptically

about the subject. Likewise, in year 11 we study Nigeria's changing economic fortunes and their implications before looking at this in the context of the challenges facing Lagos. As we do this we draw explicit parallels with the UK and London studied a year before.

Our next step at GCSE is to see if we can weave in other aspects of the course through these places. Can we find examples of water management issues in London and Nigeria that will help students reflect on what they have learnt in these topics? Can we spend more time considering the implications of climate change in these places? In this way I hope to draw further on Jackson's idea of thinking geographically

and his key concepts, in particular his relational thinking (pp. 200-201), something we are unlikely to achieve without the interleaving of different places and ideas.

Conclusion

There has always been a risk of the geography curriculum acting like a series of silos of information. Students do a topic, placed in a seemingly random order, and then move on to the next one. By interweaving systematic threads into regional studies we can overcome this while at the same time benefitting from the advantages of retrieval and spaced practice to create meaningful learning. | **TG**

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