Thinking makes it so:
cognitive psychology and history teaching

What, exactly, is learned knowledge? And why does it matter in history teaching? Does it matter? Michael Fordham seeks to use the general tenets of cognitive psychology to inform the debate about how history teachers might get the best from their students, in particular in considering the role of memory. Fordham surveys the latest research concerning memory while also arguing that remembering does matter in history education, as more than a general transferable skill. He argues not just that memory is important, but that we should, in designing the curriculum, pay heed to the need to help students to improve their historical memories, perhaps by switching from overview to depth, or perhaps by creating opportunities for students to retrieve memories over different timeframes. Fordham ends with a call for further exploration of this topic, offering his ideas as a starting point, and an introductory reading list for anyone wishing to develop their own practice along these lines, and share their findings.

Michael Fordham
Michael Fordham is Assistant Headteacher at the West London Free School (11-18 comprehensive, London).

History teachers have tended, at least in their published discourse, to be fairly agnostic about general educational theories that apply across all subjects, preferring instead to focus more on discipline-specific research to make sense of what is going on in the classroom, either by explicit reference to the discipline of history, or by drawing on research into the teaching of history in schools.[1] Having seen so many defunct theories come and go, it is easy to be cynical about generic research and its applicability to the teaching of history. Yet, in part because researchers have become better at communicating their ideas to teachers, cognitive psychology as a field is currently having something of a heyday in education. The work of specific cognitive psychologists have been lauded by government ministers; workshops on cognitive psychology have begun cropping up at conferences designed specifically for teachers; several books and articles have been published with the aim of introducing cognitive psychology to teachers; and, not least in this journal, some teachers have written their own nascent thoughts about the relationship between cognitive psychology and teaching.[2]

If this is the latest fad, then we are right in the middle of it. I am, however, more convinced that this latest set of ideas has some powerful research sitting behind it. In this article, I seek to do two things. First, I want to set out what I understand to be some of the main tenets of a theory of learning that stems from cognitive psychology research. Space here prevents a more thorough analysis of this complex field, although there are several good introductions for teachers now in print. Second, I have set out to raise a series of questions about history education that might be posed by reflection on the principles of cognitive psychology. In doing so, I shall argue that history teachers might find some of the ideas offered by cognitive psychology fruitful for further curricular and pedagogical analysis.

What does it mean to have learnt something?

For something so central to what goes on in schools, it is surprising how rarely one sees a definition of what it means to have learnt something. This is not helped by the fact that it is easy to confuse the process of learning with the effects on a person that this process creates. Where cognitive psychologists have tended to be more explicit is in their emphasis on long-term memory as the thing that changes when something has been learnt. As Kirschner, Sweller and Clark put it, 'if nothing has changed in long-term memory, nothing has been learned.'[3] A simple definition does not imply that this is a simple process. The idea of memory has received something of a bad press in recent years, with an emphasis on committing things to memory castigated as 'rote learning' or the simplistic acquisition of lists of facts. In many ways this does a disservice to memory, for it is memory that gives us a great deal of our human experience.

> *Our understanding of the role of long-term memory in human cognition has altered dramatically over the last few decades. It is no longer seen as a passive repository of discrete, isolated fragments of information that permit us to repeat what we have learned. Nor is it seen only as a component of human cognitive architecture that has merely peripheral influence on complex cognitive processes such as thinking and problem solving. Rather, long-term memory is now viewed as the central, dominant structure of human cognition.*[4]

A vast array of complex knowledge, including knowing how to do things, is kept in our memories and, although memory is perhaps just one component of *ability*, it is nevertheless a crucial component in many of the abilities that we have. The retrieval of memories can elicit emotional responses, and emotions can lead to the retrieval of memories. Humans are complex creatures and it would be incorrect to think of the human brain as a computer: nevertheless, memory plays a crucial role in our thinking, not least because we think about the present – what we can see, hear, smell, taste and feel – through the lens of our memories of prior experience.

It should be clear with but a little reflection that not all memories are alike. Some memories are retained for long periods of time, while others slip away. Some memories can be recalled quickly, whereas others require quite some effort, and perhaps not a little frustration, in order to be brought to mind. This is a matter that has concerned cognitive psychologists for some years, and which led Bjork to make a distinction between 'storage strength' and 'retrieval strength', where the former is defined as how strong one's memory of something is, and the latter is defined as how easily one can retrieve that memory.[5] This can be modelled on two axes, as shown in Figure 2. In short, the kinds of memories that history teachers are usually most interested in creating are those with high storage strength and, in most cases, high or fairly high retrieval strength.

Why does this matter? The pragmatist might point towards the fact that children might have to take exams in history under timed conditions: for these exams we want our pupils to have not forgotten what they need to know for the exam and to be able to recall this fairly easily. More profoundly, however, knowledge of one thing can directly support knowledge of another.[6] A pupil who can recall the nature of the relationship between king and Parliament in the late Middle Ages and Tudor period is far better placed to learn about the causes of the English Civil War than one who has forgotten it. A pupil who can recall multiple approaches to addressing a causal question is better placed to answer such a question than a pupil who can recall only the causal model they have most recently been taught. For any teacher in any subject, a crucial planning question should always be 'what do pupils already know?' Can they recall the relevant knowledge quickly without any supporting activity? Or perhaps they need to be 'warmed up' to help strengthen their retrieval?

All of this opens up more sophisticated thinking about history. Constructing a carefully-argued essay is a complex task, and success in argument is likely to come more easily if some of its constituent parts are held in long-term memory with a high degree of retrieval and storage strength. Engaging in debate is even more demanding on our memories, for one has a matter of seconds in which to bring to mind the evidence that might be used to challenge a point in a discussion. The sorts of things that might be committed to memory and which can be drawn on in these contexts are varied, and might include narratives, conceptual frameworks, specific quotations and a myriad of other things that historians come to know. Fluent access to a range of types of knowledge is what enables historians to participate in some of the more sophisticated forms of historical discourse, and as teachers of history who want their students to learn to discuss, critique and debate, it would seem to make sense for us to concern ourselves with what gets committed to memory and how this can be retrieved.

The power and limitations of human memory

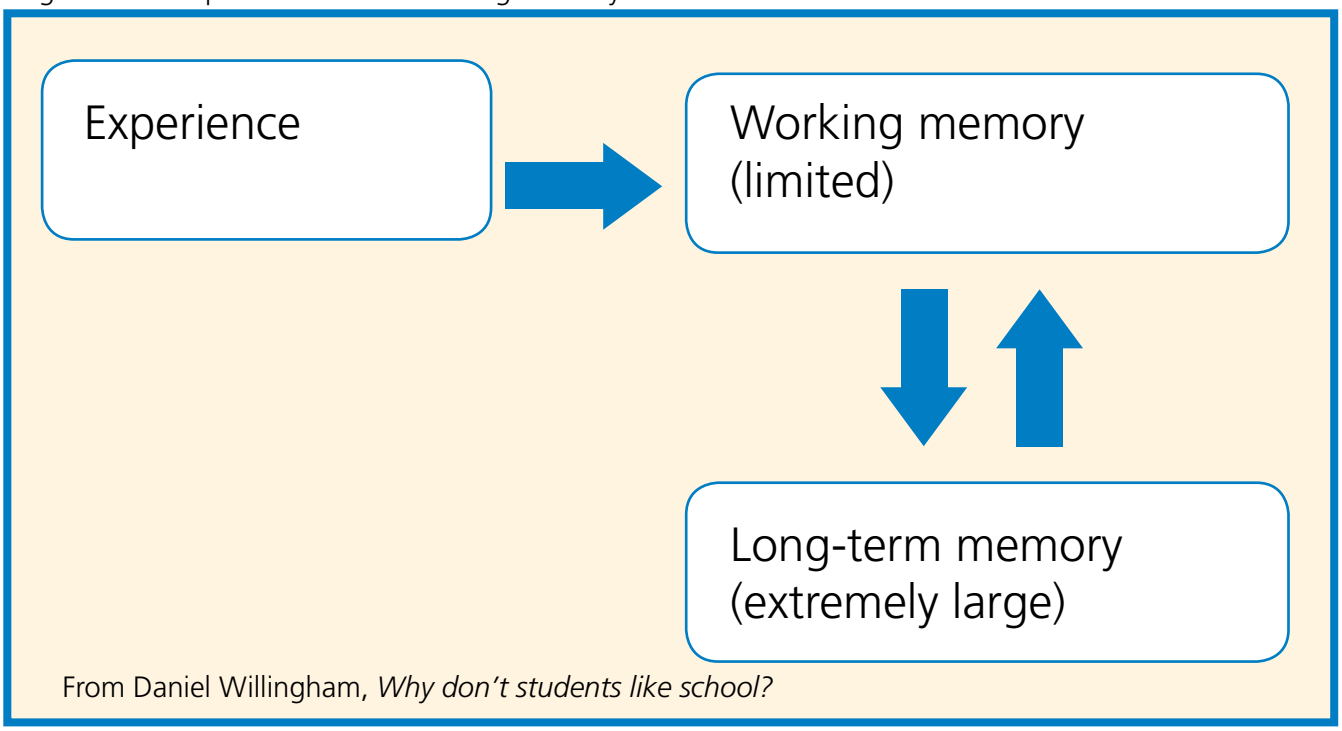
The human brain is, as far as we know, effectively without limit in terms of the quantity of information it can store. Although some of my pupils have tried to convince me otherwise, no one has yet managed to max-out a human brain. Yet if the human brain can be understood as an empty reservoir, then the means of getting information into the brain is a thin straw. This is because our working memory is in practice very limited: most psychological studies suggest that we can hold between six and eight pieces of information in our working memory at any one time.[7] As the things that we think about are held in our working memories, and long-term memory is the residue of thought, this places a significant limit on how much we can learn at any one time.

What happens if you try to think about too many things at once? If you have learnt to drive a car, you can probably remember the difficulty of having to do several things at once: using two feet on different pedals, changing gear in time with the clutch, turning the wheel, pressing indicators, watching the road ahead and remembering the rules of the road. Novices find complex tasks difficult because working memory becomes overloaded, in what psychologists call 'cognitive overload'. Experienced drivers have the basics committed to memory with both strong storage and retrieval strength, and this means that their working memories are less likely to be overloaded. The same is true of learning a musical instrument: at first it is exceptionally difficult to hold the instrument in the correct way, to produce a pleasant sound and to follow sheet music: as these things are mastered, however, working memory is freed up, allowing the musician to attempt more complex performances. The key here is that mastering more complex activities requires that the basics have first been committed to long-term memory.

History is certainly a complex task. We know from work in the field of history education that experienced historians deploy an array of history-specific processes when reading, writing or discussing history.[8] An historian who knows what questions to ask of an interpretation, or who has stored in his or her memory a framework for making sense of a complex source, has enough capacity in working memory to deal with the particular complexities of the text in front of him or her. Although less work has been done on this in history education, cognitive psychologists have shown that the same is true for substantive knowledge of the past: the more one knows about a topic, the more fluently one can read and comprehend what is in front of them, and some in the field of history education have begun to explore why this might be the case.[9]

For all of these reasons, it makes sense for history teachers to be aware of some basic principles regarding the working of human memory. As with all sciences, our collective knowledge of this advances year by year, and no doubt some of what follows will have been superseded or even supplanted

Figure 1: A simplified model of working memory



From Daniel Willingham, *Why don't students like school?*

in future years. I would argue, nevertheless, that we have a professional responsibility to remain cognisant of these developments, asking about what is and is not known, and thinking through the implications of this for our approaches to curriculum, teaching and assessment.

Creating stronger memories: classroom approaches

Drawing on these theorisations of the learning process, cognitive psychologists have derived a series of approaches to teaching that seem to have a relatively high chance of creating stronger memories in the minds of pupils.

Retrieval practice

As a broad principle, memories become stronger when we use them, and we use memories when we think about them. This is what Willingham meant when he said that 'memory is the residue of past thought'. Thinking requires effort, and the harder we think about something, the more secure the memory becomes. The process of attempting to recall memories is called retrieval, and practising retrieval is likely to result in stronger storage and retrieval strength. Retrieval practice is most commonly seen in the form of low-stakes quizzing, and a couple of articles on this practice have been recorded recently in the pages of *Teaching History*.[10] It should be noted, however, that *any* activity that asks us to recall something from memory is a form of retrieval practice.

Spaced practice

We know that retrieval practice is more likely to be effective if the retrieval is spaced out over time, rather than done in one block. I might learn the events of the Dartford Coup of 1452 by repeating them for a few minutes, but this is more likely to result in high-retrieval and low-storage strength. If I do not attempt to retrieve those events from memory again, then I am unlikely to be able to remember them six months or a year later. If, however, I attempt to retrieve those events at spaced-out intervals (a day, a week, a month, a few months, and so on) then there is more chance that those events will become strong storage strength memories, and I am more likely to remember them in the future.

Interleaving

Psychologists have shown that we are more likely to remember things if we 'mix up' what we study. For example, it is less effective to spend one day studying Topic 1, one day studying Topic 2 and one day studying Topic 3, than studying each topic every day, ideally in a different order each time. In the short term it *feels* as if we are learning the topics less well, but in the long run we are more likely to remember each one better.

Dual coding

A common myth in education is that individuals have preferred 'learning styles' where, if taught in the preferred manner, they are more likely to remember what they have been taught. There is no empirical basis for thinking that this is the case.[11] What does seem to be the case is that we are more likely to remember something if it is presented to us in more than one way. This means that most people are more likely to remember something if it is presented with both text and visuals (for example) than by one of these means alone.

Elaboration

Links are very important to long-term memory: the more a new idea is linked to existing ideas, the more likely it is that we are able to remember it. This means that there is much to be gained from asking pupils to think explicitly about how what they are learning is related to other things that they have learned, and to articulate these links: remember that memory is the residue of past thought, so if you want pupils to remember the links between ideas, then they must spend time thinking about those links.

Concrete examples

It seems to be the case that we find it more difficult to remember abstract ideas than concrete examples and that,

consequently, we are more likely to remember the abstract if it is learnt by means of multiple concrete examples. In the long run, creating your own examples of an abstract idea is an effective way of securing it in long-term memory.

The power of story

Most of the educational work of cognitive psychologists has tended to focus on subjects such as mathematics and physics, and not on subjects where story is a powerful carrier of meaning, as is the case in history. Before history teachers cast story aside as a technique, however, it is worth noting that psychologists have also found that stories help secure information in long-term memory.

Cognitive psychology and curriculum thinking

History is a distinct discipline, and history teachers have tended in recent years to resist attempts to 'apply' generic curricula, pedagogies and assessment models to the subject. I remain convinced that this is the case: history teachers are teachers *of* history, and the nature of the discipline fundamentally shapes what history teachers think and do.[12] This notwithstanding, human evolution has been happening for much longer than humans have practised the discipline of history – it is this after all that makes history, in Wineburg's terms, 'an unnatural act' – and as such it seems to make sense to me that, as history teachers, we think through what the nature of human memory makes possible in the teaching of history, and what it makes less possible.[13]

We know as history teachers that not everything we teach in our classrooms will be remembered by our pupils. I have pondered on many occasions how it can be that my pupils remember a trivial detail (such as the fact that Prince Rupert had a magical dog in the English Civil War) while failing to grasp the more seminal points of a lesson. The general strategies outlined above point towards the sorts of things that we as teachers might want to do if we want pupils to remember what we have taught them, but they do not indicate *which* particular parts of our lessons should receive the greater attention. What things should we interleave into future lessons? What ideas need concrete examples? What should we get our pupils to practise? Cognitive psychologists cannot answer these questions for they are *curricular* in nature: as teachers we need to know what curricular objects to prioritise.

History teachers have written extensively about the kinds of disciplinary knowledge that we expect pupils to learn, including powerful second-order concepts (such as 'cause' and 'change'), interpretations (including knowledge of the reasons why interpretations of the past vary) and methods (such as the use of sources as evidence to address a historical question). Insofar as these are important ideas for pupils to learn (that is, to have in their long-term memories), then we as history teachers need to create opportunities for retrieving these ideas, giving concrete examples of them, and so on. For example, in Bradshaw's work on diversity (now referred to as 'similarity and difference' in the 2014 National Curriculum) he showed how pupils were, in different academic years, asked to recall what they knew about the concept, and to use this to answer a new question.[14] While it might be questioned whether one year is an appropriate length of time, the basic idea – that disciplinary knowledge can be revisited at multiple points across a curriculum – is in keeping with the findings of cognitive psychology. Indeed, introducing new concrete examples of the kinds of questions about similarity and difference (or causation, or change, or other second-order concepts) that historians ask, is likely to result in pupils having a better knowledge of the abstract idea.

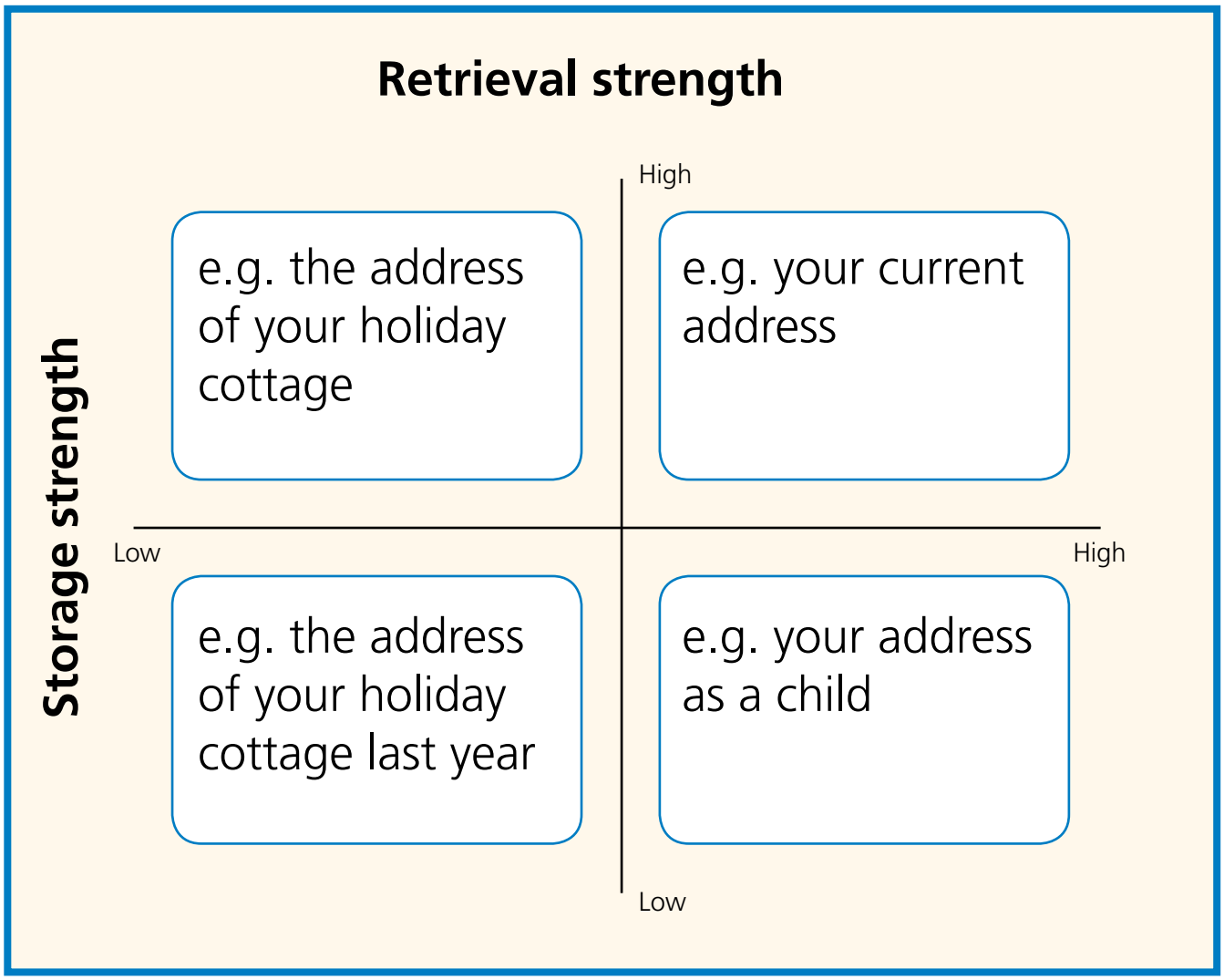
Another possibility for curriculum design comes from 'scale-switching'.[15] In this curriculum model, pupils move from depth to overview, and overview to depth, letting their study of one inform the other. The classic published example of this model is Banham's work on teaching medieval kingship through the lens of the reign of John.[16] Scale-switching also allows for more concrete examples to be introduced that illustrate an abstract idea. The chronological nature of the past, where earlier events directly influence later, can also help us as history teachers. If, for example, I have taught pupils about taxation in the late Middle Ages when they are in Year 7 (age 11-12), then I can ask them to retrieve from memory what they know about this when they come to study complaints about taxation under Charles I when they are in Year 8 (age 12-13). History teachers need to ask what pupils already know before planning the next stage in a curriculum, and, using curriculum-design strategies such as these, it is possible to create opportunities for retrieval practice, interleaving and spaced retrieval.

History teachers have already been influenced by psychological work on the benefits of retrieval practice and its limitations as a technique.[17] This sort of work is to be commended, and indeed the emphasis on recalling precise factual knowledge has been a concern of history teachers for some time.[18] It is of course all too easy to associate the learning of factual knowledge with a so-called 'Gradgrindian' approach to learning the discipline, in which pupils learn lists of facts with little understanding of the meaning of what they have learnt. Cognitive psychologists have shown, however, that such an approach works *against* the learning of factual content, for we are more likely to remember something if it is *meaningful*, in the sense that what is new is linked to things that are already known. This places an important responsibility on us as history teachers to think carefully about *what* we want pupils to commit to memory, and at what points in the curriculum.

Teaching methods used by history teachers

Just as insights from cognitive psychology might give history teachers cause to consider new problems in curriculum design, so too does it ask us to reflect on what we are doing on a day-to-day basis in the classroom. Specific techniques are suggested by cognitive psychology, and recently history teachers have been writing about their experiments with these strategies, especially low-stakes quizzing.[19] This sort of work is to be commended, and indeed the emphasis on recalling precise factual knowledge has been a concern of history teachers for some time.[20] Some caution, however, is required here. Answers to historical questions cannot always be handled in the format of a quiz and, particularly following the principle of elaboration, we probably want as

Figure 2: Storage and retrieval strength

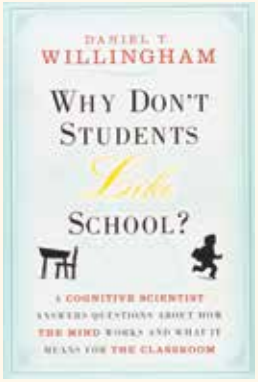


history teachers to ask our pupils to address more open-ended questions as part of their retrieval practice. In my own teaching, I quite frequently give my students three or four 'short answer' questions based on things studied at previous points in the year (or indeed in earlier years), and these sorts of tasks can allow pupils to retrieve knowledge to address more complex questions.

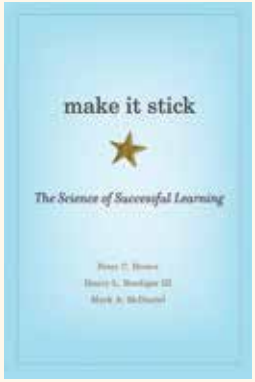
One particular challenge to history teacher practice is derived from the idea that retrieval has to be effortful for each individual. Imagine, for a moment, that you want to revise a question addressed by pupils three months earlier, and so you write it on the board and ask the class for relevant knowledge to include in answering that question. For this task to be effective as a means of retrieval practice, the mind-map would have to first be completed by each individual separately and from memory. No looking back through exercise books, and no referring to a textbook or revision guide. Similarly, a card-sort activity might be a good way of getting pupils to organise ideas, perhaps in advance of addressing an essay question, but it can give pupils and their teachers the *illusion* that they know the details, when in fact they are relying on the scaffold as a proxy for long-term memory. When the scaffold is withdrawn, the pupils cannot answer the question unless the information on the cards is in their long-term memory, although it is worth pointing out that writing an essay could be a *means* of committing something to memory, as well as being an *end* by which what has been committed to memory can be used to address a question. A timeline on the wall is very useful as a teaching aid, but can pupils reproduce it from memory? These are some of the questions that history teachers cognisant of the psychological research might wish to ask themselves.

History teachers have lots of opportunities for dual coding, not least because images are so prevalent in the discipline. What cognitive psychology seems to suggest, however, is that the images we choose do need to be related to the content being spoken or read about. One might, for example, show pupils a picture of Dickens and his book *A Tale of Two Cities* while explaining Dickens's interpretation of the French Revolution. Extraneous or indirectly relevant information can be a distraction rather than an aid to memory, and so careful choices need to be made in selecting classroom materials. A further problem here is that, with limited working memories, pupils need to be able to focus on the important information. The use of fun activities in lessons can create a memorable experience, but history teachers need to be cautious that what is remembered is the *history* rather than the *activity*. It is not my intention here to be prescriptive about teaching methods, but I would suggest that teachers consider the principles of cognitive psychology when designing specific activities for pupils.

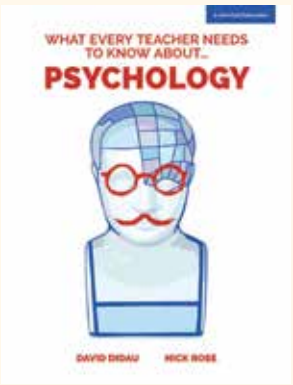
Figure 3: An introductory reading list



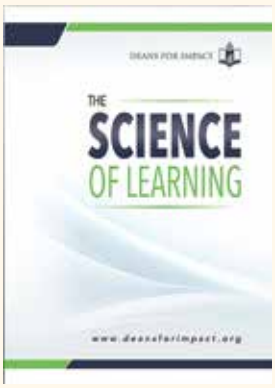
Daniel Willingham (2010) *Why Don't Students Like School?* Hoboken, NJ: Jossey Bass



Peter Brown, Henry Roediger and Mark McDaniel (2014) *Make it Stick: the science of successful learning,* Cambridge, Mass: Harvard University Press



David Didau and Nick Rose (2016) *What every teacher needs to know about... Psychology,* Woodbridge, Suffolk: John Catt



Deans for Impact (2015) *The Science of Learning,* Austin, TX: Deans for Impact

For a more comprehensive reading list of classic research papers, see https://3starlearningexperiences.wordpress.com/2017/02/28/seminal-papers-in-educational-psychology/

Conclusion

My aim in this article has been to raise a series of questions about the curriculum and teaching methods that history teachers might consider as matters for further reflection. Very little has been written on the relationship between history education and cognitive psychology but, for reasons outlined in this article, I would argue that this relationship is now in need of further exploration. As has always been the case in history teachers professional discourse, we should be cautious about accepting anything uncritically: indeed, there is a great deal to be considered in terms of the extent to which general educational theories of learning interact with discipline-specific curricular and pedagogical models. I would nevertheless hope that some of the ideas considered in this article prove a starting point from which others might advance our collective knowledge in the field of history education.

REFERENCES

[1] Counsell, C. (2011) 'Disciplinary knowledge for all, the secondary history curriculum and history teachers' achievement' in *The Curriculum Journal, 22,* no.2, pp. 201-25; I should like to thank all of the people who took time to comment on a draft of this article, including Matthew Stanford, Corinne Goullee, Nick Dennis, Christine Counsell, Harry Fletcher-Wood and Heather Fearn. The errors and misconceptions that remain are all my own.

[2] UK Education Secretary Michael Gove was particularly fond of citing the work of Daniel Willingham. See Gove, M. (2012) 'Secretary of State for Education Michael Gove gives speech to IAA', 12 November 2012, www.gov.uk/government/speeches/secretary-of-state-for-education-michaelgove-gives-speech-to-iaa; Brown, P., Roediger, M. and McDaniel, M. (2014) *Make It Stick: the science of successful learning*, Cambridge, Mass: Harvard University Press; Willingham, D. (2010) *Why Don't Students like School?*, Hoboken, NJ: Jossey Bass; Didau, D. and Rose, N. (2016) *What every Teacher Needs to Know about… Psychology*, Woodbridge, Suffolk: John Catt.

[3] Kirschner, P. A., Sweller, J. and Clark, R. (2006) 'Why minimal guidance during instruction does not work: an analysis of the failure of constructivist, discovery, problem-based, experiential and inquiry-based teaching' in *Educational Psychologist, 41*, p.77.

[4] *Ibid*. p.76.

[5] Bjork, R.A. (1994) 'Memory and metamemory considerations in the training of human beings' in J. Metcalfe and A. Shimamura (eds), *Metacognition: knowing* about knowing, Cambridge, Mass: MIT Press, pp. 185-205.

[6] Hammond, K. (2014) 'The knowledge that "flavours" a claim: towards building and assessing historical knowledge on three scales' in *Teaching History, 157, Assessment Edition*, pp.18-25; King, M. (2015) 'The role of secure knowledge in enabling Year 7 to write essays on Magna Carta' in *Teaching History, 159, Underneath the Essay Edition*, pp.18-24; Counsell, C. (2017) 'Knowledge' in Davies, I., *Debates in History Teaching,* volume 2, London: Routledge.

[7] Baddeley, A. 'Is working memory still working?' in *American Psychologist, 56,* no. 11, pp.851-64.

[8] Wineburg, S. (1991) *Historical Thinking and Other Unnatural Acts,* Philadelphia: Temple University Press.

[9] Hirsch, E. (1987) *Cultural Literacy*, Boston: Houghton Mifflin; Willingham, *op.cit;* Hammond*, op. cit.;* Counsell*, op. cit.*.

[10] Donaghy, L. (2014) 'Using regular, low-stakes tests to secure pupils' contextual knowledge in Year 10' in *Teaching History, 157, Assessment Edition*; Carr, E. and Counsell, C. (2014) 'Using time-lines in assessment', *ibid*.

[11] Kirschner, P. (2017) 'Learning styles – the emperor with no clothes,' blog https://adaptivelearninginelt.wordpress.com/2017/02/13/learning-styles-the-emperor-with-no-clothes/

[12] Fordham, M. (2016) 'Teachers and the Academic Disciplines' in *Journal of Philosophy of Education, 50,* pp. 419–31.

[13] Wineburg, *op. cit.*

[14] Bradshaw, M.(2009) 'Drilling down: how one history department is working towards progression in pupils' thinking about diversity across Years 7, 8 and 9' in *Teaching History, 135, To They or Not To They Edition.*

[15] Howson, J. and Shemilt, D. (2011) 'Frameworks of knowledge: dilemmas and debates' in I. Davies (ed.) *Debates in History Teaching*, volume 1, London: Routledge.

[16] Banham, D. (2000) 'The return of King John: using depth to strengthen overview in the teaching of political change' in *Teaching History, 99, Curriculum Planning Edition.*

[17] Dennis, N. (2016) 'Cognitive psychology and low-stakes testing without guarantees' in *Teaching History, 164, Feedback Edition*; Donaghy, *op. cit.*; Carr & Counsell, *op. cit*.

[18] Hammond, K. (2003) 'Getting Year 10 to understand the value of precise factual knowledge' in *Teaching History, 109, Examining History Edition.*

[19] Dennis, *op. cit.*; Donaghy, *op. cit.*; Carr & Counsell, *op. cit.*

[20] Hammond (2003) *op. cit.*