RETRIEVAL PRACTICE

Research & Resources for every classroom

KATE JONES

JOHN CATT

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Dedicated to Mark Duncan and his family Stella, Ian, Louise and Hiba.
An inspiring educator and good friend, taken far too soon.

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PRAISE FOR RETRIEVAL PRACTICE

'Translating evidence into practice, Kate has succeeded in making research a social process for students, teachers and leaders. We all know the importance of "best bets" and what strategies are most likely to work; we also understand that the evidence on retrieval is overwhelming. What the profession is starting to appreciate is that research should supplement teacher expertise, not supplant it. Kate is a practicing teacher and leader, faithfully adopting and intelligently adapting the science to suit her students in her classroom. Kate explains and contextualises the evidence. She gives insights that will be invaluable to students on how to use retrieval practice in their studies, practical advice for teachers for their classroom and implementation advice for senior leaders. If you love to teach and want to be the best teacher you can be, this is the book for you!'

Phil Naylor (@pna1977)
Teacher, senior leader and host of the podcast 'Naylor's Natter'

'I highly recommend Retrieval Practice*. As Kate says, retrieval practice is a low effort, high impact strategy, and it is therefore one that is very worthwhile for all teachers to know more about. As well as running through the fundamental theory in an accessible way, the book highlights many of the broader benefits of retrieval practice, such as improving metacognitive awareness of the learning process among a class, and helping teachers to be more confident about what their class know. And as Kate rightly points out, teachers who report a lack of time to use retrieval should consider that there are few strategies (if any) that result in such benefits for both the durability and transferability of learning. A real strength of the book's approach is the many practical tasks it presents. The diagrams and example worksheets will make such tasks very easy for teachers to understand and implement.'*

Jonathan Firth (@JW_Firth)
Author and Teaching Fellow at the University of Strathclyde, Glasgow

'Kate Jones returns with her second book about retrieval practice for any classroom and once again creates something that perfectly blends educational research with practical ideas for any teacher to implement in their classroom. Kate is a classroom teacher at heart and this comes across in everything she writes. She understands the way classrooms work and I am always in awe at her ideas – it's no different when reading her latest book about retrieval practice. Kate makes me a better teacher through her work and this book is a classic example of just that.'

Tom Rogers (@rogershistory)
TES columnist, Founder and Director of TMIcons and RogersHistory.com

'Kate strikes again, providing us with the very latest in educational research, this time for one of the hottest educational topics at the moment "retrieval practice". Kate effectively removes any doubt that the term is a momentary educational fad and presents quality, consumable educational research that will inspire teachers everywhere.

As is synonymous with Kate's work, she provides excellent resources and ideas which are all low in effort but high in their impact. This book will enthuse every classroom teacher to develop, implement and embed retrieval practice. We have already used the ideas and information from this book in our teaching, CPD sessions, assemblies and parent/carer coffee mornings. We cannot wait to feature it on #BookTalkThursday!'

Matt Walker and Tim Barker (@carpool4school1)
The creators and host of CarPool4School

'Kate Jones is slowly becoming the busy teacher's favourite read. Kate offers concise and accessible summaries of key research relating to retrieval practice before sharing a wide range of ways in which retrieval practice could be effectively embedded into any classroom. This book is an excellent read because Kate generously shares practical ideas that could easily be put to use within the classroom the very next day to benefit pupils' retrieval and retention skills – an area we know is fundamental to learning. Kate's personal, warm style of writing means you come away feeling energised to put her ideas into action. A fantastic middle leader, whose passion for teaching and desire to support others is so evident.'

Freya Odell (@fod3)
Teacher of English at St. George's British International School, Rome

'This is an incredibly timely book, the importance of the working memory and retrieval practices has been highlighted as a core standard in the 2019 Early Careers Framework formulated by the EEF. Whilst there is a growing body of research about the importance of cognitive science related to how students learn, there has not been much written to connect this research to its practical implications for teaching and learning. Interest from teachers into the science of learning has never been greater, but understanding how to apply it in the classroom can be a minefield. Kate has taken apart and translated the research into something that is relatable but most importantly usable.

There is no doubt that this book will fly off the shelves of many CPD libraries; I know that I will be returning to it frequently over the next year as I seek to implement its many practical ideas.'

Dee Saran (@Dee_Saran)
Deputy Headteacher at Dubai College, UAE

'This book helps further illuminate the relationship between theory and how it may walk and breathe in the daily practice of both teachers and learners. It offers clear and readily accessible explanations around retrieval practice as a key facet of memory inquiry and cognitive psychology, helping explain not just what may be effective in terms of practical classroom application, but why it may be effective. It helps further strengthen the co-natural relationship that teaching is learning.'

Mark Healy (@cijane02)
Psychology teacher and Deputy Headteacher at St. Andrew's High School, Coatbridge

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ACKNOWLEDGEMENTS

2019 has been a very year busy for me!

In August I relocated and started a teaching and leadership role at a new school, The British School Al Khubairat in Abu Dhabi. This is a very prestigious, co-educational, non-selective and not-for-profit school. I would like to thank my colleagues for the warm welcome, especially the history and geography departments. Thank you to James McBlane and Nigel Davis for their support and enthusiasm with this book. I am lucky to work with leaders who lead by example and continually promote the message of lifelong learning, therefore I also want to thank Teresa Woulfe, Head of Secondary School and Mark Leppard MBE, Headmaster.

I am very pleased to have had the opportunity to work with the team at John Catt again. Thank you to Alex Sharratt for his enthusiasm, the talented graphic designer Scott James and the kind, hardworking and dedicated editor Meena Ameen. A huge thank you to Tom Sherrington, an educator I greatly admire, for agreeing to write the foreword to this book. Tom has recently authored the very successful book *Rosenshine's Principles in Action* and this book has illustrated how educational books focusing on one key topic, concept or area of research is something that teachers want to read. As you will see he is referenced a lot in this book, thus showing how much I have learned from him!

I am delighted to have been able to include a range of case studies and ideas from leaders and teachers which explore the impact retrieval practice has had. Thank you to all the contributors for taking the time to reflect and contribute to this book. Professionally, I want to show my appreciation and gratitude to Pooja K. Agarwal, Patrice Bain and Blake Harvard. I am very lucky that, despite the distance between us, I have been able to learn so much from Pooja, Patrice and Blake. They are all incredibly supportive of the resources I share and my writing – especially about retrieval practice.

Finally, thanks to all my friends for being there for me, both professionally and personally. As always there are too many people to name and thank. This includes current and former colleagues at all the amazing schools I have had the privilege to work at, in addition to my non-teacher friends that are very supportive in all that I do. Thank you to

all the students that I have had the privilege to teach over the years. And, finally, my family: my mother, Heather, and father, Andre, Emily, Paul, Jessica, Jo-anne, Ben, Ella and my Gran Hazel – I am eternally grateful for your kindness and love.

FOREWORD

BY TOM SHERRINGTON

What is retrieval practice and why does it matter? Here's an example. Last year I became frustrated that, despite numerous visits to historical sites and reading various books over the years, my knowledge of Henry VIII's six wives and their life stories was poor. I was forever forgetting the details; I got their names and their respective fates muddled up and I was unable to tell the story with any coherence. Why? I had been relying on fragments of knowledge 'sinking in' somehow but not really engaged in any attempt to retrieve the information in a coherent manner. 'Sinking in' is actually a terrible metaphor for learning. It requires some conscious effort; some determination and, crucially, some practice. I decided to remedy the situation and engaged in a whole process of writing out timelines, re-telling the stories of each wife from memory, checking my recall for accuracy and trying again. Now, after a period of doing this, I've developed a really good sense of the story. When I read more about them, the knowledge seems to stick more easily and my Henry VIII's Six Wives schema is now rich in narrative detail that helps me understand a range of more complex ideas in history, such as the changing link between the church and the state.

Arguably the act of 'practising remembering' is at the very core of what effective learning is about. The more we know, the more we can know. The more we know, the more we can understand. The more often we retrieve knowledge from our vast complex stores of memories in different ways – all those facts, words, ideas, concepts and experiences – the stronger those memories become and the more fluently we can recall them. The more fluent we are in recalling our knowledge, the better placed we are to explore new knowledge, to solve new problems, to engage in debate, to respond to challenges, to understand what we read. The more we know, the more creative we can be.

And yet, forgetting is all too easy. It's probably the most predictable feature of any learning process that lots of students will forget a lot of what their teachers have been trying to teach. It's utterly inevitable but still teachers will often bemoan this fact. 'I can't believe you've

forgotten it already!' They'll be disappointed that the new technique, the fascinating word or powerful phrase they discussed at length only last lesson has been only tenuously grasped; it seems to have 'gone in one ear and out the other'. Thankfully, help is at hand.

In my training, I always celebrate the idea that what teachers need to develop is 'evidence-informed wisdom'. We all gain wisdom from experience, learning from our triumphs and disasters, learning from how our students respond to various strategies; learning from teaching the same material to different classes. But I think we should also be seeking out evidence from beyond our experience including from the vast array of studies into teaching and learning and the way the human brain functions. If we can blend evidence from research with the evidence we gather in our classrooms, we won't be feeling our way so much, relying on our hunches; we'll be in a much stronger position to make good decisions. Happily, slowly but surely, I think teaching is becoming a genuinely evidence-informed profession as our access to the wealth of research evidence continues to grow. New blogs, books, conferences and Twitter feeds are helping teachers to access, debate and adapt ideas like never before. It's a truly exciting time to be working in education.

Kate Jones, in my view, is the archetypal contemporary switched-on evidence-engaged teacher. Her books, blog and social media output fizz with enthusiasm and earnest commitment for teaching the subject she loves – History – but also for sharing ideas with other professionals in her school and around the world. She has the authentic voice of a practising teacher, passionate about her subject, determined for her students to succeed but also fascinated by the science of learning and the myriad ways of putting ideas into practice. *Retrieval Practice* pulls so many ideas together starting with a superb exposition of the key ideas from cognitive science then drawing on the experience of teachers across a wide range of subjects to explore their application in real classrooms. If you ever thought that retrieval practice was just a matter of taking a quiz, this book will put you straight. There are so many ideas here, it's really quite remarkable. It's been a real joy to read – a wonderfully written book about a vital subject and I think it's going to be an extremely valuable resource for a lot of teachers.

AN INTRODUCTION TO RETRIEVAL PRACTICE

Has 'retrieval practice' become the latest buzzword in education? That is a concern and frustration felt by many educators I know. There's no denying that a very trendy topic at the moment in education – people are tweeting about it, presenting about it at conferences, and now there is even a book completely dedicated to the field.

Whilst it is true that retrieval practice is a term that many educators have only become familiar with in recent years, it is certainly not a fad and, although not completely new, I still consider it to be revolutionary to teaching and learning. It is much more than the latest bandwagon to jump on and hopefully the interest in retrieval practice is not just a passing phase. The key difference between this and other fads that have come and gone in education is that it is supported by vast amounts of research and welcomed by educators as part of their daily teaching practice.

This book was not written with the intention of being dedicated to the field of cognitive psychology (one could be forgiven for thinking that based on the title), but instead it is very much focused on teaching and learning. I am not an academic researcher or cognitive psychologist. I am a classroom teacher and middle leader with a strong interest in this field who has written a book for other teachers who, like myself, simply want to learn *more*. I do reference a lot of research and cognitive psychology, which is necessary when writing about retrieval practice, but I have tried to combine theory and practice from a teacher's perspective.

Retrieval practice refers to the act of recalling learned information from memory (with no or little support) and every time that information is retrieved, or an answer is generated, it changes that original memory to make it stronger.

'Using your memory, shapes your memory' – this is a great description of retrieval from the distinguished and well-respected professor of psychology, Robert Bjork.[1] The retrieval process cements the information

1. Gocognitive (2012) 'Robert Bjork – using our memory shapes our memory'. *Youtube* [Video] 12 July. Retrieved from: www.bit.ly/2nAYHgL

in the long-term memory, which should enable that information to become easier to retrieve in the future. Retrieval practice focuses on recalling information from memory as a *powerful learning tool, not an assessment tool*. Therefore, it is regarded as essential classroom practice to support learning with the regular practice of retrieval.

Retrieval practice has previously been referred to by academics and in educational research as the 'testing effect', as naturally the act of recalling information from memory describes the process of a test. Two leading and influential academic researchers in the field of retrieval practice are Henry L. Roediger III and Jeffrey D. Karpicke – both of whom are widely referenced in this book – write that 'testing is a powerful means of improving learning, not just assessing it'.[2]

Testing itself is often used for assessment and judgment rather than as a way to further improve learning, although some tests are designed to do both. It is easy to see why the term 'testing effect' is not as commonplace as retrieval practice due to the negative connotations that come with testing, such as: exam pressure; stress, anxiety and other mental health problems; and, the suggestion that schools are simply exam factories that continually test children and kill creativity, which is simply not true. Retrieval practice is also intended to be low-stakes or no-stakes (meaning the results do not need to be recorded or shared), unlike a high stakes, high-pressure situation such as an external examination. There are many variations of retrieval practice in the classroom, going beyond traditional testing.

In order to fully grasp retrieval practice we need to have a contextual understanding and awareness of the distinction between the different types of memory. This could be a book entirely in itself, but I will just summarise this because often I have wondered, as a teacher, how much of the psychology do I really need to know? Certainly, knowledge of this is important, but there are concerns and potential issues if teachers are expected to become academic experts in cognitive psychology, in addition to experts in our own individual subjects, pedagogy and the wellbeing of students in our care too.

The key areas I believe are highly significant are knowledge of short-term memory (also referred to as 'working memory') and long-term memory. This information is now generally well known amongst teachers as there has been so much discussion of it as of late, but for

2. Roediger, H. L. and Karpicke, J. D. (2006) 'Test-Enhanced Learning: Taking Memory Tests Improved Long-Term Retention', *Psychological Science* 17 (3) pp. 249–255.

clarity I will briefly summarise the key differences between short-term and long-term memory as they are terms I will refer back to throughout. A good starting point is the multi-store model of memory by Richard Atkinson and Richard Shiffrin as shown in the diagram below.[3]

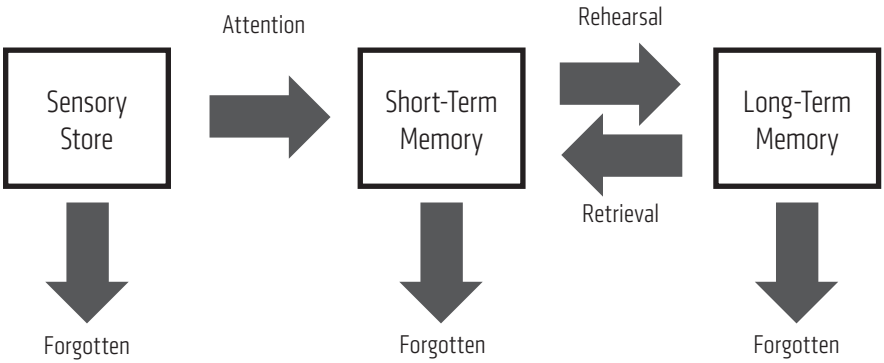

Figure 1 The multi-store model of memory by Atkinson and Shiffrin (1968)

Cognitive psychologists Atkinson and Shiffrin proposed that memory consisted of three stores:

The first is the **sensory store**, where new information is encoded. Subsequently, in the learning process we begin at the attention and encoding stage, but it's important to note that this is not the only stage in the learning process, it's just the beginning. When I started teaching I tended to focus on teaching content and skills, getting that information into students' minds, only for them to try and retrieve it at a much later date, for example an end of unit assessment or exam.

Information is then passed on to the second store: the **short-term memory**, which is also referred to interchangeably as 'working memory', based on further work carried out by Baddeley and Hitch (1974) who believed the original concept of short-term memory with the multi-store model was far too simplistic.[4]

When we encounter new material, the information is stored for a very brief time in our short-term memory. The reason for this is due to the capacity (how much information) and duration (how long we can store it) of our short-term memory, which is very limited. The length of time

3. Atkinson, R. C. and Shiffrin, R. M. (1968) 'Human memory: A proposed system and its control processes', in Spence, K. W. and Spence, J. T. (eds) *The psychology of learning and motivation*. New York, NY: Academic Press, pp. 89–195.
4. Baddeley, A. D. and Hitch, G. (1974) 'Working memory', *Psychology of Learning and Motivation* 8 pp. 47–89.

information can be stored in our short-term memory can naturally vary between different individuals ranging from a matter of a few seconds to a few minutes.

Peterson and Peterson (1959) investigated the duration of working memory and the various factors that cause working memory to decay.[5] They concluded that almost all information stored in short-term memory that is not rehearsed is lost within 18 to 30 seconds! That is alarming when we consider the implications for that in the classroom and this emphasises the importance of repeated exposure to content, concepts, vocabulary and skills. If we do not revisit material it will be lost forever, snatched away by the curse of forgetting (although I will later explain why forgetting isn't always as bad as we may think).

Finally, if information has been rehearsed and retained beyond short-term/working memory then it is then stored in what is known as our long-term memory. But it is not enough to be able to store that information in our long-term memory – we need to be able to retrieve it from there too.

The three stages of memory discussed are classed as the encoding, storage and retrieval stages as shown in figure 2, based on the work of Arthur Melton (1963).[6]

Figure 2 Stages of memory and the learning process

Retrieval storage refers to how well information is embedded in our long-term memory and retrieval strength refers to how easily a piece of information can be brought to mind when required.[7] It is good for teachers to be aware of and consider both retrieval storage and strength.

'Procedural memory' refers to a type of long-term memory that we use on a daily basis, without consciously realising that we do, often known as

5. Peterson, L. R. and Peterson, M. J. (1959) 'Short-term retention of individual verbal items', *Journal of Experimental Psychology* 58 pp. 193–198.
6. Melton, A. W. (1963) 'Implications of Short-Term Memory for a General Theory of Memory', *Journal of Verbal Learning and Verbal Behaviour* 2 pp. 1–21
7. Didau, D. and Rose, N. (2016) *What Every Teacher Needs To Know About Psychology*. Woodbridge, Suffolk: John Catt Educational.

autopilot. Automacy involves knowing how to do something so well that we don't stop to consider each stage of the process, it just happens seamlessly and effortlessly. Procedural memory does not require conscious recall, so it is consequently classified as non-declarative memory (declarative memory requires conscious recall and more effort). Procedural memory is important in a school setting because once students are familiar with specific activities or skills, the process becomes automatic so that working memory is freed up and can instead be used to focus on the content or questions instead of how to complete a task.

The retrieval process

I was taking part in a quiz one evening with a group of friends and a question came up that annoyed me. I knew that I did actually know the answer but I just couldn't recall it at that precise moment in time – typical. I'm sure it's a moment that many people can relate to. I started explaining to my friends that the information was there inside my long-term memory but I just couldn't retrieve it. One of my friends rightly asked: 'What good is information and knowledge if it's in your memory but you can't find it or use it?' Exactly. We need to be able to access that information easily when we require it.

As educators our role isn't to simply transfer information to students' long-term memory, we also need to support them so that they can retrieve that information when required. Dr Pooja K. Agarwal – cognitive scientist and co-author of a book I highly recommend, *Powerful Teaching: Unleashing the Science of Learning* – often explains that we shouldn't just focus on getting information into students' mind but instead ask, 'How can we get that information out of their mind?' That is where retrieval practice becomes so crucial to learning.

Paul A. Kirschner, John Sweller and Richard E. Clark are widely quoted for defining learning as a change in long-term memory, 'if nothing has changed nothing has been learned'.[8] This is a very good way of looking at learning, not education as a whole but specifically learning, stressing the importance of long-term memory. This has been the game changer for myself and many other teachers. Long-term memory wasn't part of my vocabulary, understanding or lesson planning when I first began teaching, but it is now.

8. Kirschner, P. A., Sweller, J. and Clark, R. E. (2006) 'Why Minimal Guidance During Instruction Does Not Work: An Analysis of the Failure of Constructivist, Discovery, Problem-Based, Experiential, and Inquiry-Based Teaching', *Educational Psychologist* 41 (2) pp. 75–86.

We are constantly retrieving information from memory on a daily basis, sometimes we are aware of it and other times we aren't. When a parent asks their child what did they do or learn in school that day the child has to retrieve the information from memory to answer. Whilst parents who ask their children about their day show genuine parental interest, it can also be a useful retrieval strategy, but are parents aware of this? If so, perhaps they could ask more often or think more carefully about the questions they do ask; perhaps they could even challenge their children by asking them to retrieve what they remember from yesterday, last week and even further back.

Retrieval practice has transformed classrooms around the world with leaders and teachers implementing it into their curriculum planning, lessons and home learning. However, there is still a lot of work to be done in embedding retrieval strategies and ensuring all teachers, students and parents recognise the value of this approach. I know many schools that have fully embraced retrieval practice and it has become part of their language of learning. I am very fortunate to currently work at a school that models exactly this but I am also aware of other schools that haven't recognised retrieval practice at all, or schools where only a select few teachers have done so, isolated in their classroom. Even worse are the schools and leaders who have enforced retrieval practice as simply another tick box activity only to be completed during lesson observations or inspections. How would you describe your school and its approach to retrieval practice? This is something to reflect and consider as a teacher or leader.

The science of learning is another phrase being used in education circles a lot, but it's important that educators, students and parents have a good understanding of what the science of learning actually refers to. Bradley Busch and Edward Watson are authors of the insightful book (described by John Hattie as his 'book of the decade') *The Science of Learning 77 Studies That Every Teacher Needs to Know*, which provides an excellent definition of the science of learning: 'It is the quest to help our students learn more effectively and efficiently.'[9] I couldn't agree more. What could be more important in our role as educators (other than the safety and welfare of our children) to support learning than enlightening ourselves on the science of learning? Learning how to learn has not previously received the profile and importance that it deserves but it certainly has begun to recently.

9. Busch, B. and Watson, E. (2019) *The Science of Learning: 77 Studies That Every Teacher Needs to Know*. Abingdon, Oxon: Routledge.

Research

There has been a movement in recent years that has involved more teachers connecting with educational research and becoming more evidence informed. Educational research has never been easier to access, especially with: the Chartered College of Teaching, which provides online access to journals and their magazine *Impact* that members receive; the EduTwitter network online tweeting articles and blogs; and, the increase of events taking place for teachers organised by teachers. There's also a wealth of educational books available too, driven by research written by both teachers and academics. I explore the reasons for the renewed interest in educational research in more depth in the first chapter of this book. However, there are still barriers when it comes to teacher engagement with research. I believe the main obstacles are:

- Time to engage, embed and reflect
- Academic jargon and terminology
- Access to research journals can still prove difficult or costly (although this is improving as mentioned)
- A disconnect between educational research and teachers
- There are inconsistent findings in the field of research linked to education
- Lack of trust and scepticism after neuromyths previously published as educational research are now debunked (learning styles being the classic example)

Probably the most obvious and pressing factor can be time. Teachers are busy. We have planning and marking to do, parents' evenings, pastoral responsibilities, organising school trips and much, much more, in addition to balancing our own personal lives too. How do we find the time to engage with this research?

Many teachers are choosing to do so in their own time because it is interesting, exciting and can be incredibly liberating, but schools do have a responsibility to support teachers who are choosing to become research and evidence informed. It is also something that, as a profession, we should do together. Engaging with educational research is so important; time should be dedicated to this at a whole school, department and individual level. A senior leader at my school recently delivered a presentation about how schools should actively and financially support teachers when it comes to professional learning.

There is research that can seem contradictory at times or not that clear. If it is not consistent then we need to think about how we react and respond to that (although the majority of the research I have encountered in regards to the testing effect is in agreement with similar experiments and findings).

Author of *Why the Brain Matters: A Teacher Explores Neuroscience*, Jon Tibke, points out that 'research is inevitably highly complex, specialised and laden with language unfamiliar to all but those working in the field',[10] and I, at times, have found this to be very true, making for some confusing reading. I have had struggles with educational research, mainly due to the complexity and use of unfamiliar terminology, but ultimately I have persevered and learned a lot despite the challenges.

Experienced teachers can also feel the frustration after witnessing many fads come and go throughout their careers; understandably they are wary of the next short-lived fad being introduced to, once again, later disappear. Another problem linked to educational research is simply the term 'evidence informed' because that in itself poses several questions, such as: where is the evidence from? Is it accurate and reliable? What were the context and conditions of the research carried out? Has the testing or research been replicated?

The Learning Scientists are a team of academic researchers and cognitive psychological scientists that are interested in research on education. Their vision is to make scientific research on learning more accessible to students, teachers and parents. They offer this considered advice in their brilliant book *Understanding How We Learn: A Visual Guide*: 'If evidence supports the effectiveness of a strategy, then we should by all means adopt it, but continue to be flexible as the science evolves.'[11] This is the approach I have taken in regards to educational research – adopting and applying it, but also accepting that we are not there yet. There are many developments yet to be made and much more progress to come, I am sure.

Author Carl Hendrick has reflected that in his view that 'there is an ethical imperative to provide the best possible classroom conditions in which students in our charge can flourish', adding 'this means rejecting what wastes time and embracing that which makes the most use of it',[12]

10. Tibke, J. (2019) *Why the Brain Matters: A Teacher Explores Neuroscience*. Thousand Oaks, CA: Corwin.
11. Sumeracki, M., Weinstein, Y. and Caviglioli, O. (2018) *Understanding How We Learn: A Visual Guide*. London: Routledge.
12. Hendrick, C. and Macpherson, R. (2017) What Does This Look Like In The Classroom? Bridging the Gap Between Research and Practice. Woodbridge, Suffolk: John Catt Educational.

and I don't think any educator would disagree with that. We have a duty and responsibility to support the students in our care as best we can and we should continually reflect and review as to how we do this. Hendrick recognises research cannot give us all the answers, but it can guide us in the right direction.

Busch and Watson also highlight that 'despite there being a wealth of research on the science of learning, to date, much of it has failed to get into the hands of the people who need it most, e.g. teachers'.[13] I would go further than that and suggest that the people who also need the knowledge and understanding of how we learn are the students themselves. That is why research summaries are so useful because they are more concise, accessible and practical.

Professor John Dunlosky illustrated that there has been too much focus in education on 'what' rather than 'how'. Dunlosky stated: 'Emphasis is on *what* students need to learn, whereas little emphasis – if any – is placed on training students *how* they should go about learning the content and what skills will promote efficient studying to support robust learning. Nevertheless, teaching students *how* to learn is as important as teaching them content, because acquiring both the right learning strategies and background knowledge is important – if not essential – for promoting lifelong learning.'[14]

Learning how to learn has been described by researchers Elizabeth and Robert Bjork as the 'ultimate survival tool',[15] essentially a crucial life skill. I think that description is so powerful and accurate, one that we should share and stress to our students. This is something I have only realised and embraced as an adult, as a student I always focused on the content and subject-specific skills (which no one is suggesting isn't important) rather than consider the learning strategies I was using. I am now very fortunate to be in a position where I can share this information with the learners in my classroom.

I am aware of many schools where senior and middle leaders filter educational research to share with colleagues and provide time during inset days or departmental meetings to get to grips with this research.

13. Busch, B. and Watson, E. (2019) *The Science of Learning: 77 Studies That Every Teacher Needs to Know.* Abingdon, Oxon: Routledge.
14. Dunlosky, J. (2013) 'Strengthening the Student Toolbox: Study Strategies to Boost Learning', *American Educator* 37 (3) pp. 12–21. Retrieved from: www.bit.ly/2iISdYC
15. Bjork, E. and Bjork, R. (2011) 'Making things hard on yourself, but in a good way: Creating desirable difficulties to enhance learning', in Gernsbacher, M. A., Pew, R. W., Hough, L. M., Pomerantz, J. R. (eds) and FABBS Foundation, *Psychology and the real world: Essays illustrating fundamental contributions to.* New York, NY: Worth Publishers, pp. 56–64

Although this is amazing, not all schools are actively doing this. This is something I am presently attempting to incorporate as a middle leader with the teachers in my department. Not all teachers are as enthusiastic to engage with the latest educational research and, as leaders, that can bring many issues and challenges as to how to create a culture of professional learning which is evidence informed whilst not dismissing teacher expertise, experience and autonomy.

I personally prefer research summaries that are concise and clear for teachers to access, understand and act on. I will refer to a wide range of sterling research summaries in this book and recommend further reading after each chapter. This may seem overwhelming, I am certainly not suggesting all of the books are a must-read because – as someone who has read all of the recommended reading – I have noticed a lot of overlap and repetition with content and information, therefore they are simply a selection of recommendations.

In December of 2018 I attended and presented at a wonderful teaching event in Hong Kong, the Asia Pacific International Schools Conference (AISC). One of the main strands and theme of the conference was the science of learning. The keynote speaker for this strand was Dr Jared Cooney Horvath, a former teacher turned author and academic researcher specialising in how we learn. Cooney Horvath is incredibly knowledgeable and passionate about the science of learning but he made it explicitly clear that the experts in the classroom are the teachers, as we have the insight, knowledge and understanding that academic researchers don't (in the same sense they have expertise in their chosen field that teachers do not possess). Cooney Horvath has stated that 'knowing how someone learns and knowing how to guide someone through the process are two very different things'.[16]

In addition to sharing a wide range of sources focusing on educational research I will include anecdotes because, as teachers, we are constantly acquiring a collection of unique experiences and stories that we can reflect on and share with other educators in the same way we can approach educational research. I also reference many blogs written by teachers. There are so many high-quality blogs available to read freely written by successful authors, leaders and teachers which illustrate that, as a profession, the collaborative and reflective culture is thriving.

16. The Learning Scientists (2019) 'Episode 40 – Memorizing Facts vs Using Information with Dr. Jared Cooney Horvath', *Learning Scientists* [Podcast] 2 May. Retrieved from: www.bit.ly/2Vp6SJG

I have previously described educational research as one piece of a complex puzzle when it comes to working with children in schools. Retrieval practice is another vital piece of that complex puzzle, however it is only *one* piece of that puzzle. Relationships, routines and much more all make up the other pieces, and what use is a puzzle with a missing piece? All pieces need to be firmly in place and connected. I do want to stress that I – and I am sure that most if not all teachers – believe there is much more to education than retrieval and the ability to recall information. That is undoubtedly an important aspect of the learning process but the bigger picture is much more intricate. I have created an infographic to show some of the different elements (or pieces of the complex puzzle) teachers have to consider when it comes to teaching and learning in the classroom, in addition to retrieval practice. What would you add?

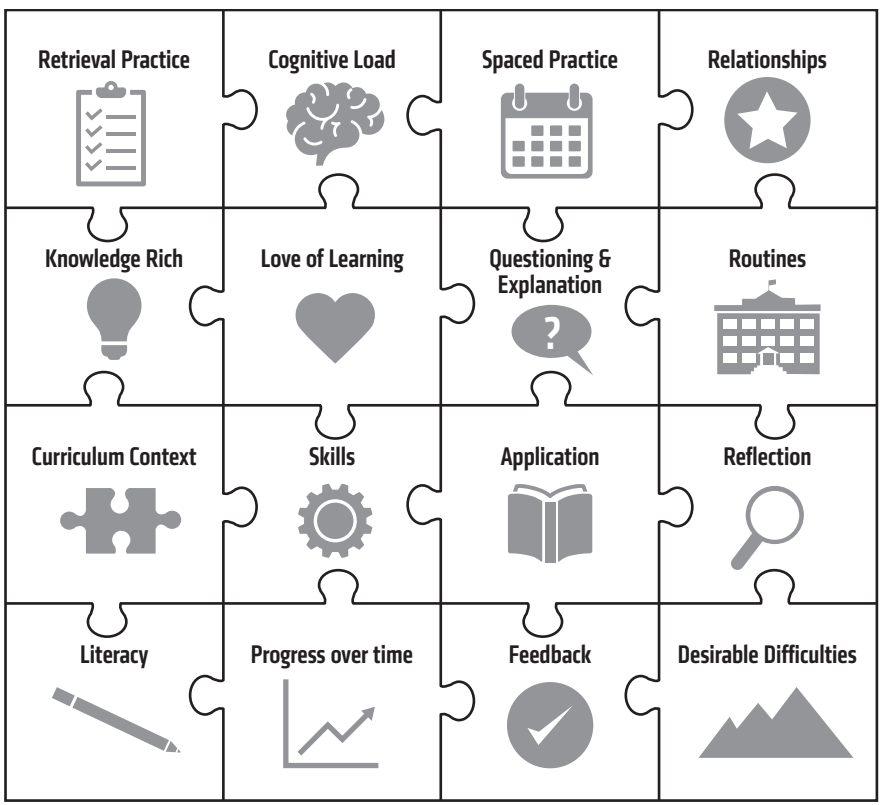

Figure 3 The teaching and learning puzzle

Finally, I have realised how important it is to share this wealth of knowledge, insight and awareness that educational research has provided us with. Other ways I have shared my ideas and reflections have included my blogs, podcast and presenting to colleagues, but sharing this information with my students has had the biggest impact.

In July 2019, I left a school where I had been teaching for three years. I received lots of lovely cards and presents. Something that I was not expecting was the gratitude shown by colleagues, parents and students for introducing them to the science of learning and educational research with a specific focus on retrieval practice. I did introduce retrieval practice to my colleagues and students, at times it came with many obstacles, reluctance and even rejection but it was certainly worth it. The impact was evident with outcomes, results and through the knowledge of knowing others now know more about how we learn.

Resources

All of the resources and ideas in this book are designed to support retrieval practice. The main aspect to remember is that this means no notes, textbooks or support is permitted as it prevents retrieval from taking place (although I will later explore the benefits of *some* retrieval support). Many of the tasks in this book could be easily adapted to be used alongside notes and textbooks as part of the encoding process, which is important but it is not retrieval practice. The key to retrieval practice is the retrieval from memory. It's as simple as that.

Like all things in education, retrieval practice can be carried out and delivered effectively or badly. That is why it is so important that we continually learn and review our practice. When it comes to implementing research and applying this in the classroom we need to think about meaningful learning. What does meaningful teaching and learning look like? This is a very challenging question but also necessary for us to reflect on when planning a sequence of lessons or designing a curriculum.

Karpicke has written about this and I thought he demonstrated that researchers and teachers are not as disconnected as some might assume. Karpicke wrote, in a paper focusing on how retrieval promotes meaningful learning, that meaningful learning is about producing organised, coherent and integrated mental models that allow people to make inferences and apply their knowledge.[17] I am confident all educators would agree with this observation (although teachers may

17. Karpicke, J. (2012) 'Retrieval-Based Learning: Active Retrieval Promotes Meaningful Learning', *Current Directions in Psychological Science* 21 (3) pp. 157–163.

wish to develop this further based on their own interpretations and experiences) and generally that would be widely accepted as an accurate description of meaningful learning. We also need to take this question further by asking what does meaningful learning look like in our subjects/phases that we teach? This was a point I considered when it came to retrieval task design.

I have included many real life examples of resources used in my classroom but as I now only specialise in teaching history I have asked teachers across other subjects, who have used these resources in their subject, to share their examples in this book. Many thanks to the teachers that have kindly agreed to do so. I have also included visuals to once again help you, the reader and teacher, consider how the tasks could be used in your classroom with your learners.

During the early years of my career I spent many evenings printing, cutting, gluing and laminating. I did enjoy creating innovative resources but they were time consuming and added negatively to my workload and wellbeing. On reflection, I also think many of my resources were over complicated and, at times, distracted from learning; knowledge of cognitive load has helped me to consider this aspect too. Now I combine educational research with my professional experience and insight to create resources that are **low effort, high impact**. I believe this to be of paramount importance when creating or using resources in the classroom. The low effort does not refer to students' effort, but rather the time a teacher puts into creating and planning, as they are tasks or activities that are simple and easy to adapt and use.

In my first teaching role I was observed by my deputy headteacher and the feedback he gave me all those years ago has stayed with me and impacted my practice ever since. He observed a religious education lesson where the class were studying key events and ceremonies in different religions at the time. That particular lesson was about Christian weddings and I did a lot of unnecessary preparation. As I wasn't teaching the period before, I used that time to organise and get ready and it took me about 55 minutes just to set up the classroom and resources. I remember decorating the classroom with a wedding theme. There were name cards on each of the desks for students – as would be at a wedding reception for guests – despite the fact students were sitting in their regular seats anyway. I also sprinkled some confetti on tables and hung up white wedding decorations around the room. The extra touches added nothing to the learning (many of the decorations weren't even explicitly linked to Christianity but have evolved as wedding traditions),

and only resulted in extra tidying up for me at the end of the lesson. This serves as an example of high effort, low impact.

The feedback my deputy headteacher gave me was very positive (despite the obvious elements of gimmickry and novelty), but he did comment on the amount of effort and attention that had gone into that single lesson and how it would not be possible to do that for every lesson. It was simply unsustainable, unnecessary and unrealistic and he was right; I was very grateful for that constructive feedback.

The high impact refers to impact on learning both inside and outside of the classroom, which is absolutely essential. When teachers aren't spending hours planning and designing classroom activities that frees up our precious time, thus allowing us to develop subject knowledge and professional learning, and even to enjoy our evenings and weekends more – how lovely! I do enjoy lesson planning and being creative with resources, but I finally feel I have struck the balance with **low effort, high impact**.

An excellent resource is not a substitute or replacement for poor subject knowledge, but a resource can certainly compliment subject knowledge to create a meaningful and impactful learning environment. The resources in this book are intended to be combined with teachers' own subject knowledge and adapted for teachers' classrooms.

Retrieval practice can be fun, enjoyable and engaging without gimmickry but with a clear focus on learning. This book contains a wide range of tasks to support retrieval practice with explanations, links to research and classroom context provided. This book is aimed at teachers in the classrooms across primary and secondary, in addition to middle and senior leaders.

All of the resource templates in this book are available to download for free online, with QR codes at the back of this book. Feedback I received after my first book was published, *Love to Teach: Research & Resources for every classroom*, was that the simplicity of the resources and the visual images helped teachers to see how they could implement the ideas and tasks in their classrooms with ease. Subsequently, I have built on this feedback with more templates and downloadable materials available.

There is also a link to a very in-depth and thorough glossary of key terms connected to learning at the back of this book, created and kindly shared by James Mannion. This glossary may include terms that you are familiar with but it is not written in a condescending tone. Since engaging with educational research, my vocabulary has

increased considerably as there is a professional dialogue now taking place in schools and online that is continually developing. The glossary created by Mannion goes far beyond retrieval practice and the science of learning, but it is very interesting and great for newly or recently qualified teachers too.

Please feel free to contact me, to provide feedback or ask any questions about retrieval practice. Let me know if, or how, any of my ideas have worked with your classes. You can contact me via my website lovetoteach87.com, send me a tweet @87History or use the hashtag #RetrievalBook.