

RETRIEVAL PRACTICE FOR MEMORY FORMATION AND RETENTION IN THE
CATECHISM CLASSROOM

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A THESIS SUBMITTED TO THE FACULTY IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF MASTER OF DIVINITY

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WISCONSIN LUTHERAN SEMINARY

MEQUON, WI

FEBRUARY 18, 2022

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ABSTRACT

Retrieval practice can be defined as when “learners recall and apply multiple examples of previously learned knowledge or skills after a period of forgetting.”¹ It’s simple to understand and execute, supported by numerous research studies, and advocated by cognitive scientists and educational researchers, yet it is often absent or deemphasized in classrooms. This paper will demonstrate that retrieval practice strategies are crucial for supporting the formation and maintenance of memory and that they can be easily and quickly implemented to improve and enhance catechism lessons in ways that align with current educational research and Lutheran catechetical goals, leading to better student outcomes in the areas of knowledge retention and overall understanding.

1. “Retrieval Practice: A Teachers’ Definition and Video Examples,”
<https://teachlikeachampion.com/blog/retrieval-practice-teachers-definition-video-examples/>.

INTRODUCTION

We can think of the brain as a filing cabinet. Its job is to receive information and to hold it securely until such a time as it is needed, at which point, ideally, it can be retrieved and utilized.

This metaphor is helpful, in one sense. It gives us a simplified model of what learning is. Cognitive scientists describe it as a three-stage process roughly equivalent to filing a document, keeping it securely for a time, and then retrieving it. First, *encoding*, the process by which new information is taken in through the senses; second, *storage*, the process by which memories are preserved; and third, *retrieval*, the act of bringing information out of storage so it can be used.²

But this model of a filing cabinet, like all metaphors, limps. The human brain is far more complex than a filing cabinet. After all, what would you make of a filing cabinet that regularly loses or even destroys the documents you put inside? It would be considered defective.

Yet, this is exactly what a properly functioning brain does. It forgets. Consider the following questions: What were you wearing on this date eight years ago? How many blue cars have you seen in the past month? For most people and in almost every circumstance, these details are not only impossible to recall, they're also irrelevant. We certainly could remember these details if we had made a constant effort to do so, if for some reason we decided it was important, but we didn't. Our brains let that information go. This isn't a defect; it's necessary, both from a practical standpoint and a neurological one.

2. Pooja K. Agarwal and Patrice M. Bain, *Powerful Teaching: Unleash the Science of Learning*, (San Francisco: Jossey-Bass, 2019), 10.

But what of those things we *want* to remember, but *don't*? Why is it so difficult to commit things to memory so they're still there when we need them? I have an intellectual awareness that I should memorize my car's license plate number, but every time I need to fill out an insurance form or apply for a parking pass, I find myself walking outside to my car to look. Or to speak of things of far greater importance, how will I remember what I heard in the sermon from last Sunday or the insight I read in my devotion this morning? How will I remember the elegant presentation of law and gospel I heard when the opportunity comes to share it with someone else?

None of this is to suggest that a sermon or a devotion is rendered useless if it is not memorized, or that the Holy Spirit's power is only effective to the degree that our memories permit, but there is no doubt that it is God's desire that we know and internalize his word. When he gave his commandments to Israel, he said through Moses, "Fix these words of mine in your hearts and minds; tie them as symbols on your hands and bind them on your foreheads" (Deut 11:18, NIV). God is clearly asking for more than our polite attention before moving on to the next item on our daily agenda. His desire is that his word would become a part of us. More than that, he goes on to say: "Teach them to your children, talking about them when you sit at home and when you walk along the road, when you lie down and when you get up. Write them on the doorframes of your houses and on your gates" (Deut 11:19-20). The responsibility extends beyond our own remembering to also ensure that our children have his words in their hearts and minds.

In Deuteronomy God was giving direction to parents, but this command to teach has a particular relevance for pastors who are called to proclaim the word. The Lord's servant must be able to teach (2 Tim 2:24). Pastors are teachers, as "teaching the faith has always been

inseparable from proclaiming it.”³ This means that pastors have a great deal to gain by paying attention to the science of learning.

Traditionally, formal classroom education has focused on an *encoding-assessment* model, that is, the teacher teaches and then the student performs on an assessment to demonstrate that learning has taken place. These assessments typically take place after the conclusion of a lesson or unit, often by taking a test or writing a paper.⁴

While it may be a useful motivational tool to impress the importance of doing well on tests and papers, you would be hard-pressed to find either a classroom teacher or a pastor who would say the primary goal for students is to perform well on an assessment task. For public school teachers the target might be college- or career-readiness, and beyond that, preparation for good citizenship. These goals are certainly in view for pastors and teachers of the gospel, but our ambition is infinitely higher, “so that your days and the days of your children may be many in the land the Lord swore to give your ancestors, as many as the days that the heavens are above the earth” (Deut 11:21).

Perhaps it must be said at this point that this is in no way to suggest that God needs our help. “Trying to teach God’s Word as effectively as possible is not some sort of attack on the power and efficacy of the means of grace. Teaching with the best teaching methods available is tipping the hat to the value and importance of the specific content area laid out in the catechism.”⁵

3. Clark M. Williamson and Ronald J. Allen, *The Teaching Minister*. (Louisville, KY: Westminster/John Knox Press, 1991), 11.

4. Agarwal and Bain, *Powerful Teaching*, 28.

5. John Raasch, “An In-Depth Look at the Feasibility of Using Authentic Assessment in Catechism Instruction,” Wisconsin Lutheran Seminary Essay File, 34.

So, moved by the certainty that God has called us to teach, that we have the responsibility and desire to do it well, and with the firm belief that our students will be blessed both in the learning and remembering of God's Word, we humbly hear and consider the conclusions and recommendations of educational researchers and cognitive scientists.

Teachers appropriately place a great deal of emphasis on getting information into students' heads, but research in the field of cognitive science has confirmed what educators have long known, that for students to become proficient at anything, they must practice. It should come as no surprise that this would also be true of remembering. Without downplaying the importance of other aspects of teaching,

one of the most robust findings from cognitive science research is the importance of getting information *out* of students' heads... Based on a century of research, in order to transform learning, we must focus on getting information *out*, a strategy called *retrieval practice*. In fact, research demonstrates that retrieval practice is more potent than other techniques commonly used by teachers and students, such as lecturing, re-reading, or taking notes.⁶

Therefore, this paper will demonstrate that retrieval practice strategies can be easily and quickly implemented to improve and enhance catechism lessons in ways that align with current educational research and Lutheran catechetical goals leading to better student outcomes in the areas of knowledge retention and overall understanding.

6. Agarwal and Bain, *Powerful Teaching*, 28 (emphasis original).

LITERATURE REVIEW

In 2007, The Institute of Education Sciences, or IES, the research arm of the U.S. Department of Education, published a report called *Organizing Instruction and Study to Improve Student Learning*. It represents a return to the philosophical principles of the early 19th century and an attempt to offer concrete recommendations to improve learning. It includes seven suggestions to “provide teachers with specific strategies for organizing both instruction and students’ studying of material to facilitate learning and remembering information, and to enable students to use what they have learned in new situations.”⁷ They operate on the principle that “learning depends on memory, and that memory of skills and concepts can be strengthened by relatively concrete—and in some cases quite nonobvious strategies.”⁸

This “practice guide” helpfully offers an evaluation of the research supporting each of the strategies, rating the level of evidence for each of them either low, medium, or strong. A rating of “strong” indicates a high level of support in studies that took place both in laboratories and in real-world contexts such as classrooms. Those recommendations that came from studies conducted exclusively in a laboratory setting received a “low” rating since it is less certain the results would be reproducible in a classroom.⁹

7. Harold Pashler et al., *Organizing Instruction and Study to Improve Student Learning*. IES Practice Guide, (National Center for Education Research, 2007), 1.

8. Pashler et al., *Organizing Instruction and Study*, 1.

9. Pashler et al., *Organizing Instruction and Study*, 3.

Only two of the strategies discussed received a “strong” recommendation, one of which is related to the thesis of this paper. It is recommended that teachers “use quizzes to re-expose students to key content.” This recommendation is based on research on what is known as the *testing effect*, namely, “that taking a test on studied material promotes remembering that material on a final test.”¹⁰ In other words, assessments, even those which are short and informal, support the retention of knowledge for subsequent assessments.

These conclusions have been widely studied, accepted, and implemented, but a 2016 report from the National Council on Teacher Quality (NCTQ), referring to the recommendations from the 2007 IES report and studying how they had been incorporated into educational literature, concluded that “aspiring teachers are not being taught — in textbooks or in their coursework and training — the foundational knowledge about cognitive strategies that can help ensure children will learn.”¹¹ In other words, some professional educators have not received adequate instruction in the basics of how children learn or how to deliver content that students will understand and remember because many textbooks used in teacher education programs ignore or overlook educational research regarding how students learn in favor of “theories du jour and debunked notions,” placing them on par with more authoritative sources.¹²

An example of this is given in *Make It Stick: The Science of Successful Learning*. In the last decades, much time has been spent by teachers and students in identifying individual learning styles and tailoring lessons to meet them. Some students prefer to learn by listening to content being read or spoken to them, while others prefer to read or see it themselves. The fact

10. Pashler et al., *Organizing Instruction and Study*, 21.

11. Laura Pomerance, Julie Greenberg, and Kate Walsh, “Learning about Learning: What Every New Teacher Needs to Know” (National Council on Teacher Quality, 2016), 1.

12. Pomerance, Greenberg, and Walsh, “Learning about Learning,” v.

that individuals have preferences about how they receive information is not disputed, however, “the popular notion that you learn better when you receive instruction in a form consistent with your preferred learning style... is *not supported by the empirical research*.”¹³

These comments are not meant to disparage the knowledge or skill of those in the teaching profession nor to downplay their successes. In fact, in this case the effort to support multiple learning styles is likely to have benefitted all students by exposing them to a variety of ways to interact with content. However, the prevalence of fads, dubious research, and debunked conclusions in professional literature presents educators with substantial obstacles. The NCTQ lays the blame for this widespread deficit in professional instruction squarely on publishers and authors, and then explains why it matters:

Put simply, publishers and authors are failing both aspiring teachers and the teaching profession. They are not ensuring that the core texts designed to produce our next generation of teachers are giving candidates the most fundamental information needed to make learning “stick.” The transfer of knowledge — from researchers to publishers to teacher educators to aspiring teachers — is not happening while the need to impart it has never been more urgent... When teachers aren’t trained well, they try to learn on the job — by guessing in the classroom.¹⁴

The difficult task of teaching has been made more difficult with the ubiquity of teaching techniques and strategies that are taught and promoted without evidence of their effectiveness, and in some cases despite research demonstrating their ineffectiveness.

Identifying this obstacle and the substantial task teachers face of evaluating for themselves the mountains of research, data, conclusions, and texts claiming to have *the* answer may lead some to wonder what can be done. If it’s this difficult for teachers with years of specific training and experience, how can anyone outside the field of education hope to find

13. Peter C. Brown, Henry L. Roediger, and Mark A. McDaniel, *Make It Stick: The Science of Successful Learning* (Cambridge, MA: The Belknap Press of Harvard University Press, 2014), 4 (emphasis original).

14. Pomerance, Greenberg, and Walsh, “Learning about Learning,” v.

success? Should we expect the task of teaching for understanding and retention to be any easier for pastors who enter the classroom, perhaps with less specific training, experience in education, oversight, accountability, support, awareness of the problem, and access to resources that can help?

Dunlosky, Rawsom, Marsh, Nathan, and Willingham, the authors of *Improving Students' Learning With Effective Learning Techniques*, agree that this is a central difficulty even for those whose training and focus is solely on classroom education. "So many techniques are available, it would be challenging for educators to sift through the relevant research to decide which ones show promise of efficacy and could feasibly be implemented by students."¹⁵ The purpose of their study was to examine the existing literature regarding the efficacy of ten learning techniques and to make recommendations for their implementation. Of the ten techniques included in the study, several were chosen based on an indication from educational literature that they may be effective, while others were chosen because many students indicate they routinely use and rely upon them. The techniques under review were limited to those which students would be able to implement without supervision but could reasonably be utilized with minimal support and time invested by teachers.

While several of the techniques addressed in *Improving Students' Learning* are related and would be of benefit in the catechism classroom, the one that is most closely related to the thesis of this paper is *practice testing*. Practice testing is here defined as "a low-stakes or no stakes practice or learning activity outside of class," as opposed to what may be considered the

15. John Dunlosky et al., "Improving Students' Learning With Effective Learning Techniques: Promising Directions From Cognitive and Educational Psychology," *Psychol. Sci. Public Interest* 14.1 (2013): 5.

traditional definition of a test, “summative assessments that are administered by an instructor in class.”¹⁶

Simply put, they found that testing improves learning. While this statement requires some explanation, the general usefulness of the technique seems to have broad support. One proposal explicitly states the connection between testing practice and retrieval, that

testing can enhance retention by triggering elaborative retrieval processes. Attempting to retrieve target information involves a search of long-term memory that activates related information, and this activated information may then be encoded along with the retrieved target, forming an elaborated trace that affords multiple pathways to facilitate later access to that information.¹⁷

This suggests that retrieval practice does more than just improve future recall of that specific information, but also that of related information accessed by the brain in the process of remembering.

Successful implementation of these findings may be improved even further in the future after further research as to the specific reasons for the results shown. Multiple studies have proposed an explanation for these outcomes, identifying two different types of effects arising from the use of testing: *direct effects* and *mediated effects*. “Direct effects refer to changes in learning that arise from the act of taking a test itself, whereas mediated effects refer to changes in learning that arise from an influence of testing on the amount or kind of encoding that takes place after the test.”¹⁸ That is, on the one hand, testing itself helps facilitate learning, and on the other hand, it sets the stage for more and better learning to take place after the practice test has been completed.

16. Dunlosky et al. “Improving Students’ Learning,” 29.

17. Dunlosky et al. “Improving Students’ Learning,” 30.

18. Dunlosky et al. “Improving Students’ Learning,” 30.

While much of the literature regarding retrieval practice is positive, a more tempered view is offered by Nate Kornell and Janet Metcalfe in *The Effects of Memory Retrieval, Errors, and Feedback on Learning*. In this report covering a series of computer-based experiments, the researchers set out to assess the effect of retrieval, the impact of student errors when attempting to retrieve, and whether that impact is affected by feedback. They offered this summary of their findings: “We found that retrieval helped, though less robustly than we expected; making errors, if they were corrected, caused no measurable harm; and feedback was unconditionally beneficial.”¹⁹

These findings came from a series of seven experiments, the first of which produced surprisingly modest results in that there was only a small difference between the group which was prompted to practice retrieval and the control group, indicating that retrieval practice to improve long-term memory formation may not be as effective as previous studies had concluded. The rest of their experiments were designed to test hypotheses attempting to explain the initial results. The hypotheses proposed were related to the types of questions asked, the retrieval conditions, the delay between teaching and testing, and the amount of time provided for the students to answer.²⁰

One of these experiments led to a hypothesis which, if correct, would both explain the difficulty of testing the effects of retrieval practice and give even more reason to implement it and make it a part of regular practice. They hypothesized that “participants may have adopted a general tactic of testing themselves, and attempted to retrieve items” even when they were only

19. Nate Kornell and Janet Metcalfe, “The Effects of Memory Retrieval, Errors and Feedback on Learning,” *Applying Science of Learning in Education: Infusing Psychological Science into the Curriculum* (2014), 225.

20. Kornell and Metcalfe, “The Effects of Memory Retrieval,” 231.

asked to read. In other words, though it is impossible to observe and test, it is possible that students mentally “test” themselves as they read new content, checking their own understanding by answering questions even when they were not asked to do so.²¹

By modifying their hypotheses and experiments, the researchers were able to narrow the focus of their questions. Of the seven experiments, the first three showed little or no benefit from retrieval practice, while the final three showed significant results. One way to interpret these results is that it is even more powerful than previously thought, that “retrieval should not be seen as a weak effect that does not apply in real life, but instead quite the opposite; it is a strong effect that can occur with minimal provocation.”²² This means that retrieval practice was happening and having an impact on memory formation even during the portion of the experiment in which subjects were not prompted to use it.

The suggestion then is not that teachers can safely ignore the implementation of retrieval practice into lessons because it will happen naturally, but that long-term memory can be greatly benefitted even with a small amount of intentional effort.

If even the research that questions the efficacy of retrieval practice ultimately concludes that it is one of the most powerful ways to positively affect memory formation, one might wonder why it is not utilized universally. The difficulty of bringing together the often-disconnected worlds of cognitive research and education is addressed head on in *Powerful Teaching*. The co-authors, Pooja Agarwal and Patrice Bain, each bring knowledge and experience from their respective fields: Agarwal, a former teacher, is a cognitive scientist and college professor teaching psychological science, and Bain brings her years of experience from

21. Kornell and Metcalfe, “The Effects of Memory Retrieval,” 233.

22. Kornell and Metcalfe, “The Effects of Memory Retrieval,” 246.

the world of K-12 education. Their collaboration alternates between an analysis of the relevant research and an explanation of concrete examples, strategies, and techniques that can be immediately put into practice in the classroom.

This combination of research and practical advice would be extremely useful to teachers looking to implement the recommendations of cognitive researchers. It builds on research-backed practices and real-world experience.

WHAT IS LEARNING?

How do you know that something you've taught was learned? How do you know that the skills, concepts, and other content you have presented will be accessible to your students when they need them? If you want to improve student outcomes, where is the best place to begin? It might seem that the greatest effect could be made by adjusting methods in encoding, that is, to find new and better ways to deliver content. Our natural bias for encoding becomes apparent in that moment you look at the clock and see there are only five minutes left in class. How will you spend it? If your inclination is to rush through the last bit of content you had planned for the day, you're not alone. It's a common assumption that most learning takes place during the encoding stage, and if you want to increase learning, you should do more encoding. However, in study after study, cognitive scientists are confirming that "learning is strengthened during retrieval."²³

It may be helpful to think of it this way: "A child stringing cranberries on a thread goes to hang them on a tree, only to find they've slipped off the other end. Without the knot, there's no making a string. Without the knot there's no necklace, no beaded purse, no magnificent tapestry. Retrieval ties the knot for memory. Repeated retrieval snugs it up and adds a loop to make it fast."²⁴ In other words, if we want students to remember, we need to have them practice remembering.

23. Agarwal and Bain, *Powerful Teaching*, 11.

24. Brown, Roediger, and McDaniel, *Make It Stick*, 28.

Lutheran Philosophy of Education

In 2001, the WELS Commission on Youth Discipleship published the results of a survey sent to all WELS pastors. The final item on the survey was: “Check one statement which comes closest to your understanding of the central purpose of confirmation.” Of the seven choices offered, all of which are good and valid reasons to teach catechism class, no one option received support from more than 27.2% of the respondents.²⁵ This lack of consensus on the purpose of confirmation may be a cause of a lack of consensus regarding best practice in catechism instruction. However, it should be taken as a given that any lesson deemed worthy of being taught should also be considered worthy of being remembered.

The degree to which a pastor feels compelled to implement retrieval practice into his catechism instruction may be a function of how well it lines up with his personal philosophy of education. There is no official Lutheran philosophy of education, nor is such a defined philosophy completely necessary. “Truly Lutheran *educational* philosophy is Biblical theology and Lutheran thinking applied into education.”²⁶ In order to do this, we first state carefully what instruction can do in the classroom and what we prayerfully leave to the Holy Spirit to accomplish in the heart.

A Lutheran whole-person view of learning may define learning as occurring in three stages, though we will be careful not to conflate this with the three-stage process of learning as defined by cognitive scientists. Here, we view learning as having an effect on a person’s knowledge, attitude, and conduct. In this sense, knowledge encompasses the entire view of the rational mind (the three-stage process earlier described with the metaphor of the mind as a filing

25. “2001 Confirmation Survey,” <https://yfm.welsrc.net/download-yfm/confirmation-general-documents/>.

26. Allan Hart Jahsmann, *What’s Lutheran in Education? Explorations into Principles and Practices* (St. Louis: Concordia Publishing House, 1960), xi.

cabinet), also called the *cognitive phase*. Attitude, also called the *affective phase*, involves emotion, preferences, and desires. The third phase, *the volitional phase*, has to do with the acts of the will influenced by both the cognitive and affective phases.²⁷

What has been said about a complete Lutheran elementary school curriculum can also easily be applied to catechesis: “Thus a complete Lutheran school curriculum includes experience that leads to the acquisition of desirable new knowledge, the cultivation of desirable attitudes based on such knowledge, and the willingness to let these attitudes result in desirable conduct and skills.”²⁸ Whatever the specific goals of catechetical instruction, the ultimate purpose is that students would know God, not just now through his word, but eternally in heaven. That the task given to pastors in the catechism classroom is mainly in the cognitive phase is not to deny the importance of the affective or volitional phases, but simply to assent to the assigned task, recognize the need for the Holy Spirit to do his work, and to gladly put God’s word into the minds of young Christians with every tool at their disposal. The decision of which tools to use can be informed with a firm knowledge of how the human brain works, especially in memory formation and retrieval.

27. William C. Rietschel, *An Introduction to the Foundations of Lutheran Education* (St. Louis, MO: Concordia Academic Press, 2000), 54–5.

28. Rietschel, *Foundations*, 55.

THE NEUROLOGY OF LEARNING

Perhaps the best way to understand what is happening inside the brain of an adolescent sitting in catechism class is to take a step back and see what the brain does over the course of years—what it does to itself as it matures from infancy to adulthood. This can be helpful because the neurological processes that gradually transform an infant brain into a mature, adult brain are the same processes involved in the formation and retrieval of memories.

Neuroplasticity

At birth, the brain has more neurons than at any other time in life. Neurons are a type of cell that specialize in transmitting electrical messages to one another. Despite this overabundance of these brain cells, infants are unable to comprehend all the sensory data they take in from their environment because the neurons are mostly unconnected to each other. In response to stimulus, the brain at this age creates connections quickly, making as many as two million connections, called *synapses*, between neurons each second.²⁹

It was once believed that humans were born with all the brain cells they would ever have with a steady decline continuing throughout life. While this is close to the truth since *most* neurons exist in the brain at birth, it is also misleading, because it would seem to suggest that

29. Frances E Jensen and Amy Ellis Nutt, *The Teenage Brain: A Neuroscientist's Survival Guide to Raising Adolescents and Young Adults* (New York: HarperCollins, 2016), 51.

brain function declines as it matures rather than increases. The reason an adult has a greater capacity for memory, reasoning, and other mental processes is that “there is lifelong growth and expansion of the abundant connections through which neurons communicate.”³⁰ This constant building and maintaining of neural networks is known as *neuroplasticity*.

Neuroplasticity includes three processes. The first, of course, is the building of new connections between neurons. Memories are not contained in individual neurons, but across thousands, sometimes even in separate hemispheres of the brain. More and stronger connections between these neurons results in clearer and longer-lasting memories. “The brain develops stronger and extended memory circuits by recognizing the common threads among existing circuits or experiencing the learning through multiple sensory modalities, such as vision, hearing, and movement.”³¹ This is why people tend to recall the details of their own experiences better than stories they read or anecdotes they heard from someone else. It’s also why someone might go years without riding a bike but can still hop on and immediately recall the memories necessary to avoid falling off.

The second process involved with neuroplasticity is strengthening existing neural connections. As electrical pulses move from one neuron to another, they travel along thin lines called *axons* to pass a signal along to the *dendrites* of the next neuron through a miniscule gap called a *synapse*. The next neuron can then in turn pass it along to the next like the flow of electricity through a wire. This is what thoughts are on a neurological level.³²

30. Jay McTighe and Judy Willis, *Upgrade Your Teaching: Understanding by Design Meets Neuroscience* (Alexandria, Virginia: ASCD, 2019), 11.

31. McTighe and Willis, *Upgrade Your Teaching*, 14.

32. Barbara A. Oakley, Terrence J. Sejnowski, and Alistair McConville, *Learning How to Learn: How to Succeed in School Without Spending All Your Time Studying* (New York: TarcherPerigee, 2018), 48–9.

Electrical wires work best when they are covered with an insulator to prevent the electricity from traveling along an unintended path or from dissipating. In the same way, axons are coated with a layer of insulation called *myelin*. Myelinated axons can be as much as three thousand times more efficient at transmitting electrical impulses.³³

A newborn baby's brain stem is almost as myelinated as that of an adult, which is why they can breathe, regulate their heartbeats, digest food, and regulate other necessary bodily functions. As the brain develops in other areas, it gradually gains the ability to process sensory information, decrease reaction time, control the arms and legs, maintain balance, and master the complex task of speaking. However, some areas of the brain will not have this insulation for over twenty years. This is perhaps most apparent in teenagers and young adults who are still developing in the areas of problem solving, impulse control, and critical thinking.³⁴

To a newborn infant, every piece of sensory data experienced is new, and the newness of it is evident. As a child develops it may take many exposures to recognize a new face, to learn a new skill, or to understand a new idea. While occurring less frequently in adolescents and adults, the neurological process is much the same.

When you learn something new, the brain-links are weak. There may be only a few neurons linked together. Each neuron may have only a small dendritic spine and a small synapse. The spark between the neurons isn't very big. As you practice a new idea, more neurons join in. And the synaptic links between the neurons get stronger. This means the sparks get bigger. More neurons, stronger synapses—the brain-links get stronger, too! Longer brain-links can store more complex ideas.³⁵

Simply put, the more a memory is accessed, the stronger and more durable it becomes.

The brain is always working to improve and preserve important memories.

33. Jensen and Nutt, *The Teenage Brain*, 55–6.

34. Jensen and Nutt, *The Teenage Brain*, 56–7.

35. Oakley, Sejnowski, and McConville, *Learning How to Learn*, 51.

The third process involved in neuroplasticity has to do with how the brain handles unneeded and unused memories. It forgets them. It may seem counterintuitive that this is intentional, but as mentioned in the introduction, this is both a practical and a neurological necessity. Practically speaking, no one wants or needs a permanent detailed record of the minutiae of each day. Neurologically speaking, the brain's limited metabolic resources must be reserved for higher priority tasks than maintaining useless memories. "Like almost everything else about human life, the brain is a finite organ, with a finite amount of space. It makes sense that if the brain simply kept adding synapses, it would soon reach a limit and all learning would cease."³⁶ The process by which myelin thins and dendrites are lost because of a lack of electrical stimulation is referred to as *pruning*.³⁷

All the scientific studies and neurological research seems to confirm what can also be known by intuition or learned by experience regarding long-term memory: *Use it or lose it*. Every teacher knows that students coming back from a break will need a review of previously taught lessons.

Though it is probably most obvious after summer break, this pruning is taking place all the time. "In very short order we lose something like 70 percent of what we've just heard or read. After that, forgetting begins to slow, and the last 30 percent or so falls away more slowly, but the lesson is clear: a central challenge to improving the way we learn is finding a way to interrupt the process of forgetting."³⁸

36. Jensen and Nutt, *The Teenage Brain*, 96.

37. McTighe and Willis, *Upgrade Your Teaching*, 13.

38. Brown, Roediger, and McDaniel, *Make It Stick*, 28.

PRACTICAL APPLICATIONS OF NEUROLOGICAL RESEARCH

Understanding what happens at a neurological level is not necessary to successfully utilize brain-based instructional techniques such as retrieval practice, but it is helpful in evaluating lessons and techniques, as well as in emphasizing the value in making them a regular part of instruction.

For example, many students believe that an effective way to study is to reread and highlight, though reliance upon these techniques has been shown not to be the most efficient use of study time.³⁹ Their relative ineffectiveness can be explained on a neurological level: “Rote memorization produces isolated and somewhat feeble circuits unlinked to other networks.”⁴⁰ Strict memorization of a set of facts is only useful in the exact context it was studied. It may help when it comes to reproducing the information on a quiz or test but will be less useful in a real-world situation.

For example, memorizing vocabulary words in a foreign language does not immediately result in the ability to use them fluently in conversation. For knowledge to be useful, it must be able to transfer. “*Transfer of learning*...is the application of concepts or information in new situations. In other words, transfer happens when students take something *familiar* and apply it to something *unfamiliar*.”⁴¹

39. Dunlosky et al. “Improving Students’ Learning,” 46.

40. McTighe and Willis, *Upgrade Your Teaching*, 15.

41. Agarwal and Bain, *Powerful Teaching*, 44.

This doesn't mean that rote memorization is bad or should be avoided, only that it's not the end. Once information is encoded, it needs to be used and manipulated, both in similar and in dissimilar contexts. Transfer to a similar context is also called *near transfer*. For example, in a catechism lesson on the 4th Commandment, students will likely be asked to memorize the commandment and meaning and then to recite or write it in class. In the context of that assessment, there is no analysis or application, only a reproduction of the words exactly as memorized. *Far transfer* refers to when the student takes knowledge gained in the classroom and uses it in a different place, at a different time, for a different task, or in a different format.⁴² The teacher might ask an application question leading the students to consider what it really means to honor authority in words, actions, and attitudes. Ultimately, even giving a thoughtful and biblically sound answer to hypothetical situations isn't the specific goal of the lesson, but rather for the knowledge gained to have some bearing in life, either immediately or in the future.

The intentional use of questions to encourage students to apply knowledge to new situations supports far transfer, as they will have to work to recall specific information and put it to use in a different context. Though there are many things that can be done to help students learn and retain information, "many learning researchers now classify retrieval practice as one of the most robust learning techniques available."⁴³

Pastors and others who teach catechism who are firmly convinced of this and understand what happens in the brain will be better prepared to create and execute plans to support students in learning that will last. While it is not necessary to understand the neurological justification for retrieval practice to use it, it is this understanding that will lead pastors and teachers to insist on

42. Agarwal and Bain, *Powerful Teaching*, 45.

43. Steven Pan and Timothy Rickard, "Transfer of Test-Enhanced Learning: Meta-Analytic Review and Synthesis," *Psychol. Bull.* 144 (2018): 4.

it, to consistently find time for it even in an all-too-short one hour catechism class, and to choose it over other activities or additional minutes devoted to lecture or other delivery of content.

Examples of suitable ways to implement retrieval practice will be given later in this paper.

ADDRESSING MISCONCEPTIONS

A clear understanding of *what retrieval practice is* will be aided by an equally clear understanding of *what it is not*. As pointed out in the NCTQ report, there is a prevalence of poor research with questionable conclusions and ineffective teaching techniques being marketed as the next big thing in education.⁴⁴ For this reason, it is necessary to be as explicit as possible in defining terms and discussing the recommendations.

Retrieval Practice Is Not Identical to Assessment

It may be misleading to focus on the term related to retrieval practice used above: *the testing effect*. In addition to conjuring up unpleasant images of grueling high stakes standardized tests, it might suggest to some that the best way to help students with their long-term learning goals is to give them more tests.

When educators speak of testing, they are often referring to either *formative* or *summative* assessment. Formative assessment is meant to give feedback to teachers and students, to find out if students are on track with their learning, and to determine if intervention is necessary.

Summative assessment is meant to determine whether goals have been met, and often they will be the basis of a grade.⁴⁵

44. Pomerance, Greenberg, and Walsh, “Learning about Learning,” v.

45. McTighe and Willis, *Upgrade Your Teaching*, 69–70.

It is essential to understand that retrieval practice is neither of these. Of course, they are all related in that they require the student to access memories of what they have learned, but the difference is that in retrieval practice the teacher does not collect data or assign grades.

“Retrieval practice is a *no-stakes opportunity* when students can experiment, be challenged, and improve over time.”⁴⁶ There will be a time to assess progress and to adjust lesson plans, if needed, and there will be a time to determine what students have learned and to report it to them, but retrieval practice is just that: *practice*. How many people would consent to being assessed on a task which they have never had the opportunity to practice?

Retrieval Practice Is Not Rote Memorization

Retrieval practice has its share of opponents. There has been a push by many, both in and outside the field of education, to focus on higher order thinking skills and deemphasize the memorization of basic facts.⁴⁷ Part of the argument is that facts are too easily forgotten and that tests are stressful and unrelated to real-world tasks. Practice quizzing and other forms of retrieval practice are viewed as “nothing more than a glorified path to rote learning.”⁴⁸ What is truly needed, they say, is more practice with problem solving, synthesis, evaluation, and more questions and tasks based on the upper levels of Bloom’s Taxonomy.

It is right to be critical of instruction that has as its sole purpose to pass a test, and instruction that results in knowledge which is unrelated to real-world applications should be

46. Agarwal and Bain, *Powerful Teaching*, 48 (emphasis original).

47. For an example of this point of view, see It’s Not a Memory Test; Education Needs to Focus on Critical Thinking, an essay written by high school student Katy DuDevoir, found here: <https://www.mainepublic.org/maine/2018-06-08/its-not-a-memory-test-education-needs-to-focus-on-critical-thinking>

48. Brown, Roediger, and McDaniel, *Make It Stick*, 44.

improved and modified, but this sort of memorization is not the aim of retrieval practice. “Pitting the learning of basic knowledge against the development of creative thinking is a false choice. Both need to be cultivated.”⁴⁹ It is difficult or impossible to engage in higher-order thinking without the basic tools necessary to engage in the topic at hand. Complex thinking like problem solving depends on the availability of facts and the ability to recall them.

Quizzing on Unfamiliar Material Is Not Harmful

If retrieval practice is so effective, what happens if students answer questions incorrectly? Won't the wrong information then be permanently cemented into their memory? This is the rationale for saving quizzes and tests until *after* students have learned, that no good can come from giving students a test they are certain to fail.

This is another way of confusing retrieval practice with formative or summative assessments. In practice, “failure” can be progress, and it can prime the brain to learn more effectively. Making any sort of response, even one known to be incorrect, can have a positive impact on memory. “If you restudy something after failing to recall it, you actually learn it better than if you had not tried to recall it. The effort of retrieving knowledge or skills strengthens its staying power and your ability to recall it in the future.”⁵⁰ A 2007 study concluded that “the fear that making errors might hamper learning appears to be unfounded” so long as the errors are followed by feedback.⁵¹

49. Brown, Roediger, and McDaniel, *Make It Stick*, 30.

50. Brown, Roediger, and McDaniel, *Make It Stick*, 203.

51. Kornell and Metcalfe, “The Effects of Memory Retrieval,” 247.

RETRIEVAL PRACTICE IN ACTION

After a teacher has settled on a philosophy of education, determined the content to be delivered, read and understood the research regarding how memories are formed and how learning happens, how long-term memory is formed and maintained in the brain by means of repeatedly accessing it, and how this process can be supported by retrieval practice, the crucial question is, *What does this actually look like in the classroom?*

Though there are countless scripts and tutorials in published literature for retrieval practice for content commonly found in elementary school curricula, a pastor will not likely find much information directly related to catechism class. This is of little concern, however, since the examples which are readily available are useful in demonstrating how to use strategies with many different types of content. The specific content will not have a negative impact on the technique's effectiveness. Studies have shown retrieval practice to be effective in multiple subject areas for factual information, visual or spatial information, comprehension, and in authentic educational contexts.⁵²

The most common retrieval practice techniques aren't going to seem particularly groundbreaking, but they are worth a brief discussion simply to demonstrate that they can and should be used regularly by teachers at every level of experience and expertise. In fact, some of them are likely already being used consistently and effectively.

52. Dunlosky et al., "Improving Students' Learning," 32-4

The form of retrieval practice that is easiest and quickest to implement is just to make it a regular habit to ask questions about previously taught material. Rather than beginning class with a recap of what happened last week, put it in the form of a question. “*What did we learn about last week?*” or “*Before we move on to our study of the Second Article of the Apostles’ Creed, who can tell me what the First Article was about?*” Provide a moment for students to think and write down whatever they can remember before calling on anyone, take a few responses, provide feedback to correct any errors, and then transition to the new material.⁵³

The crucial difference that makes this technique something more than just *asking questions* is that time has passed between the initial learning and the questioning. Doug Lemov, author of *Teach Like a Champion*, offers this definition of retrieval practice: “Retrieval Practice occurs when learners recall and apply multiple examples of previously learned knowledge or skills after a period of forgetting.”⁵⁴ The key component is that time has passed, the students have started to forget, and therefore recalling the information is more difficult. This is an example of what cognitive scientists and educators call *desirable difficulty*. “Learning that’s easy is like writing in sand, here today and gone tomorrow.”⁵⁵ Much like physical exercise, a task that doesn’t cause any exertion is unlikely to produce the desired results.

Retrieval Practice Techniques from *Powerful Teaching*

One way to get every student involved in accessing memories of previous learning is to do a *Brain Dump*. This can be done as a warm-up activity or at any time in the lesson, and it is as

53. James M. Lang, *Small Teaching: Everyday Lessons from the Science of Learning*, Second edition. (San Francisco: Jossey-Bass, 2021), 51.

54. Lemov, “Retrieval Practice.”

55. Brown, Roediger, and McDaniel, *Make It Stick*, 3.

powerful as it is easy. Simply ask the students to write down everything they can remember, then give them time to do it. That's all there is to it. Even if they are only given five minutes to complete the task, it can have dramatic results.

Brain Dumps are an example of “free-recall,” a strategy often employed for its open-endedness.⁵⁶ This makes the activity accessible to every student, whether they are new to catechism class or have the entire catechism memorized.

Consider the broad range of possible responses for the following prompt: “*Write down everything you can remember about baptism.*” One student might describe what a baptism looks like, or the words spoken during the baptismal rite. Another might recall the Great Commission or some other Bible passage assigned for memory work. Some students may remember their own baptisms, or those of younger siblings, or perhaps the four questions Luther asked and answered in the Small Catechism. Because it is only practice, there is no penalty for vague responses or simple recollections without explanation, like “water” or “babies.” Brain Dumps aren't collected or graded, so there is very little to limit a student in what they write.

Though it is unlikely that students will have sufficient time or to write *everything* they know about a given topic, even writing a small portion of what they know and the effort expended to do so will strengthen neural pathways. Those stronger connections will make those memories more accessible and durable while doing the same for information that is related but not retrieved.⁵⁷

Whenever you determine that sufficient time has been given for the students, the task is complete. The neural pathways have been strengthened, students have likely been encouraged by

56. Agarwal and Bain, *Powerful Teaching*, 56.

57. Agarwal and Bain, *Powerful Teaching*, 57.

the realization that they know quite a bit about the topic already, and perhaps they have a new appreciation that they still have something left to learn.

Though not necessary for a Brain Dump to serve its purpose, it can be turned into an extended activity by giving students a chance to pair up and look at the work of a partner. After a short period of sharing and discussion, have them answer questions like, “Is there anything my partner wrote down that I didn’t?” or “Is there anything in common that *both of us* wrote down?”⁵⁸ By taking an extra two minutes, students can receive that all-important feedback so critical to learning.

Another simple technique utilized widely is practicing with flashcards. Again, this is not groundbreaking, but a brief consideration of why it is so effective can remind us not to give up on the tried-and-true methods. It can also offer criteria for the identification and evaluation of other techniques for long-term memory retention.

Cognitive research has concluded that “practice testing is particularly advantageous when it involves retrieval and is continued until items are answered correctly more than once within and across practice sessions, and with longer as opposed to shorter intervals between trials or sessions...Practice testing with feedback also consistently outperforms practice testing alone.”⁵⁹ There are many things to draw from this. One is the understanding that part of what makes practicing flashcards work is that students can keep studying them until the content is memorized. To this end, teachers should be sure students know how to study flashcards effectively, not just repeatedly looking at both sides of a card but making a genuine effort to retrieve the information before checking.

58. Agarwal and Bain, *Powerful Teaching*, 58.

59. Dunlosky et al. “Improving Students’ Learning,” 35.

Flashcards are useful in that they are a simple way to extend retrieval practice beyond the classroom setting. Students may take them home, keep them in a pocket, and check them as they have time. One of the primary benefits of this form of study is the immediacy of the feedback, a requirement for any form of study to be successful.

While students are certainly capable of making their own flashcards, they may not know how much more efficiently flashcards could help them learn as opposed to other methods. They also may not have a clear idea of what specific information would be most helpful to practice. Consider creating a set and making copies for students before a formative or summative test. Sending them home with this powerful tool to study, for example, all the memory work passages they will be responsible for knowing the following week will make it more likely they will spend the time and effort to study them.

Note-taking can be a useful way for students to organize their thoughts and create study materials for themselves to use at home, but not all students are very good at it. Taking notes effectively is a skill that usually needs to be explicitly taught, and not all students have received adequate instruction in how to do it properly. As a result, some try to copy down what the teacher says verbatim, while others just pick and choose what they think might be important later.

Some schools invest considerable resources to teach note-taking systems such as Cornell Notes which seem to support retrieval practice by having students learn a complex step-by-step process for taking and annotating notes, asking questions, and organizing information for later study. The downside to systems like this is that they are extremely time-consuming both to learn

and to use effectively. In addition, the research is inconclusive as to whether all the effort and intensity pays off in terms of student performance.⁶⁰

Agarwal and Bain, authors of *Powerful Teaching*, suggest an alternate strategy they call “retrieve-taking” to incorporate retrieval practice into notetaking in a simpler way with the aim of supporting memory formation. At the same time, students produce a study document that can be used for self-testing at home. Rather than having students take notes during instruction, take a few minutes mid-lesson and ask students to write down topics they will study later.⁶¹

Here’s what this might look like in a catechism lesson. Imagine you have taught the first half of a lesson on the Second Commandment. Pause the lesson and prompt the students to write down three important things they have learned about God’s name. Now they must remember and identify the main ideas and compare them to determine those three that are most important. As time allows, students could then share with partners or with the class what they wrote, and then they can receive feedback on whether others agree with their choices. For example, students may have to consider whether it is more important to know what God’s various names tell us about him, or how God tells us to use his name. By participating in this exercise, the students in this class will go home with a stronger memory of what was taught and with a study aid that can be used when preparing for a formal assessment.

The mini-quiz is another technique suggested in *Powerful Teaching*. It involves writing questions or clues based on the content from the previous class on slips of paper and placing them in a basket in the classroom. At the beginning of each class, five questions are chosen

60. Zulejka Baharev, “The Effects of Cornell Note-Taking and Review Strategies on Recall and Comprehension of Lecture Content for Middle School Students with and without Disabilities” (Rutgers University - Graduate School of Education, 2016), <https://rucore.libraries.rutgers.edu/rutgers-lib/51151/>, iii.

61. Agarwal and Bain, *Powerful Teaching*, 63.

randomly and read aloud for students to answer individually. Student work is collected, then the answer to each question is shared for immediate feedback, and the questions go back into the basket, perhaps to be chosen again on a later day.⁶²

In a catechism classroom, this might mean that in just a few minutes, students have retrieved information from their memories about the distinction between law and gospel, the Fourth Commandment, baptism's power, the three purposes of the law, and the Second Article of the Apostles' Creed. In so doing they have reinforced those specific memories, but also strengthened the neural pathways to all the related information they learned during those lessons. This also encourages students to make connections between topics and memories that otherwise would likely have remained distinct from each other.

Retrieval Practice Using Kagan Cooperative Learning

Kagan Cooperative Learning is a system of learning structures that is based on and supported by cognitive science and educational research in many ways.⁶³ Without delving into the philosophy or history of the system, it can be used without a significant investment of time just by using any of the dozens of *structures* designed to move the focus from the teacher as lecturer and shift to *student learning experiences*. "There is tremendous power in having students learn from their experiences rather than from our words. There is far more engagement and retention of meaningful experiences... Learning in context more mirrors the natural acquisition of knowledge than mere passive transfusion of information."⁶⁴ A cooperative learning approach to catechism

62. Agarwal and Bain, *Powerful Teaching*, 67–8.

63. Kagan Publishing maintains a sizeable list of research studies and reviews in support of their philosophy and system of teaching: https://www.kaganonline.com/free_articles/research_and_rationale/

64. Spencer Kagan and Miguel Kagan, *Kagan Cooperative Learning* (San Clemente CA: Kagan Publishing, 2017), 6.1.

could also be transformative in the ways it provides opportunities for retrieval practice. This can be accomplished with a minimal investment of time and without radically changing the way lessons are prepared.

While there is plenty of research in the field of cooperative learning, and a good deal specifically studying the use of Kagan Cooperative Learning, several Kagan structures will be explained and evaluated here based on the research on retrieval practice already discussed, followed by examples of how they might be used in a catechism classroom.⁶⁵

Timed Pair Share is a structure that bears some similarity to a commonly used teaching technique in which students are directed to discuss a question with a partner and then bring that discussion to the whole group. Note the differences in the following steps that explicitly bring in retrieval practice:

1. The teacher announces a topic, states how long each student will share, and provides think time.
2. In pairs, Partner A shares; Partner B listens.
3. Partner B responds with a positive gambit.⁶⁶
4. Partners switch roles.⁶⁷

First, *think time* is essential. It prevents eager students from answering too quickly and letting the rest of the class off the hook. Second, because each student will have a time during which they are expected to have an answer to the question, every single student is accountable to someone, and no one is let off the hook for a response. This is crucial, because “active, self-generated

65. Kagan Cooperative Learning includes instructions for fifty cooperative learning structures, which is only a sampling of the more than two hundred fifty included in other publications. In recognition that the sheer number of possibilities to sort through might prove to be a barrier, they have published *The Essential 5: A Starting Point for Kagan Cooperative Learning* as an entry point for those who want to try it out. This article can be found at www.kaganonline.com.

66. “Gambit” is used here in the sense of *a remark intended to make a telling point*. It is often helpful to provide students with examples of positive comments they can say to each other and to practice them.

67. Kagan and Kagan, *Kagan Cooperative Learning*, 6.84.

attempts to retrieve information from memory enhance memory (especially in the long term), as compared to passivity.”⁶⁸

In a lesson on the Fifth Commandment, the teacher might introduce a *Timed Pair Share* activity like this: “Let’s all take one minute to think about the answer to this question: *How does the Fifth Commandment give me a chance to thank God?* Everyone will get thirty seconds to share their answer.” After the silent think time, the teacher prompts the students to begin: “Stand up, hand up, pair up!”⁶⁹ The teacher keeps track of time and announces when the thirty seconds are up, at which point the listening partner offers a positive comment, perhaps from a teacher-provided list, such as “Thank you for sharing!” Then the two partners trade roles and repeat. It’s a simple structure but useful, and it requires no advance planning other than training the students in the steps and asking the right questions. In as little as two to three minutes (regardless of the size of the class), every student can engage with the question, actively work to recall information, be held accountable for an answer, and receive feedback.

Quiz-Quiz-Trade is effective for many of the same reasons that flashcards are, but it adds movement, coaching, and a social component. To prepare, the teacher must prepare a set of flashcards, or the students may each create one for use in the activity (though it is recommended that student-created flashcards be checked first).

1. The teacher tells students to “stand up, put a hand up, and pair up.”
2. Partner A quizzes Partner B (by asking the question *and* showing the card)
3. Partner B answers.
4. Partner A praises or coaches.
5. Partners switch roles.
6. Partners trade cards and thank each other.

68. Kornell and Metcalfe, “The Effects of Memory Retrieval,” 226.

69. This is another of the Kagan structures. It can be used on its own for discussion, but it is often used as a quick and efficient way for students to find random partners. See Appendix A for the steps.

7. Repeat steps 1-6 a number of times.⁷⁰

In addition to think time, during which that active effort to recall a memory takes place, students can also receive hints and coaching to help them recall the answer. Whether or not they are able to answer correctly, they have received feedback, which mitigates any harm which might have taken place from giving a wrong answer.⁷¹ The memory is then reinforced as the question cards are traded and each partner then becomes the “expert” as they question and coach their next partner on the question they were just asked and coached on. This structure can be repeated as many times as desired.

Quiz-Quiz-Trade is meant for review and mastery of factual information. It could be used for memory work review or with any questions with short answers. Many catechism curricula include printable worksheets that are often used as in-class guided activities or assigned as homework. With just a few minutes of preparation ahead of time, those same factual questions can be put on a single class set of flashcards and turned into a high-interest retrieval practice activity.

Students participating in a *RallyCoach* activity have their memories of factual information strengthened by interaction with the information in multiple ways.

1. Partner A solves the first problem.
2. Partner B watches and listens, checks, coaches if necessary, and praises.
3. Partner B solves the next problem.
4. Partner A watches and listens, checks, coaches if necessary, and praises.
5. Partners repeat taking turns solving successive problems.⁷²

Students in a pair alternate between two roles, referred to as *coach* and *scribe*. The scribe is asked to recall the information, say it out loud to seek consensus, and only then to write it down,

70. Kagan and Kagan, *Kagan Cooperative Learning*, 6.56.

71. Kornell and Metcalfe, “The Effects of Memory Retrieval,” 225.

72. Kagan and Kagan, *Kagan Cooperative Learning*, 6.58.

while the coach asks the question, coaches, and checks that the answer is correct before giving final approval.

Once students are comfortable with these steps, this structure can be applied to any worksheet that might otherwise have been intended for use as an individual assignment without modification or additional preparation. Lutheran pastors also have a tremendous resource that can be used for this. Luther's Catechism has hundreds of questions that can fit into this structure.

Look in the catechism for an example of how this can be done. The section on the Second Article of the Apostle's Creed goes through each of Christ's offices. Question 149 reads:

To *anoint* means "to pour or sprinkle oil on a person's body." **What was the significance of anointing throughout the Old Testament?**

1 Kings 19:16 Also, *anoint* Jehu son of Nimshi *king* over Israel, and *anoint* Elisha son of Shaphat from Abel Meholah to succeed you as *prophet*.

Exodus 30:30 *Anoint Aaron and his sons* and consecrate them so they may serve me as *priests*.

1 Samuel 16:13 *Samuel took the horn of oil and anointed him* in the presence of his brothers, and from that day on the Spirit of the Lord came powerfully upon David.

Samuel then went to Ramah.⁷³

In *RallyCoach*, students are encouraged to do their thinking out loud, so a conversation might sound like this:

Scribe: I don't know all those names, but I know they're all important. I think anointing is for important people.

Coach: That's a good answer. Do you think you could be more specific?

Scribe: I know that the passages mention specific jobs, and those are the same ones we talked about in class. So anointing is for kings and prophets.

73. Martin Luther et al., *Luther's Catechism: The Small Catechism of Dr. Martin Luther*, New International Version. (Milwaukee, Wisconsin: Northwestern Publishing House, 2017), 155.

Coach: Look at the passages and see if you can find anything else.

Scribe: The second passage also talks about anointing priests. So I could write: Anointing in the Old Testament showed that someone was supposed to do one of the important jobs of prophet, priest, or king. Do you agree?

Coach: Yes. Good work.

This is somewhat artificial and represents sort of an ideal conversation, but with a little practice, students working cooperatively can begin to incorporate retrieval practice strategies without even knowing it.⁷⁴ *RallyCoach* naturally supports what is known about memory formation and retention by incorporating active involvement, multiple modalities, movement, retrieval practice, and feedback.

74. Cooperative learning does not remove the teacher from the learning process but many fear that students teaching students will result in misconceptions being shared with each other without correction. “This fear is justified: Wrong answers will be shared and not always corrected when we shift to having students share with each other, not just with the teacher. Nevertheless, we still come out ahead. The data shows achievement increases in cooperative learning. The question becomes, Why would achievement go up if wrong answers are shared and not always corrected? The answer is that the probability of a correction is actually greater in the cooperative learning classroom compared to the traditional classroom.” See Spencer Kagan, “Overcoming Resistance to Kagan Structures for Engagement” (*Kagan Online Magazine*, Summer 2012).

CONCLUSION

Teaching is an art, and cognitive research and the science of learning have much to contribute to education. Teachers must be aware of the resources available to them and responsive to the needs of their students. Retrieval practice is a tool, not *the* tool, albeit a fundamental one that should be used routinely in every classroom. In *Powerful Teaching*, Agarwal and Bain identify and recommend the use of three more “power tools” in addition to retrieval practice: *spaced practice*, *interleaving*, and *feedback*.⁷⁵ any of these would be worthy of an in-depth study regarding their utility in catechism class.

Whether or not you’re ready to go all in on implementing brain-based teaching practices into catechism class, retrieval practice is a good place to begin. The bottom line is that retrieval practice *works*. The good news is that it's easy. “You don’t have to think too hard about how to give your students effective retrieval practice; you just have to do it.”⁷⁶ Some may find great value in becoming an expert when it comes to retrieval practice techniques, perhaps even seeking formal training in Kagan Cooperative Learning structures, for example, but the entry-level knowledge and practice is accessible to everyone and can be utilized with tremendous effect.

75. Agarwal and Bain, *Powerful Teaching*, 5.

76. Lang, *Small Teaching*, 51.

We want students to learn what we teach, and we want students to remember what they learn. Learning and remembering are neurological functions, and a basic understanding of how they work should be considered fundamental to the art of teaching.

Psalm 78 expresses our task: “we will tell the next generation the praiseworthy deeds of the Lord, his power, and the wonders he has done” (Ps 78:4). It also identifies the goal: “Then they would put their trust in God and would not forget his deeds but would keep his commands” (Ps 78:6). God blesses us to be a part of this work. It is our prayer that he would guide us to do it faithfully and to his glory.

APPENDIX: KAGAN STRUCTURE “STANDUP-HANDUP-PAIRUP”

The following structure is not used exclusively for the delivery of content, but is often utilized to efficiently pair students, after which a different structure with an academic goal will often be used. As such, it is not one that necessarily relates to retrieval practice, but is a helpful, and perhaps even necessary, structure for students to understand and practice before attempting other structures that specifically support retrieval practice. The following is reprinted from *Kagan Cooperative Learning*, page 6.74.

Students stand up, put their hands up, and quickly find a partner with whom to share or discuss.

1. Teacher says, when I say go, you will “stand up, hand up, and pair up!”
2. Students stand up and keep one hand high in the air until they find the closest partner who’s not a teammate.⁷⁷ Students do a “high five” and put their hands down.
3. Teacher may ask a question or give an assignment, and provides think time.
4. Partners interact using:
 - Rally Robin
 - Timed Pair Share

Hint: In some classes, it may be necessary to make sure students pair with their classmate they are closest to rather than running to a friend.

⁷⁷ In the Kagan cooperative learning system, students in a classroom are seated in groups of four. When they are instructed to stand up and move around the room as a part of a structure, they are often asked to find a partner who is not seated in the same group.

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