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Effective Teaching and Learning Strategies for Pre-Service Law Enforcement: Reviewing the Evidence for Retrieval Practice and Spaced Retrieval
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Abstract

The law enforcement profession requires officers to apply large amounts of information to rapidly changing problems in diverse and unpredictable environments. While many occupations demand adaptability and quick decision-making under pressure, policing carries distinctive implications because decisions often involve matters of public safety, ethics, and human rights. These high-stakes contexts make effective learning, memory retention, and decision-making especially critical for law enforcement personnel. Consequently, optimizing teaching and learning methodologies in the classroom becomes crucial to adequately prepare individuals for pre-service law enforcement for their roles in serving communities. This paper reviews existing research and best practices to show how faculty in higher education and criminal justice education settings can leverage effective teaching strategies to enhance the readiness of pre-service law enforcement students. Drawing from established empirical findings, this review highlights retrieval practice and spaced practice as premier evidence-based techniques for facilitating learning. Through a synthesis of relevant literature, the discussion demonstrates that integrating retrieval practice and spaced practice in the classroom significantly enhances long-term retention, fosters higher-order thinking skills, and promotes knowledge transfer.

Keywords: pre-service law enforcement, criminal justice education, retrieval practice, spaced retrieval, teaching strategies, evidence-based teaching, active learning

The Case for Retrieval Practice and Spaced Retrieval Practice in Police Training

The law enforcement profession is unique in that police need to apply vast amounts of information to rapidly changing problems within a vast array of environments. Law enforcement officers need advanced knowledge of laws, procedures and policies. Additionally, searching Google, legal guides or policies during a rapidly evolving situation like a police pursuit or use of force incident is not an option. The officers must have the best practices, laws and policies firmly committed to memory. As a result, effective teaching and learning techniques need to be implemented in higher education classrooms to effectively prepare pre-service law enforcement for their careers.

Some of the most substantially validated teaching and learning strategies are related to the following: retrieval practice and spaced repetition (Brown et al., 2014). However, not many criminal justice professors have taken extensive coursework on cognitive science related to effective teaching and learning in the classroom (Brown et al., 2014). Understanding these learning strategies is crucial because they directly influence how students retain and apply critical information in real-world policing situations. This review focuses on how higher education faculty can utilize effective teaching and learning strategies so pre-service law enforcement can better acquire the curricula knowledge needed to succeed in the 21st century.

Purpose and Scope of this Review

The purpose of this review is to examine how evidence-based learning strategies from cognitive science, specifically retrieval practice and spaced retrieval, can be applied within higher education classrooms to strengthen the preparation of pre-service law enforcement students. Rather than presenting new empirical data, this paper synthesizes and interprets existing research to highlight how these well-supported learning principles can enhance criminal justice education. The goal is to bridge the gap between learning science and instructional practice so faculty can implement teaching approaches that promote durable learning, critical thinking, and long-term knowledge retention among students seeking to be law enforcement.

As noted by Reaves (2016), approximately forty-seven percent of police academies are operated by 2- and 4-year academic institutions. Thirty-seven percent of police academies are operated by municipal academies, sheriff academies and multi-agency academies. The remaining sixteen percent of academies are operated by either state police academies, POST academies, county police academies or other academy models (Reaves, 2016). These arrangements, partnerships, and methods vary in police education. Paoline and colleagues (2014) showed half of police officers in the United States have a college degree and exactly half of those majored in criminal justice. Thus, higher education plays an important and leading role in the education of pre-service law enforcement in the United States. This necessitates utilizing the best teaching and learning techniques in the classroom for educating pre-service law enforcement so they can better serve their communities. Consequently, the students' ability to master the policing and criminal justice curriculum will depend on the teachers' ability to expertly impart the curriculum through teaching.

Historically, much of the emphasis on requirements relate to accreditation which focuses on covering course content to ensure a quality criminal justice degree program (Sloan III, 2018). While covering course content is important, equally important is the use of effective teaching and learning strategies within the classroom, such as retrieval practice and spaced practice.

Criminal justice faculty have competing perspectives on what criminal justice education should be. Specifically, some faculty focus more on the practitioner orientation of education while others focus more on the social science orientation of education (Sloan III, 2018). Although a large

number of criminal justice faculty are experts in their field regardless of their educational orientation, most are not necessarily experts in effective teaching and learning practices within the criminal justice classroom (Finckenauer, 2005). The road to becoming a criminal justice faculty member includes taking numerous criminal justice-related classes. These courses lead to earning a graduate degree specializing in criminal justice. Nevertheless, few of the classes taken by criminal justice faculty are in cognitive science or in areas related to effective teaching and learning (Brown et al., 2014). Effective faculty not only are competent in their academic discipline, but they also understand the teaching approaches that yield the strongest results (Bain, 2004). While individual differences and instructional contexts influence how students learn most effectively, the focus of this review is on evidence-based principles shown to enhance long-term retention across multiple settings.

The Higher Education Situation

Although faculty have a good idea about what curricula and content students should be taught, they do not always stress how students should use effective learning strategies to acquire curricular knowledge (Dunlosky, 2013). As such, higher education faculty frequently use techniques in the classroom that are not optimal (Eng, 2017). For example, a teaching-centered lecture-based method is primarily used in criminal justice classrooms (Birzer, 2004). Yet, student focused active learning strategies are often a better choice to enhance student learning (Birzer, 2004). In recent years, cognitive scientists have learned a great deal about how effective teaching and learning actually takes place (Brown et al., 2014). As a result, several strategies are available to maximize learning within criminal justice classrooms to increase student memory, understanding and application of criminal justice course content. Importantly, meta-studies have shown retrieval practice and spaced practice are some of, if not the most powerful tools to learn (Blunt & Karpicke, 2014). Some educators remain unaware of, or hesitant to implement, evidence-based learning strategies within the classroom despite substantial research supporting their effectiveness (Dempster, 1988). Studies have widely shown that cramming as a study technique is ineffective compared to retrieval practice and spaced practice. Yet, students often engage in cramming and other ineffective learning techniques such as highlighting and re-reading because they are not informed of long-term benefits of retrieval practice and spaced practice (Kornell, 2009). This paper examines how criminal justice faculty within higher education classrooms could use effective teaching and learning techniques to better equip pre-service law enforcement students for their careers.

Retrieval Practice

Retrieval practice is the act of calling information to mind which results in the enhancement of learning. This process strengthens memory and understanding, making it one of the most practical ways for students to build lasting knowledge. Retrieval practice is a simple and extremely effective strategy to enhance learning (Binks, 2018). The great philosopher Aristotle wrote in an essay discussing memory that “exercise in repeatedly recalling a thing strengthens the memory” (Brown et al., 2014, p. 28). Aristotle was describing retrieval practice. Retrieval practice is sometimes also called the testing effect and has been studied for many years. For more than a century, researchers have demonstrated practice tests improve retention of information being tested (Abott, 1909; Gates, 1917; Jones, 1923). A classic study on retrieval practice was put forth by Spitzer (1939) who demonstrated that using retrieval practice even without the instructor giving feedback on what the correct answers were still enhanced final performance when the initial test occurred within a week of learning materials (Spitzer, 1939). In 1989, Glover sparked widespread interest in retrieval practice with his article, *The “testing” phenomenon: not gone but nearly forgotten*. In the study, Glover showed retrieval practice is a critical mechanism that produces successful learning (Glover, 1989). More than 200 studies from over the last century have found that attempting to recall information from memory promotes learning. (Pan & Rickard, 2018). The

essence of retrieval is when the learner is actively retrieving the information they learned. Simply put, anytime students are trying to remember information to answer a question they are engaging in retrieval practice.

Spaced Retrieval Practice

The effectiveness of spaced retrieval practice was documented over a century ago. Starting in 1885, in studies that have stood up to tests of time, Ebbinghaus accurately noted memories decay with time (Ebbinghaus, 1913). Additionally, Ebbinghaus showed in his studies the forgetting of information could be lessened by repeatedly testing students at various periods of time after they initially learned the materials (Ebbinghaus, 1913). Since then, hundreds of studies have concluded spacing out learning sessions results in more durable long-term memories than cramming session(s) (Cepeda et al., 2006). These findings emphasize that spacing learning over time improves long-term retention without requiring additional study time. In fact, a meta-analysis on the effects of spaced practice looked at 839 assessments of spacing practice in 317 experiments located in 184 articles that showed spaced practice is more effective than cramming for long-term retention (Cepeda et al., 2006). What is more, spacing is considered to be one of the most effective learning techniques (Dunlosky et al., 2013). Importantly, spaced retrieval does not need to take more time than crammed study, it is merely studying the materials at different time intervals. Actually, by utilizing spaced retrieval, students can learn more with less study time (Carpenter & Agarwal, 2020).

Generally, spacing retrieval practice a few days after initial learning is a successful way to increase long-term learning (Karpicke & Roediger, 2007). Studies have explored a fixed schedule and expanded schedules of spacing. A fixed schedule is where spacing gaps are the same. For example, every 36 hours. An expanded schedule is where spacing gaps become progressively longer. For example, the first test is after 36 hours, the next test is 72 hours and the next test is one week (Carpenter et al., 2012). However, determining the optimal spacing gap between testing sessions is difficult. On one hand, studies have shown expanded schedules produce better learning results than fixed schedules (Cull et al., 1996). On the other hand, studies have also shown expanded schedules produce very similar learning results as fixed schedules (Cull, 2000). However, both expanded and fixed spaced retrieval schedules have been shown to produce better learning than cramming session (Carpenter & DeLosh, 2005; Cull, 2000). Taken together, the research seems to indicate more exams should be conducted in the upcoming weeks and months after the initial exam about the learned material (Carpenter et al., 2012). Moreover, it is important students get spaced retrieval practice to previously studied materials whether it be in an expanded or fixed format to increase long-term memory (Rohrer & Taylor, 2006).

The benefit of spaced retrieval is well established; yet it is not well understood or commonly used within education (Seabrook et al., 2005). One reason why cramming is a common method to prepare for exams is because students are often only tested on the content once. When faculty fail to have regular cumulative testing, students can engage in a crammed study session and still be successful in getting a positive grade on the noncumulative exam. Cramming is an effective study method to increase short-term memory. Nevertheless, the consequences of cramming are quickly forgetting the learned material (Maddox, 2016).

The following figure summarizes data adapted from Roediger and Karpicke's (2006) research comparing retrieval practice and rereading. Their findings demonstrated that although rereading produced higher immediate test scores, retrieval practice led to superior long-term retention. Figure 1 illustrates this performance difference.

Figure 1

Massed Practice Compared to Spaced Practice

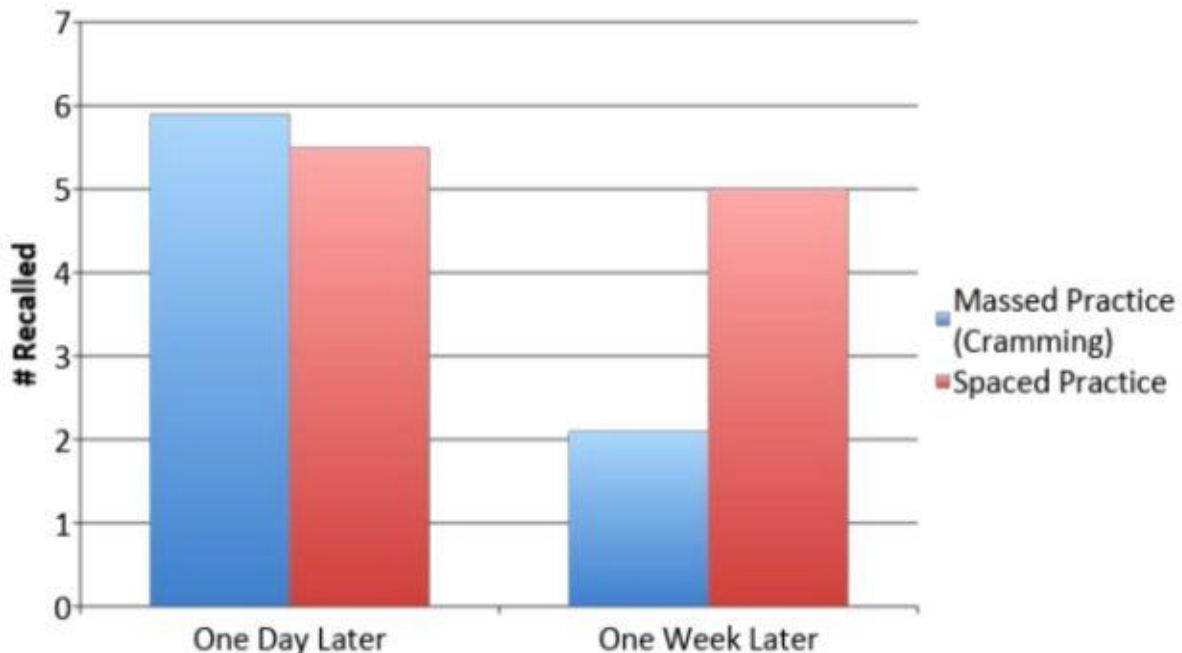


Figure 1. Adapted from Roediger and Karpicke (2006), showing mean percentage of correct recall after initial study (immediate test) and delayed test. Students who used retrieval practice retained substantially more information over time.

As illustrated in Figure 1, retrieval practice consistently leads to stronger long-term retention compared to rereading, reinforcing the importance of incorporating active recall opportunities into classroom instruction for pre-service law enforcement students.

According to Kornell and Bjork when faculty only have a midterm or final exam, the majority of students in the course only study immediately before the exam (2007). Conversely, when faculty conduct cumulative exams often, the result is students will study more in preparation for the exams and naturally engage in spaced retrieval. In short, they will learn and retain more of what they learned.

Thus, if criminal justice faculty want pre-service law enforcement students to retain study materials so they can use the knowledge in their future careers, then spaced retrieval should be incorporated in classroom activities. The most effective way to utilize retrieval practice is when students engage with the learning materials multiple times compared to only a single or a few times.

Implementing Retrieval Practice in the Classroom

All testing and questioning based on what the student has learned are examples of retrieval practice, regardless of the question format. The retrieval practice could be short answer questions, multiple-choice questions, true and false questions, or longer open-ended essay responses. Taken together, if students are trying to remember information to answer a question, they are engaged in retrieval practice. Moreover, retrieval practice can be categorized in several ways such as cued retrieval, free recall and elaborative retrieval (Hall & Geis, 1980). Cued retrieval is when a student gets information which helps the student remember what they learned. An example of cued retrieval is a flashcard. Free recall is when the student remembers information; however, there is no cue to help the students remember. For example, if at the beginning of class, the students were told to write everything they can remember about a topic previously studied. This would be considered free recall. Elaborative retrieval is more involved than simply recalling information. Elaborative retrieval is when the student organizes what they know into an outline, timeline, concept map or some other

organizational framework. Comparatively, studies have shown that an elaborative retrieval enhances the learning effects the most (Endres et al., 2017).

A common form of testing in education is multiple-choice and true/false format. There is some concern among cognitive scientists that these types of question formats can lead to acquiring inaccurate knowledge. In true/false questions, students must differentiate between what is true and what is false. In addition, some true/false questions will incorporate some true and some false elements. Similarly, multiple-choice questions incorporate a set of false choices and thus students have to think about false statements. When undergraduate students are repeatedly exposed to statements, the statements gain credibility even if they are false. This effect is known as the mere truth effect or suggestibility effect and has been well documented in the literature (Bacon, 1979; Begg et al., 1985). Consequently, students exposed to these test formats such as multiple choice and true/false may believe the false information within the questions (Roediger III et al., 2011). Yet, studies clearly show the suggestibility effect associated with true/false and multiple-choice questions can be easily overcome when feedback of correct answers is given to the student (Butler et al., 2008). Thus, feedback is key to overcoming the suggestibility effect associated with exposing students to wrong answers (Pashler et al., 2005). Taken together, multiple-choice and true/false retrieval practice are an effective way to implement in the classroom; however, these formats should be combined with feedback to avoid the suggestibility effect.

Short answer questions and essay questions are an effective retrieval practice technique. Agarwal has conducted many studies on retrieval practice and also authored the book *Powerful Teaching: Unleash the Science of Learning* (Agarwal, 2019). In her book, Agarwal describes the techniques she uses to implement retrieval practice in her classroom. For example, when students come into the classroom they complete four or five low-stakes short-answer questions for 20–30 minutes. Then students engage in small group and whole class discussions for approximately 20-30 minutes. The short answer questions often have students recall three specific things they learned from last week and has students write a persuasive argument about something they previously learned in the class. Importantly, students are not allowed to use Google or AI tools to look up the answers to the faculty's questions during class. In addition, the nature of the questions do not lend itself to right or wrong answers. These approaches require students to recall and organize what they know, encouraging deeper engagement and more accurate retrieval of course material.

However, some faculty might be hesitant to give up too much of their class time to dedicate to retrieval practice. Noteworthy, several quick and easy ways to implement retrieval practice at the beginning, middle and end of class are available. James Lang gives several examples in his book, *Small Teaching: Everyday Lessons from the Science of Learning*. Lang promotes that faculty should ask the students at the beginning of class what they talked about last class period. In addition, several variations of this method exist. For example, faculty could ask students what are the main theories the class has read about or discussed thus far (Lang, 2016). In the middle of class, faculty could also have the students pause and write down everything they can remember. Then, the faculty could continue with the class activities. However, if the faculty want students to learn more, they could have the students pair up in small groups and share with each other their answers. Then faculty could discuss with the students as an entire class (Agarwal et al., 2020). Furthermore, at the end of the class, faculty could ask the students various retrieval questions based on recent class learning activities. Utilizing retrieval practice questions as a way to open and close classes are simple ways to boost learning without taking a lot of class time and without additional faculty time dedicated to grading.

Ken Bain wrote a classic book entitled, *What the Best College Teachers Do*. Bain states that many outstanding teachers give cumulative exams throughout the entire semester relative to what information has been covered in the class at the time. Having all exams cumulative is important because it prevents students from learning the content once and discarding it. Students who

continue to retrieve what they have learned throughout the semester strengthens long-term memory of the content. Thus, the final exam would cover all course content (Bain, 2004).

In sum, there are countless ways to implement retrieval practice in the classroom. Asking students questions about what they have learned in a variety of question formats such as cued retrieval, free recall and elaborative retrieval increase retention of the studied information (Endres et al., 2017).

Retrieval Practice as a Learning Strategy

Unfortunately, retrieval practice has become strongly associated as high stakes tests for assessment of learning rather than a strategy to learn (Adesope et al., 2017). The schema in higher education is too often the teacher gives lectures, then the students take a test based on the lecture and assigned reading materials to assess the students' learning. The connotation of the word "test" "quiz" or "exam" often associates with the negative feeling of taking a high stakes test to establish a grade (Lang, 2016). Test, exam and quiz are words which have the ability to produce anxiety for students (Dunlosky, 2013). Naturally, the use of tests as an assessment of learning and to determine student grades is appropriate at times (Kibble, 2017). Yet, when faculty use exams only for high stakes assessment only after initial learning this equates to forgoing one of the most extensively supported techniques for improving student learning (Dunlosky, 2013). However, when retrieval practice is used as a pedagogical strategy, it is not rooted in high stakes assessment but instead for the purpose of fostering learning. Extensive research has shown testing improves retention of the content (Roediger III et al., 2011). Retrieval practice does not need to be associated with grading or points. Retrieval practice can be a no-stakes or low-stakes way for students to challenge themselves and improve (Agarwal, 2019).

Retrieval Practice as a Means to Identify and Improve Gaps in Knowledge

Using retrieval practice as a learning strategy instead of as an assessment strategy requires educators to view testing differently. Consequently, retrieval practice can be effectively used to identify gaps in knowledge and thereby, aid the student in knowing what they need to study. As expected, when frequent testing takes place in classrooms, it allows students to assess what they got wrong on the exam. As a result, students are confronted with their incorrect answers and are able to study the items missed before the next exam. In one study, researchers found students corrected mistakes on a second test if they had an additional study session after the first test (Amlund et al., 1986). Overall, using retrieval practice frequently in the classroom helps students assess what information they know and what information they do not know which allows them to target their weaknesses with further study.

In a similar matter, faculty need to have a handle on what students know and what they still need to learn. Faculty are more likely to accurately determine where students are at in their learning by using increased testing within the classroom. Then, based on the student test results, faculty can adjust their teaching according to meet the educational needs of the class. Conversely, when faculty only give midterm exams and final exams in their courses, they are missing an opportunity to accurately gauge student learning on a regular basis (Roediger III et al., 2011). When faculty are unable to identify and improve gaps of learning with their students in a timely way, the students' learning potential suffers. Moreover, faculty often believe their students have learned and know more than they actually do (Kelley, 1999). For example, a study conducted Sargent and Curcio (2012) is particularly relevant to this review. In the aforementioned study, a law school professor teaching a second-year evidence course had two course sections. The first section was taught with one final exam which counted as the entire course grade for the students. However, the second section was taught using the same methods during the course, except, the students also took five ungraded quizzes spread throughout the semester and a graded midterm. The students who took additional quizzes and a midterm performed over 9 percentage points better in the final exam (Sargent &

Curcio, 2012). Noteworthy, the authors attributed the better course scores to the additional exam opportunities.

In sum, effective educational intervention can occur when faculty and students can identify gaps in learning through retrieval practice techniques and target those gaps in learning.

Retrieval Practice as an Effective Study Technique

Faculty have an important role in implementing retrieval practice in the classroom. In particular, when faculty use retrieval practice, it shows students effective ways to learn. Students are generally not aware of the benefits of retrieval practice. According to Karpicke and colleagues, approximately 11% of students listed retrieval practice as a study technique they used (2009). In other words, when students study on their own, most do not choose retrieval practice as a technique. In fact, a study by McCabe (2011), concluded college students' awareness of the effective learning strategies is low or non-existent. A survey at a university showed students actually studied by rereading their textbooks and notes 84 percent of the time (Karpicke et al., 2009). Despite rereading being an easy study method, it is not an efficient way to study based on the decades of research (Dunlosky et al., 2013).

In a landmark publication in 1994, Robert Bjork coined the term desirable difficulties. Desirable difficulties is a counterintuitive learning principle. Desirable difficulties is when learning appears to cause difficulties for the learner; yet, these difficulties are actually positive because these difficulties improve long-term retention. Using retrieval practice as a study technique is considered a desirable difficulty. By contrast, easy learning techniques such as rereading and highlighting only lead to short-term learning (Bjork et al., 2015). The ability to retrieve the information learned in the future instead of forgetting is critical when examining the effectiveness of learning techniques. It has been well documented retrieving information from memory strengthens the durability of the information memorized (Butler, 2010; Rohrer et al., 2010).

Ineffective learning techniques are problematic because when students reread texts and notes repeatedly, they have an illusion of fluency due to familiarity. Whereas, retrieval practice reduces the illusion of fluency and student overconfidence by showing actual fluency (Metcalfe & Finn, 2008). John Dunlosky is a highly regarded expert and researcher on the topic of learning and improvement of student achievement. A benchmark paper by Dunlosky ranked learning techniques based on effectiveness (2013). Although many strategies are used by students, not all are equally effective. See Table 1 for Dunlosky et al.'s (2013) ranking of common learning techniques according to their overall effectiveness.

Table 1

Table 1. Adapted from Dunlosky et al. (2013), summarizing ten learning techniques and their relative effectiveness based on empirical evidence.

Technique	Extent and Conditions of Effectiveness
Practice testing	Very effective under a wide array of situations
Distributed practice (Spacing)	Very effective under a wide array of situations
Interleaved practice	Promising for math and concept learning, but needs more research
Elaborative interrogation	Promising, but needs more research
Self-explanation	Promising, but needs more research
Rereading	Distributed (spaced) rereading can be helpful, but time could be better spent using another strategy
Highlighting and underlining	Not particularly helpful, but can be used as a first step toward further study
Summarization	Helpful only with training on how to summarize
Keyword mnemonic	Somewhat helpful for learning languages, but benefits are short-lived

Imagery for text

Benefits limited to imagery-friendly text, and needs more research

Note. Dunlosky concluded after reviewing multiple learning techniques that practice testing (retrieval practice) and distributed practice (spacing practice) were the most effective learning techniques (Dunlosky, 2013; Dunlosky et al., 2013).

As shown in Table 1, retrieval practice and spaced learning are consistently rated among the most effective strategies for promoting long-term retention and understanding. In sum, college students' knowledge of effective study strategies is poor without instruction from faculty on how to study using effective techniques such as retrieval practice and spacing. For pre-service law enforcement students who need to constantly adapt to the rapidly changing field of policing, they need to be taught how to learn and then incorporate the learning techniques in lifelong learning (Kornell & Bjork, 2007).

Retrieval Practice as a Means to Higher Order Thinking and Transfer of Knowledge

By and large, higher education faculty have resisted implementing retrieval practice strategies in their classrooms (Brown et al., 2014). One of the main reasons faculty hesitate embracing retrieval practice is because their focus is on developing higher order thinking skills. Consequently, when faculty hear about the benefits of retrieval practice it seems too simplistic to develop critical thinking. Furthermore, most faculty members are familiar with Bloom's taxonomy. In 1956, Benjamin Bloom and colleagues published a book that later became popular amongst educators called *Taxonomy of Educational Objectives*. Blooms Taxonomy is still a popular way to think about learning among educators. In 2001 the book was revised and updated (Anderson et al., 2001). Blooms taxonomy portrays lower order thinking categories which can evolve into higher order thinking in a progression of knowledge, comprehension, application, analysis, synthesis, and evaluation. Blooms taxonomy is typically shown in an image of a pyramid where recognition, memory, and comprehension are correlated to the 'remember' and 'understand' categories on the bottom of the pyramid. By contrast, 'evaluation' or 'creation' are at the peak of the pyramid (Anderson et al., 2001). Naturally, because higher education should develop higher order thinking, faculty have a bias toward teaching at the top of the pyramid (Lang, 2016). While the Blooms taxonomy is popular, it is not without criticism. Many cognitive scientists take issue with Bloom's hierarchy because it assumes that learning is a linear step by step process when in reality, it is more fluid and interconnected (Wineburg & Schneider, 2010). Essentially, many faculty members and students often resist the idea of retrieval practice because they think those who practice it confuse learning with recalling information (Brown et al., 2014).

While these critiques of retrieval practice seem logical, the research conducted on retrieval practice shows strong support for retrieval practice as a way to develop higher order thinking and transfer of knowledge. Retrieval practice is not the useless methodical memorizing of facts that is a students' waste of time because they could just look the information up via Google. On the contrary, research has demonstrated retrieval practice improves transfer of knowledge to new contexts (Pan & Rickard, 2018).

Transfer happens when students take knowledge they are familiar with and apply it to a problem they are unfamiliar with. Transfer of knowledge can be classified as either near or far. Near transfer occurs when a student can apply what they learned in a similar learning situation. Far transfer occurs when a student can apply what they learned in a different situation (Sala et al., 2019). Transfer of knowledge to new context is an important goal for faculty within higher education. Pre-service law enforcement students need to use what they learned in the classroom in their careers (O'Neill et al., 2018). Many cognitive scientists consider obtaining transfer of knowledge within classrooms the ultimate goal of education (Butler, 2010; Rohrer et al., 2010). Transfer is extremely important; yet, unfortunately, transfer is difficult to obtain (Barnett & Ceci, 2002).

Nonetheless, there is an expanding body of research showing retrieval practice as a learning technique that promotes transfer of learning. Over 70 studies have concluded that retrieval practice

can obtain transfer in learning (Carpenter & Kelly, 2012; Pan & Rickard, 2018). In one study, researchers concluded medical students who used retrieval practice compared to other study methods were better at applying what they learned to new clinical situations (Larsen et al., 2013). Another study showed, students who used the spaced retrieval practice passed the bar exam at a rate 19.2 higher than students who did not use this method (Teninbaum, 2017). This is an impressive improvement on the bar exam pass rate. What is more, the bar exam not only assesses memory retention, but also higher order thinking skills. During a typical bar exam, students need to know about legal hierarchy, lawyering skills, problem solving, legal analysis, reasoning, legal research, factual investigation and issue spotting (Meyer, 2019). Essentially, passing the bar exam requires advanced higher order thinking skills and spaced retrieval practice has been shown to significantly increase passing rates on the bar exam.

In a similar manner, pre-service law enforcement also need to be able to grasp many of the concepts as law students. Law enforcement needs to be able to use analytical and problem-solving skills to appropriately apply the law. Appropriate application of the law requires foundational and relevant knowledge about criminal justice issues, history, laws and policies. At times, this knowledge needs to be quickly accessed from memory (Kang, 2016). Police are often in time sensitive, dynamic and dangerous situations where there is not time and opportunity to research best practices, laws or policies. Still, police are expected to apply the laws, follow policies and best practices in these dynamic, complicated and time sensitive situations. Importantly, researchers have found that retrieval practice not only benefits recall, but also improves other cognitive learning processes (Butler, 2010; Dobson et al., 2018; Karpicke & Aue, 2015; Larsen et al., 2013).

Dobson et al., found that university students who used retrieval practice were better at evaluating and critiquing physiology research articles than students who read and re-read the articles (Dobson et al., 2018). This finding is especially significant to this review because evaluating and critiquing information involves higher order thinking according to Bloom's taxonomy (Bloom, 1956; Anderson et al., 2001). Thus, there is strong evidence that retrieval practice produces more than lower order thinking as Bloom's taxonomy would indicate. In fact, relevant research indicates that learning is not a hierarchy or pyramid but bi-directional (Pan & Rickard, 2018).

Higher education faculty resist retrieval practice because they seem to think remembering information is less important in the 21st Century than in the past. It seems logical because students in modern times have easy access to information via Google and Ai. Memorization of materials become less important than in the past. Faculty often believe students do not need to waste time learning to remember information using retrieval practice techniques when they can easily find the information online (Finley et al., 2018). However, Daniel Willingham, a Cognitive Scientist and Professor of Psychology at the University of Virginia aptly pointed out students need extensive factual knowledge in their brains as a prerequisite to critically think. In essence, Willingham argues that if a student does not know basic information, how can they think deeply about what they do not know? Willingham stated, "The very processes that teachers care about most—critical thinking processes such as reasoning and problem solving—are intimately intertwined with factual knowledge that is stored in long-term memory (not just found in the environment)" (Willingham, 2009, p. 28). Retrieval practice improves memory and memory facilitates the ability to reason and problem solve.

Some higher education faculty mistakenly equate retrieval practice only to low-level, fact-based questions. Significantly, retrieval practice is not limited to simple low-level questions. For example, a low-level question would be, 'Which Supreme Court case established a precedent for the reasonable use of force that still persists today?' The correct answer is *Graham v. Connor* (1989). Fact-based questions are beneficial for learning. In contrast, a higher-level question could also be asked and would create even more learning. For example, a higher-level question would be, 'As a police officer, how will you be judged by a court if someone sues you for using excessive force?' First, to answer this question, the student would need to know the name of the case *Graham v. Connor* (1989). Then, the student would need to understand how the *Graham* decision is interpreted and applied. For instance, this question requires the student to retrieve and analyze factors such as

whether the suspect posed an immediate threat and the objective reasonableness standard. The result is the development of higher order thinking skills using retrieval practice.

A study conducted by Jensen et al., (2014), looked at the effect of exam-question level regarding fostering student conceptual understanding. The introductory college course broke the class into two sections. Both sections were taught in a high-level inquiry-based style. However, each section was assigned either low-level questions focused on memory of facts or high-level questions such as application, evaluation, and analysis on the quizzes and exams. At the end of the semester, both sections of the class were given a final exam consisting of 20 low-level and 21 high-level questions. Students that were in the section which had high-level questions did better on the final exam on both the low-level questions and the high-level questions than the section who had the low-level questions. The authors of the study concluded, testing students with high-level questions result in better memory and conceptual understanding of course information.

Overall, retrieval practice develops higher order thinking skills and transfer of knowledge. Faculty can better develop higher order thinking by asking higher order thinking questions. Higher order thinking questions are geared towards application, evaluation, and analysis. Yet, even lower-level questions help because they give the students the prerequisite knowledge which is needed to deeply think about the issues. Essentially, research has shown retrieval practice facilitates higher order thinking and transfer of knowledge.

Conclusion: Where does the Field Go from Here?

This review highlighted key research on the learning benefits of retrieval practice and spaced retrieval within higher education classrooms. Retrieval practice can be implemented in many simple ways to increase long-term learning, yet it remains underused by both faculty and students. When educators do not encourage retrieval-based study and spacing techniques, students often rely on less effective methods such as rereading or highlighting (Adesope et al., 2017). Research continues to show that retrieval practice supports higher order thinking and transfer of knowledge (Carpenter & Kelly, 2012), and that its benefits are amplified when combined with spacing across time (Cepeda et al., 2006).

Although the most effective spacing intervals are still being investigated, the evidence is clear that retrieval practice and spaced retrieval strengthen durable learning across a variety of contexts and subjects (Dunlosky et al., 2013). Criminal justice faculty have a responsibility to integrate these findings from cognitive science into their teaching practices to improve student learning outcomes. In addition to being knowledgeable in their academic discipline, faculty must also understand and apply instructional methods that yield the greatest impact on learning. Optimizing teaching and learning strategies is essential for preparing pre-service law enforcement professionals for the cognitive demands of their careers. By applying retrieval practice and spaced retrieval in the classroom, educators can enhance long-term retention, strengthen critical thinking, and promote knowledge transfer, ultimately improving the readiness of future law enforcement officers to serve effectively in complex and dynamic environments.

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