Memory (Encoding, Storage, Retrieval)

Instructor Manual

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In this module, Memory (Encoding, Storage, and Retrieval), students are exposed to the different stages of the memory process. The bulk of this module is dedicated to explaining how encoding, storage, and retrieval act as interwoven processes that influence our memories. The Memory module concludes by tying together the information in an applied example of how students can improve their memory.

Learning Objectives

- Relevant APA Learning Objectives (Version 2.0)
    - Describe key concepts, principles, and overarching themes in psychology (1.1)
    - Develop a working knowledge of psychology's content domains (1.2)
    - Describe applications of psychology (1.3)
    - Demonstrate psychology information literacy (2.2)
    - Engage in innovative and integrative thinking and problem solving (2.3)
    - Interact effectively with others (4.3)
- Content Specific Learning Objectives: Memory
    - Define and note differences between the following forms of memory: working memory, episodic memory, semantic memory, collective memory.
    - Describe the three stages in the process of learning and remembering.
    - Describe strategies that can be used to enhance the original learning or encoding

of information.

- Describe strategies that can improve the process of retrieval.
- Describe why the classic mnemonic device of the method of loci works so well.

Abstract

"Memory" is a single term but it applies to a number of different abilities—holding information briefly while working with it (working memory), remembering episodes of one's life (episodic memory), and our general knowledge of facts of the world (semantic memory), among other types. Remembering episodes involves three processes: encoding information (perceiving it and relating it to past knowledge), storing it (maintaining it over time), and then retrieving it (accessing the information when needed). Failures can occur at any stage, leading to forgetting or having false memories. The key to improving one's memory is to improve processes of encoding and to use techniques that guarantee effective retrieval. Good encoding techniques include relating new information to what one already knows, forming mental images, and creating associations among information that needs to be remembered. The key to good retrieval is developing effective cues, ones that will lead the rememberer back to the encoded information. Classic mnemonic systems, known since the time of the ancient Greeks and still used by many today, can greatly improve one's memory abilities.

Class Design Recommendations

This module of memory can be taught in a single class period, but is optimally taught over a 2 class period (to allow time for class activities).

1st class period (50 min – 75 min):

- Introduce memory as a dynamic process with different types of memories
  - Episodic & Semantic Memories
- Three Stages
  - Encoding: Transforming perceptions into memories

- Storage: Maintaining memories over time (sensory storage, short-term storage and working memory, long-term storage)
- Retrieval: Getting information out

Module Outline

Introduction

- The introduction of this module highlights the memory feats of Simon Reinhard (he can remember hundreds of digits at a time!). By explaining Simon's performance, the authors briefly introduce students to the average number of digits a person can remember (seven), that memory is not a singular term, and that there are ways to improve one's memory.

Varieties of Memory

- This section of the module helps students understand that memory is not a singular term – there are many different types of memory, including episodic memory (the ability to remember the episodes of your life), semantic (storehouse of more or less permanent knowledge, the meanings of words in the language, and facts about the world), collective memory (memory that people in a group share), and autobiographical memory (remembering the events across the course of one's entire life).
- This section concludes by letting students know that focus of this module is on episodic memory, which is the type of memory that most people have in mind when they hear the word "memory."

Three Stages of the Learning/Memory Process

- This section starts with listing and defining the three stages of memory: Encoding (initial learning of information), Storage (maintaining information over time), and Retrieval (ability to access information when you need it).
- Next, it briefly discusses two types of errors that can be made: forgetting (drawing a blank) or misremembering (false recall or false recognition). However, it is important to keep in

mind that misremembering can occur at any stage (e.g., failure to encode, store, or retrieve information) and that the stages rely on each other – they are bound together.

Encoding

- Encoding is defined as the initial experience of perceiving and learning events. Typically, our physical and mental environments are much too rich for us to encode all the stimuli around us or our internal thoughts we have in response to those sights and sounds. So an important first principle of encoding is that it is selective: we attend to some events in our environment and ignore others. A second point about encoding is that it is promiscuous —we are always encoding the events of our lives. Normally these are mundane occurrences that we can remember for a short time afterwards, but soon forget. However, if something novel happens, we tend to play close attention (and therefore are more likely to remember it; referred to as distinctiveness). We also tend to remember very emotional occurrences, where we have vivid personal memories of receiving momentous news (referred to as flashbulb memories, they are often unreliable despite great confidence in their clarity).
- The next part of this section describes recoding, taking the information from one form as it is given to us and then converting in a way that makes sense to us. While it is usually helpful in aiding memory, recoding can lead to its own set of errors. Some ways to use recoding for study strategies include thinking of the meaning of events, relating these events to information we already know, creating vivid images of information, and creating distinctive memories. However, some errors can occur because during the process of recoding, we add in related events without realizing it (e.g., the Deese-Roediger-McDermot effect and pragmatic inferences).
- Finally, encoding is important in the learning and memory process. Unless an event is encoded in some fashion, it will not be successfully remembered later. However, just because an event is encoded (even encoded well) is no guarantee that it will be remembered later.

Storage

- Experiences change our brain – they leave memory traces or engrams (the two terms are synonyms that refer to the change in the nervous system that represents our experience). The basic idea is that events create engrams through a process of consolidation, the neural changes that occur after learning over time to create the memory trace of an experience. However, memory traces are not little packets of information that lie dormant in the brain, waiting to be called forward to give an accurate report of past experience. Rather, we

reconstruct past events as we remember with the aid of our memory traces but also with our current knowledge of what we think happened in the past. That is, remembering is reconstructive rather than purely reproductive.

- Sometimes between the time we learn something and when we are tested, errors are introduced, such as retroactive interference (events that occur after the event of interest will usually cause forgetting of the original event) and proactive interference (experiences that occur before an event that interferes with its retention). Retroactive interference is one of the main determinants of forgetting. One example of this is the misinformation effect, when erroneous information occurring after an event is remembered as having been part of the original event (like in eye-witness testimony).

Retrieval

- This section starts out describing the importance of retrieval - the bottleneck in learning and memory is the retrieval process. We distinguish information that is available in memory and that which is accessible. The assumption is that accessible (retrievable) information represents only a tiny slice of information available in our brains (available).
- The next section discusses what factors determine what information can be retrieved from memory. One critical factor is the type of hints or cues in the environment. The general principle that underlies the effectiveness of retrieval cues is the encoding specificity principle: cues help retrieval to the extent that they help match or recreate the original experience (e.g., a song you hear takes you back to a specific memory). However, that cue cannot match too many other experiences (cue overload principle), as it would no longer be distinctive.
- The third section of retrieval describes how psychologists can measure recall with either production tests (involving recall) or recognition tests (involving selection of correct from incorrect information like multiple choice tests). Usually, recognition tests are easier than production tests, but this is not always the case, as demonstrated by the recognition failure of recallable words.
- We usually think that retrieval is a neutral act because we implicitly believe in trace theory; we think we retrieve the memory (like taking it off a shelf) and then it is still the same (like putting it back on the shelf). However, research shows that this assumption is not so; every time we retrieve a memory, it changes. Changes can be both positive (e.g., testing effect) and negative (e.g., retrieval induced forgetting).
- Further, just as retrieval practice enhances accurate memories, so will it increase errors or false memories. If we accidentally include errors in our memories, those errors become facts over time.

Putting It All Together: Improving Your Memory

- To improve learning and memory, we need to encode material in a meaningful, distinctive way and to provide ourselves with excellent cues that will bring back the remembered events when we need them. To maximize retrieval, we should construct meaningful cues that remind us of the original experience, but cues that are distinctive and not confusable with other cues. We can also use mnemonic devices such as the peg word technique.

Difficult Terms

Encoding Specificity Principle
Episodic Memory
Proactive Interference
Retroactive Interference
Semantic Memory

Lecture Frameworks

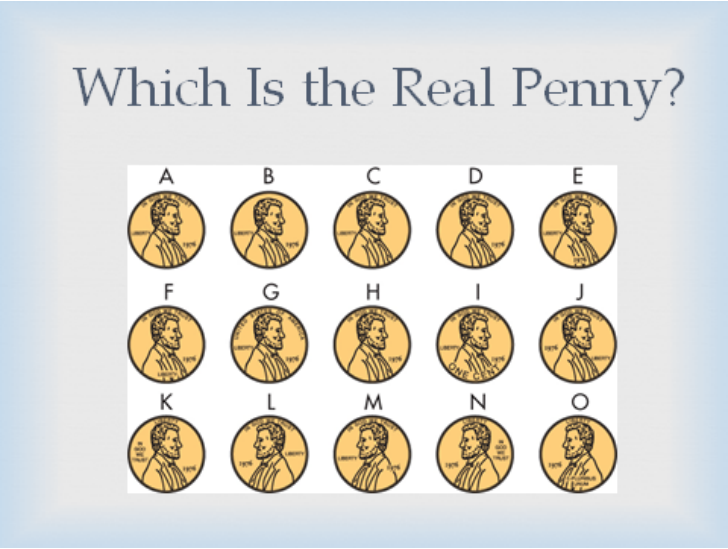
Overview

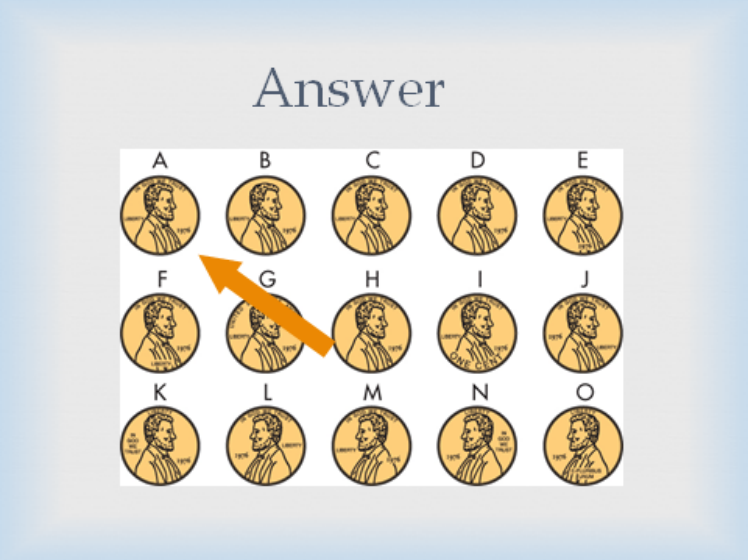
This is such a fun unit to teach for so many reasons. First, there are lots of activities that you can use for the different memory principles. Second, most students have never thought about or been exposed to the knowledge that our memories are quite fallible. Third, this unit directly relates to their school and study habits – it is VERY easy for them to understand the connection between the research and how it applies to their life. We like #3 because it's a two-for-one: the students are learning about psychology AND they learn the best study techniques, which means they perform better in all their classes (including this one).

First Class Period

- Discussion/Warm-Up
- oGet the students thinking by doing a quick memory activity that leverages what they read in the module about Simon Reinhard.

- Lecture – Refer to slides for the following:
  - To present the types of memory.
    - For working memory, you can give them the definition provided in the PowerPoint, and use the example of the memory test activity.
    - For semantic and episodic memory, you can use lots of examples to demonstrate the concepts.
  - To present the stages of learning/memory.
    - Encoding: Since we can't remember everything, our brains pick and choose. However, sometimes we encode without even thinking about it (automatic encoding). One way to illustrate automatic encoding is to ask students what they had for breakfast that morning. Assuming they ate breakfast, they will remember. Then ask them what they had for breakfast two weeks ago. Unless they eat the same thing for breakfast every day, it is unlikely they will remember (unless there was something really special about that breakfast, like having it served in bed because it was their birthday).
    - Encoding failures: How do we see something every day and yet are unable to recall it with much detail? Have you ever been driving home, noticed a new store or house, and wondered to yourself how long it had been there? It happens all the time due to encoding failure. To really drive this point home, play a game with your students – ask them if they could pick out the "real" penny in a sea of imposters (see both slides; below; Appendix A in the PowerPoint)



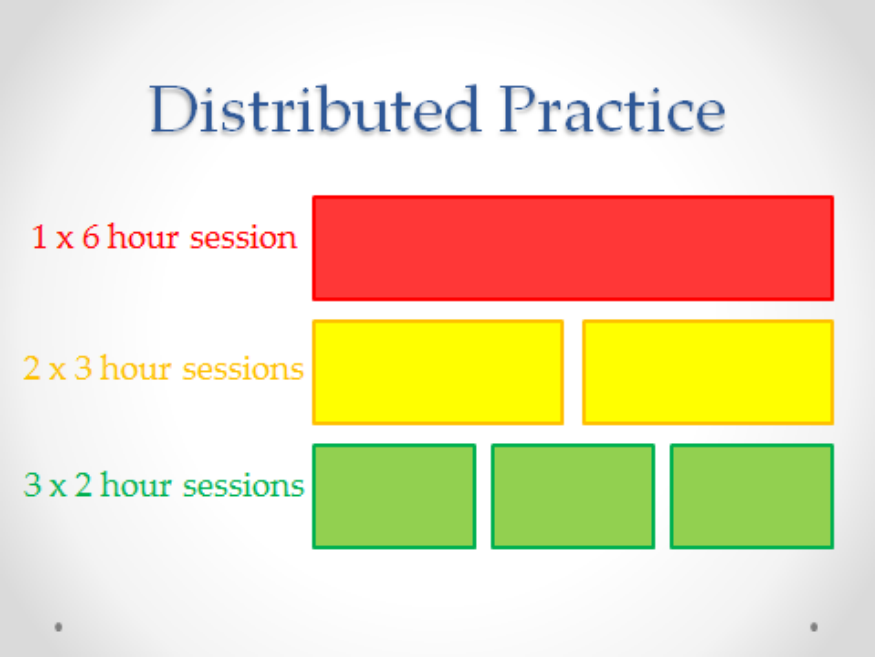


- Most students cannot pick out the real penny (only one or two per class, less than chance) because we fail to encode the information – it's just not important to know the details of a penny (we just need to know that it is the copper colored coin and that it's bigger than a dime but smaller than nickels and quarters).
    - Talk about "flashbulb" memories – those memories of important or momentous events that seem crystal clear. You can share your own (where you were when you learned about 9/11; what you were doing when you realized you won the lottery, etc.) or ask students to share theirs. Plus, since many flashbulb memories are at least partially incorrect, it serves as a nice transition into storage and retrieval.
    - Storage: Here, it is really important to highlight that memories do not just sit in our brain like books on a shelf, ready to be retrieved at a moment's notice. Rather, our memory is a reconstruction and often prone to mistakes, such as *proactive* and *retroactiveinterference*. This begins the conversation about the fallibility of our memories (if we accidentally include errors in our memories, those errors are likely to become "facts" over time). These concepts can be difficult for students to understand, so we suggest offering plenty of examples of each.
- Activity: Influences on Working Memory Capacity (Appendix B in PowerPoint)
    - See Activity section (below)
- Lecture – Refer to slides for the following:

- To discuss retrieval: This is basically the recall stage, which can be challenging; our memories are dynamic, and are prone to change each time we retrieve them, think about them, and then "put them back." This is elaborated on in Module 2: Eyewitness Testimony and Memory Biases (which we recommend).
- To discuss methods of measuring memory performance. The second piece of retrieval that you can emphasize is study techniques that promote memory retrieval (see the special topic section, below).
- Putting it all together: improving memory. Here, you can talk about memory techniques that promote performance.

- Lecture: Special Topic – Student Study Habits (PowerPoint Appendix B)

  - One of the ways that you can start this discussion is by asking students how they study. What do they do before a big exam? Most students will say that they re-read the chapters, re-read their notes, make flashcards, highlight, etc. At this point, you can talk about how these study techniques tend to focus on encoding. By using student study techniques that focus on encoding only, they are missing a vital step in the learning/memory process: *retrieval*. That is, students tend to spend so much time putting information *in*, they forget that ultimately, they need to be able to get the information *out*. Without even being aware of it, they are assuming that as long as they spend enough time laboring on the encoding process, the information will be perfectly stored for later retrieval. This is your opportunity to help students let go of these misconceptions and improve their study habits.
  - First, before you even make it into the classroom, check out Dunlosky, Rawson, Marsh, Nathan, & Willingham (2013). It's a meta-analysis on the effectiveness on student study strategies (if you don't want to read the whole paper, skip to Table 4 on page 45 where the authors rank the utility of different study techniques). The important point here, is that techniques that are passive and focus on encoding only (e.g., highlighting, keyword mnemonic, and re-reading) tend to have low utility compared to active techniques that incorporate both encoding and retrieval (practice testing and distributed practice are rated as the most effective).
  - So now that you know the best practices according to empirical research, how do you communicate this to your students? One approach is to sell it to students by touting the benefits of using better study techniques – they can improve their grades AND use their time more effectively. For example, the slide below represents three students, each studying for the same amount of time (6 hours). However, as you can see, each student divides up the time differently:



- After showing this slide, have students guess which of the fictional students had the best exam score (assuming everything else is equal). As you know from the Dunlosky et al. (2013) article, student #3 is likely to have the best test score because of the distributed practice. By presenting the information visually, it is easier for student to see that given the SAME amount of time, they can perform better if they just space out their studying a little bit.

    - The other important study technique you will want to cover is the testing effect, where students study by taking practice tests. Unfortunately, when you say the word test…most students want to go running. So this technique can be harder to get student buy-in. One of the ways to frame the importance of practice testing is to explain that it serves as a form of feedback. While studying, many students do not have an accurate view of their content mastery. Because they have their notes right in front of them and they are recognizing the terms, they tend to be overconfident. By taking practice tests, it gives them a more realistic appraisal of their mastery of the material, as well as which areas they are struggling with (which leads to more focused studying). Something you might consider pointing out is that practice testing feels a lot more difficult that passive studying (because the emphasis is on retrieval) – don't let that discourage them! That difficulty will help them learn and retain the information for much longer.

- Activity: Mini-Writing & Memory Application

- See Activities/Demonstrations (below) for directions.

Activities & Demonstrations

Influences on Short-Term/Working Memory: In-Class Activity

This series of activities should be done during class. In this series of mini-activities, students test their memories under different learning conditions.

- Time: 10 minutes
- Materials: See related Noba PowerPoint slides for this module
- Directions for Serial Position Effect
  - During class, tell students that they will see a list of 20 words, one word at a time. After the last word, they will see the word RECALL. Once they see RECALL, they will write down as many words as they can remember.
  - After they have had a chance to write down everything they remember, ask them a few leading questions: How many people wrote down the word table (the first word on the list)? Sugar (2nd)? What about the word body (last word on the list)? Teacher? Then ask them about words in the middle – Season? Cattle? Grass? You will see that almost 100% of students wrote the first and last words, but very few remember words from the middle of the list. You have now introduces them to the serial position effect!
- Instructions for Chunking Effect (Appendix C)
  - Before starting the activity, the class will need to be split in half (Groups A and B). Once you have split the class, have group B close their eyes. While Group B has their eyes closed, show Group A the series of numbers (the slides are animated so that each number appears individually). After a few seconds, let them right the numbers down. Once this is complete, switch groups (Group A closes their eyes while Group B opens them). Once group B is ready, show them the same series of numbers, but this time the numbers are chunked together (the numbers are still displayed for the same amount of time). After a few seconds, let them right the numbers down.

- Now that both groups have looked at the same set of numbers (Group A saw them individually; Group B saw them chunked), ask the class how many numbers they were able to correctly recall. Of course, Group B should outperform Group A even though they saw the same numbers (the benefits of chunking!).

Mini-Writing & Memory Application: In or Out of Class Activity

- This activity can be done during class or assigned as an out of class project/homework. In this activity, students apply what they have learned in the memory unit by creating a study plan and mnemonic devices.
    - Time: 10 minutes
    - Materials: Slide with directions
    - Directions: Show students the prompt and give them enough time to read it through. You can then let them talk in small groups for a few minutes or have them start writing immediately.
- An example of prompt:
    - Create a study plan for our next Exam
- Potential questions to ask your students:
    - When will you study?
    - Where will you study? What will your environment look like?
    - How will you study? What techniques will you use?
- Other prompt examples:
    - Why is retrieval so important to learning and retention?
    - In your words and using the content we have talked about it class, explain how you would go about learning the names of everyone in this class (think about each step: encoding, storage, and retrieval).
    - Create at least 3 of your own mnemonic devices

Additional Activities

Caudle, F. M. (1999). Information processing capacity: A visual demonstration of the magical number seven. In L. T. Benjamin, B. F. Nodine, R. M. Ernst, C. Broeker (Eds.), *Activities handbook for the teaching of psychology,* Vol. 4 (pp. 189-193). Washington, DC, US: American Psychological Association.

- This activity provides a visual demonstration of the well-known limitation on information processing capacity. Students are presented with an array of dots, arranged either randomly or in patterns. A graph of students' judgments of the number of dots in each array demonstrates the limits of information processing capacity and the facilitative effect of chunking.

Jenkins, J. J. (2008). Processing meaning enhances recall. In L. r. Benjamin (Ed.), *Favorite activities for the teaching of psychology* (pp. 130-132). Washington, DC, US: American Psychological Association.

- This in-class activity is a demonstration of the importance of context in enhancing recall. The activity is appropriate for courses in introductory psychology, memory, or cognition. It requires about 10 minutes in one class, some data analysis on the part of the instructor outside of class, and reporting of the results and accompanying discussion in a subsequent class.

Miserandino, M. (1991). Memory and the seven dwarfs. Teaching Of Psychology, 18(3), 169-171. doi:10.1207/s15328023top1803_10

- Describes a teaching demonstration in which the names of the 7 dwarfs are used to introduce and explain basic processes of memory for an introductory psychology or cognition class. Recall and recognition are contrasted to develop an understanding of other important memory principles: organization by sound, letter, and/or meaning; the tip-of-the-tongue phenomenon; long-term memory; and short-term memory. Empirical verifications of this teaching method, used with 66 students, found it effective in helping students master the principles of memory.

Weseley A. Applying the principles of learning and memory to students' lives. *Activities handbook for the teaching of psychology,* Vol. 4 [e-book]. Washington, DC, US: American Psychological Association; 1999:183-185. Available from: PsycINFO, Ipswich, MA.

- In studying learning and memory, students are confronted with a vast number of theories and effects. Often, even as we teach them about levels-of-processing theory they cling stubbornly to study techniques that are based solely on more superficial strategies. This activity requires students to apply their knowledge of learning and memory by evaluating a set of claims about how to study effectively.

Wieczynski, D. M., & Blick, K. A. (1999). Memory for Monopoly properties. In L. T. Benjamin, B. F. Nodine, R. M. Ernst, C. Broeker (Eds.), *Activities handbook for the teaching of psychology*, Vol. 4 (pp. 200-201). Washington, DC, US: American Psychological Association.

- This activity illustrates various aspects of memory. Students recall the properties from the game Monopoly and rate their amount of experience and success in playing the game on a 7-point scale. The demonstration requires little preparation and gives students a concrete example of basic memory principles. Its simplicity makes it practical for classes of all sizes.

Outside Resources

Book: Brown, P.C., Roediger, H. L. & McDaniel, M. A. (2014). Make it stick: The science of successful learning. Cambridge, MA: Harvard University Press.
https://www.amazon.com/Make-Stick-Science-Successful-Learning/dp/0674729013

Student Video 1: Eureka Foong\\\\\\\'s - The Misinformation Effect. This is a student-made video illustrating this phenomenon of altered memory. It was one of the winning entries in the 2014 Noba Student Video Award.
https://www.youtube.com/watch?v=iMPIWkFtd88

Student Video 2: Kara McCord\\\\\\\'s - Flashbulb Memories. This is a student-made video illustrating this phenomenon of autobiographical memory. It was one of the winning entries in the 2014 Noba Student Video Award.
https://www.youtube.com/watch?v=mPhW9bUI4F0

Student Video 3: Ang Rui Xia & Ong Jun Hao\\\\\\\'s - The Misinformation Effect. Another student-made video exploring the misinformation effect. Also an award winner from 2014.
https://www.youtube.com/watch?v=gsn9iKmOJLQ

Video: Simon Reinhard breaking the world record in speedcards.

http://vimeo.com/12516465

Web: Retrieval Practice, a website with research, resources, and tips for both educators and learners around the memory-strengthening skill of retrieval practice.
http://www.retrievalpractice.org/

Evidence-Based Teaching

Carney, R. N., Levin, J. R., & Levin, M. E. (1994). Enhancing the psychology of memory by enhancing memory of psychology. *Teaching of Psychology*, 21(3), 171-174. doi:10.1207/s15328023top2103_12

- Provides instructional recommendations for promoting positive student perceptions of the efficacy and personal relevance of mnemonic strategies (MSs). Using mnemonic demonstrations can convince students of the potency of MSs and can promote their spontaneous application.

Carney, R. N., & Levin, J. R. (2008). Conquering mnemonophobia, with help from three practical measures of memory and application. *Teaching of Psychology,* 35(3), 176-183. doi:10.1080/00986280802186151

- Recent articles in Teaching of Psychology have endorsed the classroom use of various mnemonic techniques. Yet a degree of mnemonophobia (i.e., fear of using mnemonics) may persist in the minds of some ToP readers due to various lingering misconceptions. Researchers found that on all measures, mnemonic students statistically outperformed control students. These findings provide further support for the use of classroom-based mnemonic techniques.

Conrad, N. J. (2013). Practicing what is preached: Self-reflections on memory in a memory course. *Teaching of Psychology*, 40(1), 44-47. doi:10.1177/0098628312465863

- To apply several principles of memory covered in a first-year university memory course, the researcher developed a series of one-page self-reflection papers on memory that required students to engage with the material in a meaningful way. These short papers covered topics related to memory. Exam grades and analysis of a specific question related to the topic covered in one reflection paper support the use of this assignment to enhance student learning and retention.

Einstein, G. O., Mullet, H. G., & Harrison, T. L. (2012). The testing effect: Illustrating a fundamental concept and changing study strategies. *Teaching of Psychology*, 39(3), 190-193. doi:10.1177/0098628312450432

- An important recent finding is that testing improves learning and memory. In this article, the authors describe a demonstration that illustrates this principle and helps students incorporate more testing into their learning. The authors asked students to read one text using a Study–Study strategy and one text using a Study–Test strategy. One week later, the authors tested students' memory for both texts with short-answer quizzes. The results revealed the standard testing effect and served as the basis for a laboratory report that required students to analyze and interpret the results and to answer questions about the testing effect and the experimental design. At the end of the term, students indicated that they were engaging in more testing during their studying.

McCabe, J. A., Osha, K. L., Roche, J. A., & Susser, J. A. (2013). Psychology students' knowledge and use of mnemonics*. Teaching of Psychology*, 40(3), 183-192. doi:10.1177/0098628313487460

- An online survey examined psychology students' metacognitive awareness and self-reported behaviors regarding mnemonics. Results showed that most participants could define mnemonics, but only a minority could describe the cognitive mechanisms involved. Participants were more familiar with some mnemonics (acronyms and acrostics) compared to others (peg word); further, the most common sources of mnemonics were those created by the students themselves and those provided by the instructors. Usefulness of mnemonics was rated at a moderate level compared to other common study strategies. Finally, the ratings for mnemonics were positive and correlated with independent measures of metacognition as well as psychology course experience.

Schoen, L. M. (1996). Mnemopoly: Board games and mnemonics. *Teaching of Psychology*, 23 (1), 30-32. doi:10.1207/s15328023top2301_5

- Describes a game board, Monopoly, for building mnemonic memory in students of psychology. Meaningfulness, organization, association and visualization are main principles to a successful and effective mnemonic system. Two powerful mnemonics systems that are impractical in class are the method of loci, which involves learning a series of places paired with information that needs to be remembered, and phonetic peg system, which uses a code in which numeric values are replaced by phonemes. An easy way that maintains the power of these methods is the use of Monopoly (Mnemopoly) board which is effective, since it is easy to visualize and can be organized in many ways. The Mnemopoly was compared to the other methods by giving instructions to 3 groups of students on 1 of

the 3 methods. The mnemopoly system incorporated the best features of the other 2 systems, with the main advantage being its swift acquisition.

Suggestions from the Society for Teaching's Introductory Psychology Primer

Stiegler-Balfour, J. J. (2013). Memory. In S.E. Afful, J. J. Good, J. Keeley, S. Leder, & J. J. Stiegler-Balfour (Eds.). *Introductory Psychology teaching primer: A guide for new teachers of Psych 101*. Retrieved from the Society for the Teaching of Psychology web site: http://teachpsych.org/e-books/intro2013/index.php

POSSIBLE ASSESSMENTS (In or Out of Class)

Classic Readings

- This activity takes 30-50 minutes. The instructor should ask students to read the article prior to the class meeting and provide students with a list of discussion questions ahead of time so they can prepare answers at home.
- A list of full-text readings in various topics of psychology including articles related to memory and cognition (The Scientific American: Psychology Reader to Accompany Introductory Psychology Texts). Students can also be asked to write reflection papers based on assigned articles, which exposes them to current psychological research and theory as well as allows them to develop writing and critical thinking skills.
- Possible articles include Loftus, E.F. (1975). Leading questions and the eyewitness report. *Cognitive Psychology*, 7, 560-572 and Tolman, E.C. (1948). Cognitive maps in rats and men. *Psychological Review*, 55, 189-208.

Student Paper/Project

- This demonstration only takes about 5-10 minutes of class time (if instructor asked students to read one of the primary articles, allow at least 15-20 minutes for discussion of the article)
- To demonstrate to students how inaccurate our memories can be “ask students to close

their eyes, imagine a loaf of bread (or any other familiar object such as a can of soda or carton of eggs), and then, with their eyes still closed, estimate its size with their hands. Have students then open their eyes and view their own estimates. Did they underestimate or overestimate the size of the object?" (Bolt, M. (2007). Psychology instructor's resource manual to accompany David G. Myers Exploring Psychology (7th ed.). New York: Worth Publisher).

- Research by Smith, Franz, Joy, and Whitehead (2005) demonstrated that sighted individuals typically overestimate an object's size whereas blind people did not. Ask students to read the Smith et al. (2005) article and write a paper about their experience during the demonstration, and how their results compare to those discussed in the Smith et al. (2005) article.

ACTIVITIES & TECHNIQUES (In Class)

Memory Quiz

- Introduce chapter with Barry Gordon's Forgetting Questionnaire to demonstrate how common forgetting is (See Gordon, B. (1995). Memory: Remembering and forgetting in everyday life. New York: Mastermedia Limited
    - http://home.comcast.net/~pamelawhite0794/AP Psych/Unit 6/Forgetting Frequency Questionnaire.htm.
    - Instructor should allow 15-20 minutes for students to complete the questionnaire and discuss the outcomes in class

Feature Film

- Momento provides an introduction to a discussion about memory and memory loss. The scenes: "It's like waking" (6:25 to 11:05) and "Memories can be distorted" (22:15 to 28:28) are especially impactful.
    - Instructor should allow 20-30 minutes to watch the videos and discuss how the scenes relate to memory and memory loss).

PowerPoint Presentation

This module has an associated PowerPoint presentation. Download it at https://nobaproject.com//images/shared/supplement_editions/000/000/275/Memory%20(Encoding,%20Storage,%20Retrieval).ppt?1432931847.

About Noba

The Diener Education Fund (DEF) is a non-profit organization founded with the mission of re-inventing higher education to serve the changing needs of students and professors. The initial focus of the DEF is on making information, especially of the type found in textbooks, widely available to people of all backgrounds. This mission is embodied in the Noba project.

Noba is an open and free online platform that provides high-quality, flexibly structured textbooks and educational materials. The goals of Noba are three-fold:

- To reduce financial burden on students by providing access to free educational content
- To provide instructors with a platform to customize educational content to better suit their curriculum
- To present material written by a collection of experts and authorities in the field

The Diener Education Fund is co-founded by Drs. Ed and Carol Diener. Ed is the Joseph Smiley Distinguished Professor of Psychology (Emeritus) at the University of Illinois. Carol Diener is the former director of the Mental Health Worker and the Juvenile Justice Programs at the University of Illinois. Both Ed and Carol are award- winning university teachers.

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