INTRO PSYCH SCIENTIFIC REASONING MODULE: STUDY STRATEGIES

INSTRUCTOR GUIDE FOR SMALL CLASSES

TOPIC: LEARNING

Photo Source: https://en.wikipedia.otg/wiki/Study_skills

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Summary

In this module, students consider the effectiveness of two study techniques (concept mapping and retrieval practice) on student learning. The module emphasizes the importance of experimental research to inform questions about which they may have their own lay hypotheses. Students gain practice developing hypotheses and presenting and reading results presented in graphical form.

Topic Learning

Source Article

Karpicke, J., & Blunt, J. (2011). Retrieval practice produces more learning than elaborative studying with concept mapping. *Science, 331,* 772-775.

Content Specific Student Learning Objectives

1. Generate hypotheses about the effects of two different study strategies on student learning.
2. Identify the DV/IV in a research study.
3. Generate graphical data that would support research hypotheses.
4. Practice reading results presented in graphical form.
5. Draw conclusions about research findings as they relate to real-life problems.

APA Learning Objectives (2.0)

1.1 Describe key concepts, principles, and overarching themes in psychology.
1.3 Describe applications of psychology.
2.1 Use scientific reasoning to interpret psychological phenomena.
2.2 Demonstrate psychology information literacy.
2.4 Interpret, design, and conduct basic psychological research.

MCAT Learning Objectives (2015)

Psychological, Social, & Biological Foundations of Behavior: Foundational Concept 6B
Scientific Inquiry & Reasoning Skills
Skill 2: Scientific Reasoning and Problem-solving
Skill 3: Reasoning about the Design and Execution of Research
Skill 4: Scientific Statistical Reasoning

Class Time 30 - 45 minutes.

Other Resources For This Module

Powerpoint Slides

BEFORE CLASS

Read through this guide, getting an estimate for how much time to spend on each piece, depending on the time you have available.

Be sure you understand the study design, including the between- and within-subjects factors, as well as how the actual performance data was different from students' predictions of their own learning.

The following article summary provides an overview of the details:

This module focuses on the second of two studies reported in Karpicke & Blunt (2011). Study 2 compared the effectiveness of two study techniques (concept mapping vs. retrieval practice) on student learning. This module focuses on two factors manipulated in the study: Learning Condition (concept mapping vs. retrieval practice, manipulated within-subjects) and Final Test Format (short answer vs. concept map, manipulated between subjects). During the first visit to the lab, participants studied two, ~250-word science text (e.g., on the digestive system, or the make-up of human blood). As a within-subjects manipulation, one text was studied using each method (order counterbalanced across participants). In the concept mapping condition, participants first had 5 minutes to read the text. Then, participants had 20 minutes to create a concept map to represent the content, with access to the passage the entire time. (Participants also received instruction in concept-mapping, as well as an example concept map.) In the retrieval practice condition, participants first had 5 minutes to read the text. Then, the text was removed and participants had 7 minutes to type into a blank text-box as much materials as they could remember from the passage. Then, the passage was returned for 5 minutes so the participants could re-study the material, before it was removed and participants had a second 7 minutes to type into a blank text box as much as they could remember from the passage. Student self-judgments of learning were assessed by asking participants to rate what percent of the material they expected they would remember one week later. Actual learning was assessed through a final test administered one week later, when participants returned to the lab. The final assessment could take the form of either a series of short-answer questions (including both factual and inference questions) or the creation of a concept map. Type of final test was manipulated between subjects, such that participants completed one type of test or the other, for both passages studied previously. In each case, an objective and reliable scoring procedure was used to indicate what percent of the material was recalled. Results indicated that while participants believed they learned more when studying with concept mapping, the assessment data indicated that participants remembered more material if it was previously studied with the retrieval practice technique, regardless of the format of final assessment.

DURING CLASS

SET THE STAGE

[Slide 1] (title slide)

- Ask students to list the study techniques they use; write on board
- Make sure students come up with retrieval practice (testing oneself) and concept maps; others might involve spaced learning, chunking, re-reading, etc
- Explain that everyone has their favorite way to study for classes like Intro Psych, but researchers require carefully collected, systematic, empirical information rather than personal observations
    - Aside: Remind students of the difference between empiricism and dogmatism/appealing to authority
- Here: We'll be discussing a study designed to pit two techniques against one another
    - *On the board, highlight or circle the techniques that might be similar to concept mapping or retrieval practice*

[Slide 2] (sample concept map, from the study they'll be discussing)

- Ask students who have used concept mapping in previous course
- Have students generate ideas about why concept mapping might be beneficial
    - Be sure students identify concept mapping as an active learning technique, and helping with encoding and forming network of relationships among different ideas and concepts

[Slide 3] (retrieval practice)

- Note that this can be operationalized in different ways…
- Ask students to identify study examples that might be described as 'retrieval practice'
- Note that in the study to be discussed, retrieval practice means a COMPLETE RETRIEVAL of as much students remember about something that was studied
- Have students generate ideas about why this type of retrieval practice might be beneficial
- Students might have a harder time here… and that's okay! Many people expect concept mapping to be the most beneficial

ACTIVITY

[Slide 4] (Study description)

- Describe the basic design of the Karpicke & Blunt study which tested concept mapping against retrieval practice
    - Participants read an ~250 word factual science text (e.g., on the digestive system, or the make-up of human blood)
    - Studied the material for 5 minutes… THEN, in different conditions participants either:
        - "Concept Map" – had 20 minutes to make a concept map, with text available
        - "Retrieval Practice" – removed the text & participants had 7 minutes free-recall typing as much material as remembered into text box, then 5 minutes to review the text again, then 7 minutes to recall as much as they remember again)
    - Everybody did BOTH study techniques! (counter-balanced across participants, used different texts each time)

[Slide 5] (Outcome measures)

- Continue describing the study by elaborating on the outcome measures
    - Self-perception: Participants made a self-judgment about how much they thought they learned (% remembered one week later)
    - Actual Learning (between subjects – participants did one or the other, for both texts studied)
        - Concept map (made a concept map, without the text for reference)
        - Short answer (typed answers to questions into computer)
        - NOTE: actual learning was scored as "percent correct" – the researchers were able to develop a reliable scoring method for both concept maps and the short answer questions

(optional) [Slide 6] (Sample Short Answer questions)

- Optional slide with examples of short answer questions
- In the concept mapping assessment, participants were asked to re-create the concept map of the material

(optional) [Slide 7] (Study Design)

- Reiterate that study conditions were a within-subjects factor and assessment was a between-subjects factor

[Slide 8] (Based on the study description)

- Either individually or in small groups and then as a full class have students work through the questions on the slide
    - DVs? (note there are *two* dependent variables)
        - Test scores
        - Self-perception of learning
    - IVs? (be sure students identify both variables)
        - Study Condition (Concept Map / Retrieval Practice); remember that this was a within-subjects variable
        - Test Type (Concept Map / Short Answer Test); remember that this was a between-subjects variable
    - Generate hypotheses?
    - Generate sample data to support hypothesis?
- As students work, particularly on this last question, circulate to look at student graphs / discuss predictions and possible patterns of results. Students can also complete this activity alone or in groups, then form larger groups to compare answers
    - After students / small groups have worked for a while, pull class back together to discuss the hypothetical data
        - Discuss several possible findings, and what the data would like if that hypotheses were supported (e.g., if Concept Mapping is always superior, or if it's best to study using a format that matches the type of assessment). While doing this, draw the graphs on the board (or have students do this while they are working in groups)

[Slide 9] (Actual data)

- Remind students of the importance of developing hypotheses prior to collecting data
    - If students have not drawn predictions on the board, poll class to see what students think and/or explain and justify their predictions (students often think concept mapping will be better or that performance will be best when study technique is matched to assessment type)

[Slide 10] (Test Performance)

- Have a student or students describe the patterns shown in the graphs

- Performance is better on both types of assessments when retrieval practice was the study technique
- Performance is better on the final short answer test in general (make sure to note the difference in y-axis)

[Slide 11] (Student predictions)

- Have a student or students describe the patterns shown in the graphs
  - Ensure students note that students' self-perceptions about which method of studying would be most effective were not in line with what method was actually more effective based on their test performance
  - Reiterate the point about how empirical research can often inform questions about which we have (potentially incorrect) assumptions

[Slide 12] (Beyond the data)

- Step through the questions on the slide
- Some points that might be drawn out as part of discussion:
  - Potential limitations of applying research from a laboratory study to actual studying behaviors
    - Would normally study across multiple days, in multiple settings
    - Would not leave a week between studying and a test
  - Are these findings restricted to certain types of materials (short science texts); would concept mapping be superior for other types of content?
  - Can these findings be applied to something like learning a second language, or mathematics education? How would each study technique be operationalized in those cases?
  - How can students be encouraged to use more retrieval practice techniques to aid learning?
  - Would you see the same results if the test occurred a month, or a year later?
  - How do you engage an issue like this, where self-perceptions are so out of line with actual performance? What would motivate new college students to try a study technique that they might think is not going to be as effective?
    - The last question can be used to frame future research studies that might conducted to address these issues.

CONCLUDING THOUGHTS

- End by noting that one challenge in psychology research is to use multiple studies to understand a key finding better…. This study is ground breaking, and it will be interesting to see how future research helps us better understand whether these findings hold across multiple contexts, or if down the road evidence will exist to support using different study techniques for different domains.

- Beyond the specific topic of this study, the results remind us to be aware that our own assumptions are not always correct