

Open Your Class With This Tomorrow- *The Science of Learning: 99 Studies That Every Teacher Needs to Know 2nd Edition*

Teacher Directions: Provide students with the following summary of a journal article based on the book *The Science of Learning: 99 Studies That Every Teacher Needs to Know, 2nd Edition*. Then, have them answer the practice article analysis question and multiple-choice questions to test their research methods skills.

AP Psychology Style AAQ (Article Analysis Question)

Directions: Respond to all parts of the question using the source provided.

- (A) Identify the research method used in the study.
- (B) State an operational definition of the dependent variable.
- (C) What does the fact that the results were statistically significant mean regarding the impact of spacing out study sessions in the study?
- (D) Identify at least one ethical guideline applied by the researchers.
- (E) Explain the extent to which the research findings may or may not be generalizable using specific and relevant evidence from the study.
- (F) Explain how at least one of the research findings supports or refutes the researchers' hypothesis.

Title: *Spacing effects in learning a temporal ridgeline of optimal retention. Psychological Science*

The study "Spacing Effects in Learning: A Temporal Ridgeline of Optimal Retention" by Cepeda et al. (2008) investigated the efficacy of spaced learning sessions on long-term memory retention. The researchers manipulated variables such as the duration between revision sessions and observed their impact on participants' performance, measured by successful answers in the final exam.

Introduction and Methods

Researchers gathered 1,354 people of different ages and from different countries. The selection process created a large and diverse sample, with participants from various backgrounds and locations worldwide that captured a broad spectrum of perspectives and experiences. The participants were split into 26 groups and tested at different intervals to see how effective spaced learning sessions were for improving memory. Participants learned 32 short facts during the study, such as "Who invented snow golf?" and "Which European nation consumes the spiciest Mexican food?"

Participants were divided into 26 groups by chance. Each group had different intervals before review sessions and final tests. Researchers tested several intervals, including 7 days, 35 days, 70 days, and 350 days. Participants were tested on facts and given feedback. Feedback was provided, and sessions were repeated with increasing difficulty. The final session included recall and multiple-choice recognition tests. The researchers analyzed participants' performance in the final exam to determine the best spacing between study sessions for memory retention.

Before formally agreeing to participate, participants were provided detailed information about the research objectives, procedures, and potential risks. The study was conducted online, and accessibility was ensured from any standard web browser. The participants' anonymity was maintained.

Results

The findings showed that longer gaps between study sessions improved memory recall and recognition over time as measured by test scores. The researchers used statistical analyses to determine the significance of the observed effects and differences between groups. They compared the means of the two groups and found statistically significant differences. Moreover, the study discusses effect sizes (d-values) to provide additional context regarding the magnitude of the observed differences between groups. Effect sizes help researchers understand the size or magnitude of the observed effects, regardless of sample size. This provided additional context to the statistical significance tests and helped interpret the practical implications of the findings. It's like zooming in to see how much of an impact something has. In this study, the effect sizes helped the researchers see the strong relationships between the different factors they studied.

Researchers found that spacing out study sessions over time helps people remember things better. So, it's better to study a little each day rather than cramming everything into one day if we want to remember things well. Spaced learning allows for efficient use of time, as participants can space out sessions without sacrificing immediate performance while improving long-term memory retention. Additionally, participants' age, gender, prior knowledge, and background showed no significant differences.

Cepeda, N. J., Vul, E., Rohrer, D., Wixted, J. T., & Pashler, H. (2008). Spacing effects in learning a temporal ridgeline of optimal retention. *Psychological Science*, 19(11), 1095–1102.

Effects of Meditation on Stress Reduction Among College Students **Multiple-Choice Practice Qs**

Directions: Answer the following multiple-choice questions to test your understanding of science practices related to research methods, research ethics, and statistics.

1. What study design was employed in "Spacing Effects in Learning: A Temporal Ridgeline of Optimal Retention"?
 - A) Observational study
 - B) Cross-sectional study
 - C) Longitudinal study
 - D) Experimental study.
2. How did the researchers ensure ethical conduct in the study "Spacing Effects in Learning: A Temporal Ridgeline of Optimal Retention"?
 - A) By selecting participants based on their prior knowledge and expertise
 - B) By conducting the study online to ensure accessibility from any standard web browser
 - C) By maintaining participants' anonymity and providing detailed information about the research objectives and potential risks
 - D) By excluding participants from certain countries to ensure homogeneity in the sample
3. How did the researchers utilize effect sizes in the study "Spacing Effects in Learning: A Temporal Ridgeline of Optimal Retention"?
 - A) To determine participants' prior knowledge and background
 - B) To identify participants' demographic characteristics to evaluate the sample's representativeness.
 - C) To ensure random assignment and control for confounding variables.
 - D) To compare the magnitude of observed differences between groups, regardless of sample size

4. What is the independent variable (IV) in the study "Spacing Effects in Learning: A Temporal Ridgeline of Optimal Retention?"
 - A) Participant's age
 - B) Duration between revision sessions
 - C) Participants' performance in the final exam
 - D) The number of study facts learned

5. What would be an appropriate dependent variable (DV) in the study "Spacing Effects in Learning: A Temporal Ridgeline of Optimal Retention?"
 - A) Participant's age
 - B) The level of motivation of participants on a Likert scale
 - C) Duration between revision sessions
 - D) Participants' scores on the final exam

6. What potential confounding variable should be controlled for in the study "Spacing Effects in Learning: A Temporal Ridgeline of Optimal Retention?"
 - A) Participant age
 - B) Participant performance in the final exam
 - C) Duration between revision sessions
 - D) Number of study facts learned

7. How did the researchers ensure diversity in the participant pool for the study "Spacing Effects in Learning: A Temporal Ridgeline of Optimal Retention?"
 - A) By selecting participants from a single demographic group
 - B) By conducting the study in a controlled laboratory setting
 - C) By using convenience sampling methods
 - D) By gathering participants of different ages and from various countries

8. Which aspect of the study design in "Spacing Effects in Learning: A Temporal Ridgeline of Optimal Retention" helps establish causality between spacing intervals and memory retention?
 - A) The use of a representative sample
 - B) The inclusion of participants from various countries
 - C) The use of random assignment
 - D) The reliance on self-reported data

9. Which group in the study "Spacing Effects in Learning: A Temporal Ridgeline of Optimal Retention" is the control group?
 - A) Participants who received feedback after the final exam
 - B) Participants who revised study materials at 7-day intervals
 - C) Participants who revised study materials at 35-day intervals
 - D) Participants who did not receive any manipulation of spacing intervals

10. What role does the control group serve in the "Spacing Effects in Learning: A Temporal Ridgeline of Optimal Retention" study?
 - A) To receive the experimental manipulation of spacing intervals
 - B) To provide feedback on the study procedures
 - C) To serve as a comparison against the experimental group
 - D) To gather demographic information from participants