



Exploring the Boundaries: When Explanation Activities Do Not Improve Comprehension

Jennifer Wiley, Tricia A. Guerrero, Lena Hildenbrand and
Thomas D. Griffin

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Jennifer Wiley, Tricia A. Guerrero, Lena Hildenbrand, & Thomas D. Griffin

University of Illinois at Chicago

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Abstract

Engaging in explanation while studying expository science texts can improve comprehension. The present study varied the timing of explanation activities and restudy opportunities before taking final comprehension tests on a set of 6 topics studied as part of a course in Introduction to Psychology. When students had the opportunity to restudy in the same session, then comprehension benefited from explanation activities. However, no benefit from explanation activities was seen when they were done in a session prior to the restudy opportunity.

Theoretical introduction

Generating explanations can be a beneficial activity for learning from expository science texts (Ainsworth & Loizou, 2003; Butcher, 2006; Chi et al., 1994; Guerrero & Wiley, 2021; Hinze, Wiley, & Pellegrino, 2013; McNamara, 2004). Explanation activities can help students to detect gaps or weaknesses in their understanding (Chi, 2000) and have also been shown to improve students' ability to monitor their own comprehension (Griffin, Wiley, & Thiede, 2008; 2019; Wiley et al., 2016) which is necessary in order for students to make effective choices during self-regulated study. In the present study, the timing of explanation activities and restudy opportunities was manipulated so that they were either completed in a single study session or across two separate study sessions (one week apart).

Methodological overview

Participants. Undergraduates ($N = 346$) received course credit for completing these activities as a part of their Introduction to Psychology course. This data was collected online during semesters impacted by COVID.

Materials. The reading materials consisted of college-level textbook excerpts describing theories and research on 6 topics (Sampling Bias, Placebo Effect, Self-Control, Fundamental Attribution Error, Conformity and Obedience, and Cognitive Dissonance). The average length of the excerpts was approximately 800 words with Flesch Kincaid Grade Levels ranging from 10.5 to 13.5. Two multiple-choice assessments were employed, a prior knowledge test with 5 questions about each topic which was given before exposure to the readings, and a final comprehension test that contained 5 new multiple-choice questions for each topic. The questions on the final test could not be answered based on verbatim memory for the excerpts, and required students to apply their understanding of concepts in each text (Wiley, Griffin & Thiede, 2005).

Design. In a 2 x 2 design, students were assigned to either explanation or summary activity conditions, and either had an opportunity to restudy the texts as part of the same session or in a separate session one week later.

Procedure. In an initial session, students took a short reading comprehension assessment (ACT practice passages) and completed the prior knowledge test for the 6 topics. These both served as covariates in analyses. In a second session students read the 6 assigned textbook excerpts. As they read each text, students were prompted to generate explanations or summaries. The summary instruction for the sampling bias text prompted students to “Write a summary of this passage on WHAT MAKES A GOOD SAMPLE”. In contrast, students the explanation condition were prompted to “Write your explanation of WHAT MAKES A GOOD SAMPLE and how it is supported by studies or examples in the passage”. The explanation condition also received further instruction adapted from Griffin, Wiley, and Thiede (2008, 2019):

As you read the passages, you should try to explain to yourself the meaning and relevance of each new sentence to the overall purpose of the passage.

Ask yourself questions like:

What does this mean?

What new information does this add?

How does this information relate to previous sentences?

Does this information raise new questions in your mind?

Does this information provide important insights into the major theme of the text?

How does this information relate to the title?

In addition, when you reach the end of each text, reflect on the text as a whole, how it makes sense, and what it means. They then saw example passage about the Rorschach test with possible comments presented to the right of each sentence.

In the same-session conditions, students proceeded immediately to the opportunity to re-study the texts after the explanation or summary activity. In the separate-session conditions, students had the opportunity to re-study the texts after a delay of one week. Across conditions, all students were allowed to select 3 topics for restudy, and had 5 minutes to re-study the selected excerpts. All students completed the final comprehension tests after the re-study opportunity.

Results

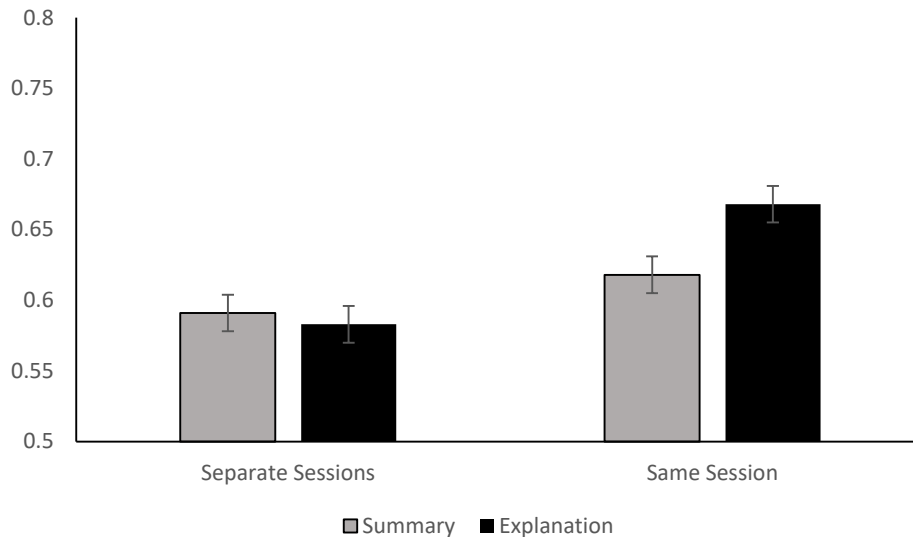
Regardless of condition, test scores were higher after studying the excerpts and either explaining or summarizing compared to scores the initial prior knowledge test.

To test for differences due to the type and timing of the activities on learning, performance on the final comprehension test was analyzed using a 2x2 ANCOVA with explanation condition and delay entered as two between-subject factors, and ACT scores and prior knowledge scores entered as covariates. Both covariates significantly predicted comprehension test scores. The estimated means from this analysis are shown in Figure 1. When students had the opportunity to re-study in the same session as initial study, then comprehension benefited from explanation activities more so than summary activities. In contrast, when there was a delay before re-study opportunities, then comprehension did not differ across the two activity conditions. This resulted

in a significant interaction between activity type and delay. In addition, there was a significant effect of delay with better performance in the single session condition compared to when study was split across two sessions, while the effect of activity condition was marginal.

Figure 1

Final Comprehension Scores as a Function of Explanation Activities When Completed in the Same or Separate Study Sessions



Discussion

Although past work has shown that engaging in explanation activities can support better comprehension and more accurate comprehension monitoring from expository science texts, studies typically explore the impact of explanation activities within a single learning episode. It appears that the benefits from engaging in explanation activities on re-study decisions may be stronger when the cues from these activities are still fresh in memory, and when there is no delay between explanation activities and engaging in re-study opportunities.

Author Note

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