Helping Students Identify Relevant Information on PowerPoint slides: Definition Relevance Training

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Abstract

This study is an extension of a prior study that examined ways in which different levels of feedback (no feedback, general feedback, and specific feedback) impact college students’ abilities to identify relevant information on PowerPoints slides. We instructed students to highlight what they believed to be relevant information on PowerPoint slides. Results indicated that specific feedback improved students’ performance on identifying relevant information, as opposed to irrelevant, compared to general or no feedback. However, we found that students highlighted more irrelevant information when less relevant information was present on the slides. It is possible that students need an objective definition of relevant information to effectively ignore high amounts of irrelevant information on PowerPoint slides. We addressed this possibility in the present study, where we first provided students with definitions of relevant and irrelevant information and then used the same feedback conditions as the prior study. We expected that the provision of such definitions would drive students to identify more relevant, and less irrelevant, information on PowerPoint slides. Results showed that providing a definition with specific feedback improved students’ performance on identifying relevant information on PowerPoint slides. However, consistent with the previous study, students continued to highlight more irrelevant information when less relevant information was present on the slides. New experimental designs are being used to help students identify relevant, while ignoring irrelevant, information when more irrelevant information is present on PowerPoint slides.
Helping Students Identify Relevant Information on PowerPoint slides: Definition Relevance Training

A growing field of research addresses the importance of students’ abilities to identify relevant information from study materials including lecture notes, textbooks, and PowerPoint slides (Haynes, McCarley, & Williams, 2015; Stencel, 2001). Stencel (2001) employed a method where students used an electronic notebook in place of handwritten notes. The notebook is more time-efficient in that it eliminates the need to copy off a board or overhead and allows the student to focus on what’s important. He stated that if students are able to identify the most relevant topics, they can spend more time focusing on that information, which has been shown in prior research to improve retention (Haynes, et al., 2015). Robin, Martello, Foxx, & Archable (1977) found that showing underachieving students how to correctly identify information from lectures increases their identification of important words and topics from lectures. Recently, a study conducted by Williams et al. (2016) showed that providing specific feedback can also improve students’ abilities to identify relevant information from PowerPoint slides. Specific feedback consisted of having students identify relevant information on PowerPoint slides and then providing them with an opportunity to review their slides to see if they correctly identified the relevant information. However, this study also found that when there was a higher amount of irrelevant information surrounding the relevant information, students were less able to distinguish relevant from irrelevant information. General feedback, which consisted of providing the students with a percentage of relevant words correctly identified, proved insufficient to improve students’ abilities of identifying relevant information. Providing only a percentage seemed to leave the student continuing to make the same mistakes, whereas, specific feedback enabled them to address these mistakes. The current study aimed to address these issues further
by providing a definition of what constitutes a relevant and irrelevant word beyond the provision of feedback. In Williams et al. (2016), students identified relevant words based on their own working definition of relevant/irrelevant information. But, providing them with definitions of what constitutes a relevant and irrelevant word could lead students to think objectively about these concepts thereby reducing cognitive load in short term memory. Cognitive load occurs when an individual engages in cognitive processes that exceed their learning capacity, thereby preventing them from gaining a deeper understanding of the information and integrating it within their existing relevant knowledge base. Cognitive load has been challenging to diminish in many learning environments, such as in multimedia learning. For instance, Mayer and Moreno (2003) suggested pretraining as a technique used to help reduce cognitive load and enhance learning. They defined pretraining as a prior instruction concerning the components in the to-be-learned system. Learners watched a multimedia presentation explaining how a car’s breaking system functions. They were instructed to build a component model and a causal model simultaneously. Mayer and Moreno (2003) provided pretraining about the components, enabling the students to have a better understanding of the components, which allowed them to more effectively process the narration and focus more on creating the causal model. An objective definition of what constitutes a relevant and irrelevant word would serve as a form of pretraining, directing students to focus on the relevant words and eliminating any other extraneous cognitive processes. Specifically, we explored if providing such definitions would enhance students’ abilities to ignore irrelevant information and lead to more accurate identification of relevant words on PowerPoint slides. We also examined whether combining feedback used in the study by Williams et al. (2016) with a definition is the most successful intervention for assisting students, or if a definition alone is a substantial replacement for specific and general feedback.
Method

Participants

We recruited 75 students ($M = 21.45$, $SEM = 0.68$) enrolled in Introduction to Psychology at a mid-size university in the southeastern United States and randomly assigned each one to either the DONF ($n = 31$), DGF ($n = 22$), or DSF ($n = 22$) condition. Each student signed up to participate via the Department of Psychology online research management system and earned a half hour credit toward the research participation module of the Introduction to Psychology course.

Materials

Relevance definitions and quiz. Students first read definitions of relevant and irrelevant words. Relevant words included titles, names, content words, and words that provided the meaning or context of a content word. Irrelevant words included prepositions (“of, as, in, like…”), redundant words, and words that are implied by a content word (Haynes et al., 2015). After providing definitions of what constitutes relevant and irrelevant words, students took a four-question multiple choice quiz on the definitions to ensure their understanding of the concepts.

Feedback session slides. We used two PowerPoint slides during the feedback phase of the experiments, one on the topic of Economics and the other on the topic of the History of Science, presented in a counterbalanced fashion. We selected these topics as they did not have a clear link to the information to be presented in the testing phase of the experiments, thereby reducing the potential for any information carryover effects. Both slides, printed on paper, had a white background with black lettering. Each slide consisted of 47 total words, of which 24 were relevant and 23 were irrelevant, for a relevant to total ratio of .51. Two of the authors, both of
whom are professors, worked together to predetermine the relevant and irrelevant words on the
slides.

**Test session slides.** We used four PowerPoint slides, printed on paper, during the testing
phase of the experiments, all of which were on the topic of Ethology. We selected Ethology for
the topic as the student participants had not yet been exposed to such information in their
Introduction to Psychology courses at the time of the study. All slides had a white background
with black lettering. Two of the slides contained a “high” amount of relevant words. These high
slides contained 47 total words, of which 33 were relevant and 14 were irrelevant, which created
a relevant to total ratio of .70. The remaining two slides contained a “low” amount of relevant
words. These low slides contained 47 total words, of which 14 were relevant and 33 were
irrelevant, which created a relevant to total ratio of .30. We presented the high and low Ethology
slides in a counterbalanced order.

**Procedure**

First, all participants engaged in the informed consent process. Then, they were given one
minute to read over definitions of what constitutes a relevant and irrelevant word, after which
they were given two minutes to complete a four-question multiple choice quiz on the definitions.

We randomly assigned participants to 1 of 3 feedback conditions: definition with no
feedback (DONF), definition with general feedback (DGF), or definition with specific feedback
(DSF). DONF participants received the packet of four Ethology slides, a highlighter, and the
following instructions, “Here is a packet of four PowerPoint slides. Use this highlighter to
identify what you believe to be important information on each slide. Complete these slides in the
order in which they are stapled.” Participants had 10 minutes to complete this task.
Participants in the DGF condition began with the first feedback session, during which they received either the Economics or History of Science feedback slide, depending on counterbalancing, and the following instructions, “Here is a PowerPoint slide. Use this highlighter to identify what you believe to be important information on this slide.” They had two minutes to complete this task. After the two minutes, the researcher collected the highlighted slide, stepped out of the testing room, and graded the slide. Then, the researcher re-entered the testing room and told participants the percentage of relevant words identified correctly on the PowerPoint slide. After telling the participants the percentage, the researcher presented the second feedback slide, either Economics or History of Science, depending on which one the participants saw first, and stated, “Here is a PowerPoint slide. Use this highlighter to identify what you believe to be important information on this slide.” Again, they had two minutes to complete the task and after the researcher graded the slide, participants verbally received the percentage of relevant words identified correctly on the PowerPoint slide. After the second feedback session, participants received the packet of four Ethology slides and the same instructions as the DONF condition.

Participants in the DSF condition went through the same procedure as the DGF condition except that after being told the percentage of relevant words identified correctly during each feedback session, DSF participants examined their graded PowerPoint slide for one minute, thereby seeing the words they identified correctly and incorrectly. After examining the second graded feedback slide, the DSF participants received the packet of four Ethology slides and the same instructions as the DONF and DGF participants.
After 10 minutes with the Ethology PowerPoint slides, all participants completed a short demographic questionnaire. Next, all participants engaged in the debriefing process with the researcher. The total participation time equaled 30 minutes.

**Data Coding and Analysis**

On all feedback and testing slides, we recorded the total number of relevant and irrelevant words participants highlighted. In order to capture in one measure the amount of relevant and irrelevant words highlighted, we calculated a relevance index: \((#R - #IR)/(#R + #IR)\), putting scores on range of -1.0 to 1.0. On all test slide analyses, we computed one relevance index for the two high slides and one relevance index for the two low slides. To statistically analyze all relevance indices, we used ANOVAs as data met all necessary test assumptions.

**Results**

Participants across all groups scored, on average at least 96% on the definition quiz. A Kruskal-Wallis \(H\) test indicated that students in the DONF (Mean Rank = 40.21), DGF (Mean Rank = 38.02), and the DSF (Mean Rank = 34.86) conditions equally understood the definitions of relevant and irrelevant words \((\chi^2 (2, N = 75) = 3.043, p = .218)\). Figure 1 depicts the mean relevance indices for all conditions on the high- and low-relevant test slides. A 2 (Feedback Session: 1 vs 2) x 2 (Group: DGF vs DSF) mixed ANOVA revealed a significant effect of Feedback Session, \(F(1, 42) = 6.075, p = .018, \eta^2 = .126\). Only those in the DSF condition showed a significant increase in the relevance index from Feedback Session 1 to Feedback Session 2 \((p = .004)\). A 2 (Slide: High vs Low) x 3 (Group: DONF vs DGF vs DSF) mixed ANOVA revealed a main effect of slide with higher relevance indices on the high-relevant slides compared to the low-relevant
slides, $F(1, 72) = 463.636, p < .0001, \eta^2 = .866$. There was also a main effect of group, $F(2, 72) = 10.093, p < .0001, \eta^2 = .219$. Scheffé post hoc analyses revealed that the DSF condition had significantly higher indices than the DONF condition ($p < .0001$) and marginally higher indices than the DGF condition ($p = .062$). The DGF and DONF conditions did not differ ($p = .173$). There was no significant Slide x Group interaction, $F(2, 72) = 0.767, p = .468, \eta^2 = .021$.

**Discussion**

With the large amount of information college students are required to learn and study, effective study strategies are a necessity. For instance, underlining and highlighting are among the most popular study techniques (Dunlosky, Rawson, Marsh, Nathan, & Willingham, 2013; Fowler & Barker, 1974; Yue, Storm, Kornell, & Bjork, 2014). It has been found in previous research that students have trouble identifying the most relevant material, especially on PowerPoint slides (Fowler & Barker, 1974; Leutner et al., 2007). The ability to distinguish between relevant and irrelevant information may help students compile lecture or textbook notes more effectively by condensing the amount of information recorded, thus aiding in the retention of the most important material via the encoding and external storage functions of note taking (Haynes et al., 2015). In the present study we provided participants with a definition of what constitutes a relevant and irrelevant word on PowerPoint slides before following the same feedback procedures of Williams, et al. (2016). We examined whether providing this definition enhanced students’ abilities to identify more relevant information, opposed to irrelevant information, when more irrelevant was present and whether combining the feedback used in the study of Williams, et al. (2016) with a definition would be sufficient to improve students’ abilities to identify relevant information or if a definition alone would be adequate.
Providing a definition with specific feedback was shown to improve students’ abilities to identify more relevant than irrelevant information beyond general and no feedback. However, consistent with Williams et al. (2016), students still identified more irrelevant words when there were less relevant words to identify (low-relevant slides). Once a full sample is acquired for the current study, comparisons will be made with the performance across feedback conditions of Williams et al. (2016) to better examine the impact, if any, of providing a definition to students. We believe that having a definition will lead to higher overall relevant word identification for all feedback conditions. Furthermore, studies are being designed to investigate ways in which we may help students better identify relevant, and ignore irrelevant, information when the relevant information is situated amongst a high amount of irrelevant information.
References


Figure 1. Mean relevance indices (± 1 SEM) of the three feedback conditions on high- and low-relevant test slides.