When Redundant Presented On-Screen Text in Multimedia Technical Instruction Causes Cognitive Overload

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Abstract:

According to human memory, it is suggested that under some circumstances, more processing capacity is effectively available to learners if instructional materials use multiple modalities with the full text (e.g. auditory for text and visual for pictures). Based on cognitive load theory, some conventional approaches to instructional design are ineffective as they place an unnecessary load on a learner's working memory and cause learning difficulty. Previous research, particularly in technically-based areas, has demonstrated that duplicating the same text in both visual and auditory formats may inhibit learning (audio-visual redundancy effect). However, it is not yet clear whether partial on-screen textual information (e.g., key words or phrases) presented simultaneously with fully narrated text would generate a similar negative effect or be beneficial for learning when the same full text shown on slides. Accordingly, the reported study examined whether supporting the narrated textual explanations of the related graphics in a visual form as key words or phrases would be more effective as less cognitive load to learning in a realistic setting than the exact visual duplication of the narrated the same full text. University students learned Cognitive Load Theory (CLT) and its instructional designs through audio text and graphics presented using Power Point slides and three different versions of the visual text: 1) the full text equivalent to the narrated explanations; 2) the reduced version of the text that presented phrases expressing major ideas in the text; and 3) key words representing main concepts. The pre-and post- tests and the mental load evaluation were conducted to evaluate levels of learner prior knowledge and post-instruction performance. The results indicated that the auditory explanations of the graphics supported by visual display of main phrases related to the explanations resulted in significantly less burden of working memory (less cognitive load) than exact full visual duplication of presenting with limited number in key words of the text. The study shows that supporting presentation with less words on screen using the audio explanations of graphics with visually presented on-screen phrases and key words expressing main ideas of the text could be the most effective in learning when listeners or learners were less cognitive loaded.