Can Speaking Make Learning Easier? Verbal Rehearsal Effects on Cognitive Load, Learning Efficacy and Performance

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Abstract: In the study reported here, the effectiveness of verbal rehearsal as a learning strategy that could mediate extraneous load effects and increase learning was examined within the research area of Cognitive Load Theory. While the learning outcomes between the groups did not differ significantly, participants who verbally rehearsed the material found learning the new material less challenging and reported lower levels of cognitive load. Results imply verbal rehearsal may be an effective method to enhance learning.

Introduction

Understanding the cognitive processes of working memory capacity can enable us to make better educational decisions in the way instruction is delivered to students. The use of multimedia learning typically used in classrooms has the ability to impede learning by increasing the cognitive load demands on students. This is often due to substandard instructional design such as unnecessary irrelevant information or seductive details. Active learning strategies, on the other hand have been found to mediate extraneous load conditions, but can also risk adding to the load conditions. Well supported assumptions of Cognitive Load Theory (CLT) maintain that presentation approaches which reduce the amount of cognitive load caused by extraneous sources, such as added redundant information, will improve the learning performance of the student (Mayer & Moreno, 1998). In theory, these cognitive load effects are based on our understanding of human cognitive processing systems, primarily that we have a limited working memory capacity (Clark, Nguyen, & Sweller, 2011). Self-efficacy can also play an important role in predicting performance on learning and is considered an important component in learning achievement. Learning strategies that can enhance self-efficacy, could also increase learning. Therefore, in this study, the effect of the inclusion of seductive details and the possible mediating effect of a germane strategy (i.e. verbal rehearsal) on learning performance and perceived interest, confidence and challenge (as per Bandura, 1993) were explored.

The present study

Using a 2 x 2 x 2 repeated measures experimental design (see figure 1.), one hundred participants were randomly allocated to four learning conditions with varying cognitive load requirements (with vs. without seductive details), in a consistent low-load modality (visual + narration only) when learners were engaged in a germane load activity (with active verbal rehearsal vs. without active verbal rehearsal). Verbal rehearsal (Makita et al., 2013) that assists memory encoding, as the added germane load was used to explore the underlying question of whether verbal rehearsal as an instructional strategy would stimulate more elaborate cognitive processing and therefore result in better learning outcomes. Alternatively, the learner unnecessarily processes the additional cognitive load source in the act of verbal rehearsal, resulting in poorer learning.

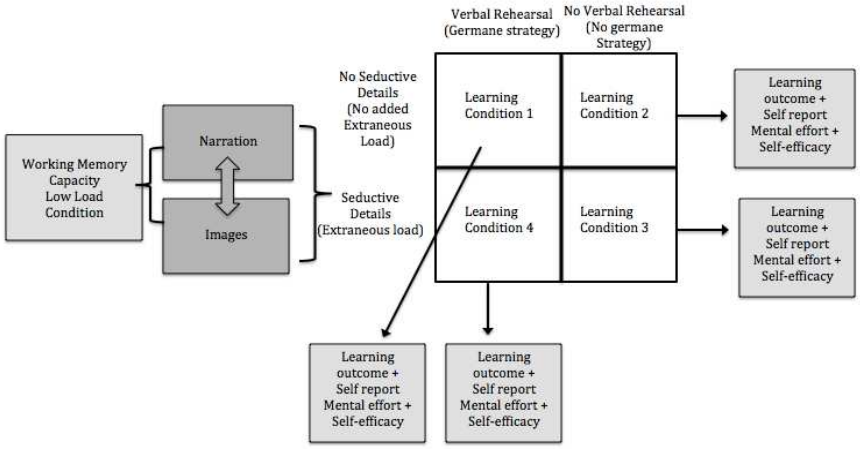

Figure 1. Study design of experimental paradigm.

Discussion and results

While learning performance did not differ significantly across the learning conditions, the difference in pre to post test scores did indicate some effect between the verbal and non-verbal groups. Differences in the pre and post mean scores between the reciting groups and the listening groups, showed a partial eta squared effect size of .04, approaching a medium effect. Results did show however that those who rehearsed, found learning the new material less challenging and reported lower levels of cognitive load (see figure 2.). We also found that ratings of self-perceived learning, were higher for those who had rehearsed the material, indicating the use of verbal rehearsal supported the participants in feeling more positive about their own learning. Combined with lower levels of cognitive load reported by this same group, averages for the rehearsal group (M = 1.73, SD = 1.81) were significantly lower than the non-rehearsal group (M = 3.06, SD = 2.25) with a main effect for rehearsal type yielding an F ratio of F (1, 96) = 10.96, p = .001, partial $\eta 2$ = .10, a possible beneficial interaction with working memory demand constraints was revealed (Hoffman & Schraw, 2009). These low ratings of cognitive load were apparent even though participants were engaged in a germane load activity that could have added to the processing demands of working memory.

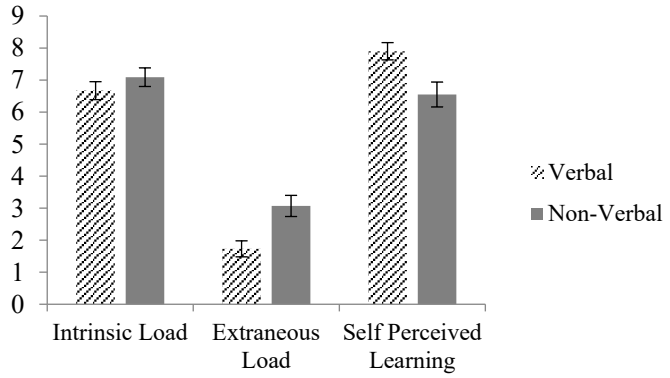

Figure 2. Cognitive load rating means, error bars denote standard error for verbal rehearsal.

Summary and conclusion

Research in educational and cognitive psychology continues to search for better ways to present new material in order to maximize learning and reduce cognitive load. Verbal rehearsal as an instructional strategy may stimulate more elaborate cognitive processing, and assist in successful encoding without overloading working memory capacity. Asking students to verbally rehearse the material they are learning, is a simple and cost-effective way for students to interact with the instruction. When the cognitive load demands are reduced to meet the needs of the student's working memory capabilities, the learning outcomes for individuals engaged in multimedia presentations could be improved. It is unresolved whether this was of any benefit to performance, however the results are promising and warrant further investigation.

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