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Research in Cognitive Science

The transfer potential of learning via variable and constant retrieval practice

Much research in recent years has been devoted to strategies to enhance learning in educational settings. The emerging picture is that the learning process should involve repeated and spaced retrieval attempts, followed by feedback presenting correct answers. Learning via spaced retrieval has been shown not only to support memory for learned materials but also the application of learned information across various contexts.

The success of retrieval-based techniques in enhancing learning does not imply that efforts to improve these methods have ceased. Building on the concept of encoding variability, studies show that variable retrieval – using different cues for retrieval attempts – enhances the effectiveness of retrieval practice to a greater extent than constant retrieval using always the same cues.

Variable retrieval operates on the principle that the alignment between encoded information and retrieval cues is crucial for memory performance. Studies have shown that a closer match between these two factors results in better retrieval from memory. The use of variable cues during retrieval practice, therefore, has two key effects: first, it makes retrieval practice itself more challenging; second, the increased difficulty of retrieval practice with variable cues means that feedback that follows retrieval attempts is encoded more richly – incorporating more details from variable cues into memory representations of the practiced materials – ultimately contributing to enhanced memory performance in the future.

Recently, varied retrieval has been investigated by Butowska-Buczyńska et al. (2024). There, participants were asked to learn translations of foreign vocabulary through five cycles of spaced retrieval practice. In each cycle, foreign words were presented within contextual sentences that served as partial cues to their meaning. In the variable retrieval condition, the sentences varied for each word across cycles, while in the constant retrieval condition, the same sentences were used for each word across all cycles. Consistent with the idea that changing cues enhances memory performance, the study found better learning outcomes in the variable retrieval condition compared to the constant retrieval condition.

Although variable retrieval improves performance on memory tasks, its impact on knowledge transfer – using learned information in non-memory tasks – remains underexplored. Understanding the role of variable retrieval in knowledge transfer is crucial, as it has the potential to enhance not only memory retention but also the ability to apply learned information

in novel contexts. This is particularly important in educational domains, where the ultimate goal is often not just to recall information but to effectively use that information in different contexts.

The project will aim to assess whether variable retrieval enhances semantic access to newly acquired foreign vocabulary more than constant retrieval. We hypothesise that that variable retrieval not only strengthens memory retrieval but also facilitates the transfer of learned vocabulary to new contexts and applications.

References

Butowska-Buczyńska, E., Kliś, P., Zawadzka, K., & Hanczakowski, M. (2024). The role of variable retrieval in effective learning. *Proceedings of the National Academy of Sciences*, *121(44)*, e2413511121. <https://doi.org/10.1073/pnas.2413511121>