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Self-Initiated Learning through Transformation of Representation

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It is quite easy to transfer information from sensory storage to working-memory. We do this with little effort and no concern for the steps for doing so. On the other hand, transferring information from working-memory to long-term memory, relatively permanent and integrated storage, is much more difficult and problematic.

There is general advice offered for this purpose. For example, active learning, deep processing (Craik & Lockhart, 1972), and the use of graphic organizers (Novak & Gowin, 1984) are advocated. Thinking about how we might be more specific with our advice to learners has brought me to the question of how this sort of learning can be self-initiated. Since meaning is needed for long term memory, a specific task that explicated meaning from the material to be learned should be particularly effective in fostering learning.

Hypothesis

The widely held view is that the longer information is kept in working-memory the better chance it has of being transferred to long-term memory. Alternatively, we might focus on what the learner is doing and advise learners to do something with the information in working-memory, such as transforming it into a different representation. If information is transferred from working-memory by some sort of probabilistic process, then learners who hold information in working-memory by a rehearsal process would not be expected to differ from those who performed an transformation of representation on the information because both would be keeping the information in working-memory, one by rehearsal, the second while transforming its representation. On the other hand, if the explication of meaning was essential or central to learning, then the act of transformation would lead to superior learning.

Method

Fifty-seven college students learned relatively new concepts and facts (Air traffic control zones) presented to them in written form. Each studied the information for ten minutes. They were randomly divided into three learning conditions based upon what the Ss were told to do with the information while studying it. In the READ condition Ss were instructed to read the material and prepare to answer questions about it, in the REHEARSAL condition Ss were asked to mentally rehearse the information by keeping it in memory during the study period, and in the TRANSFORMATION condition Ss were instructed to imagine a graphical representation of the information presented. Their retention of this information was tested 40 minutes later by asking them to write a definition or description of the subject in five minutes. Their answers were rated on a scale of 1-10 for correctness and completeness.

Results & Discussion

Table 1 gives the mean scores and standard deviations for retention under each of the conditions.

Table 1: Retention scores across groups.

Condition	Mean (sd)
READ	4.8 (1.27)
REHEARSAL	5.6 (1.80)
TRANSFORMATION	7.1 (1.52)

The REHEARSAL group scored higher than the READ group ($t=2.17$, $p<.05$) and the TRANSFORMATION group scored higher than the REHEARSAL group ($t=3.39$, $p<.05$).

The results suggest that transformation of representation is more effective for learning than rehearsal, which is, in term, more effective than the usual reading-learning strategy students use. This supports the expectation that explication of meaning by transformation of representation facilitates learning. The results also support the conclusion that transformation of representation is a specific intentional act learners can do to foster the transfer of information from working-memory to long-term memory.

References

Craik, F. I. M., & Lockhart, R. S. (1972) Levels of processing: A framework for memory research. *Journal of Verbal Learning and Verbal Behavior*, 11, 671-684.

Novak, J. D. & Gowin, D. B. (1984). Learning how to learn. Cambridge: Cambridge University Press.