

Learning from text: The effect of adjunct questions and alignment on text comprehension

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Background

Tests are rarely seen as learning instruments for improving learning (e.g., Karpicke & Roediger, 2008) and knowledge consolidation. However, the testing effect has shown that tests can positively influence the learning process (e.g., Roediger & Karpicke, 2006). Based on these findings, researchers have recommended that teachers make use of tests in their courses (e.g., Leeming, 2002).

To incorporate tests in education, *adjunct questions* inserted in written prose can be used (Hamaker, 1984). Research on adjunct questions has shown that questions can serve different functions (e.g., Rothkopf & Bisbicos, 1967) and that they can be distinguished by looking at their specific level/form. For example, verbatim questions require the learner to recognize words previously read in a text and comprehension questions require learners to employ higher order processes (Anderson, 1972).

In addition to question function and level/form, *alignment* of cognitive activities during encoding and retrieval is also important (e.g., McDaniel, Friedman, & Bourne, 1978); *transfer appropriate processing* (TAP; (Thomas & McDaniel, 2007)). The underlying idea is that the effectiveness of generative study activities depends on the degree of alignment between processes required by the study activity and processes required at retrieval.

The research reported on here investigated the effect of different types of adjunct questions (factual/comprehension) on learning from text. It also focused on the influence of alignment in the type of questions offered during encoding and retrieval of information from text.

Method

Participants were 106 first-year students (101 females, 5 males; mean age = 18.53 years, $SD = .93$) in Pedagogical Sciences at a large Flemish university. A multiple-choice prior-knowledge test (15 minutes) was administered at least 1 week prior to the experimental session to minimize possible retention effects. One week later, participants were randomly assigned to one of four experimental conditions to investigate the effect of *Question Type* (factual/comprehension) and *Alignment* (aligned/ not aligned) on final test performance by a 2x2 factorial design. Participants had 15 minutes for each phase. Conditions 1 ($n = 29$) and 4 ($n = 22$) were aligned conditions (only factual or comprehension questions respectively in the study and test phase). Conditions 2 ($n = 27$) and 3 ($n = 28$) were non-aligned conditions (factual questions in the study phase and comprehension questions in the test phase (condition 2) or vice versa (condition 3)).

In the *study phase*, participants read the text and answered factual questions (condition 1 and 2) or comprehension questions (condition 3 and 4). The text was used to answer the questions. During the *test phase* participants answered five factual questions (conditions 1 and 3) or five comprehension questions (conditions 2 and 4). During the *restudy phase* all participants reread the text. Between the phases participants worked on a filler task (2 minutes). The 20-item final test consisting of repeated and new factual and comprehension questions was administered one week later (30 minutes).

Results

Results on the final test showed that there was a marginal significant effect of alignment on repeated factual questions. Participants in aligned conditions performed better on repeated factual questions than participants in non-aligned conditions. The type of question answered during the study phase did not significantly influence scores. The type of question answered during the study phase did not significantly influence scores on new factual questions and no differences were found for participants in aligned or non-aligned conditions.

Participants who answered comprehension questions during the study phase, scored significantly better on repeated comprehension questions compared to participants who answered factual questions. Participants who answered comprehension questions in the study and test phase scored significantly higher on repeated comprehension questions than participants in the other conditions. Alignment of questions in the study and test phase on comprehension questions led to higher performance on repeated comprehension questions than no alignment or alignment on factual questions. Scores on new comprehension questions were significantly higher for participants who answered comprehension questions during the study phase than for participants who answered factual questions. Participants in aligned conditions did not score better on new comprehension questions than participants in non-aligned conditions.

Conclusion

Results show that effects are especially found on comprehension questions in the final test. A possible explanation for this result is that offering comprehension questions requires participants to process the text more deeply compared to a situation in which factual questions are offered.

Alignment on comprehension questions has a positive influence on repeated and new comprehension questions. There is only a marginal significant effect of alignment on repeated factual questions. A possible explanation for this finding is that facts can be seen as isolated parts of information in a text. Remembering one part of information does not automatically lead to remembering a new fact from the text.

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