

The influence of text length and prior knowledge on the testing effect in meaningful learning

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Theoretical background: The testing effect



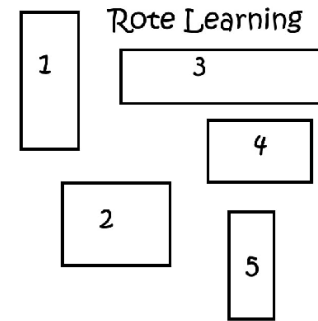
- Testing effect often studied in verbal learning tradition
- Testing effect paradigm:
study phase – initial test/restudy – delayed final test
- Performance on delayed final test boosted most by prior testing
- Tests are powerful learning tools



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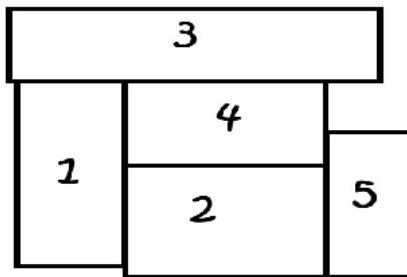


Theoretical background: Rote versus meaningful learning



- Research focused on testing isolated facts (rote learning)
- Limits relevance of findings for educational practice, which focuses on meaningful learning
- Research on testing effect for more educationally relevant ideational units is scarce

Meaningful Learning



Theoretical background: Testing effect in meaningful learning

Karpicke and Blunt (2011)	Kester, Firssova, Gorissen, Wetzels, and Kirschner (2011)
276-word science text on sea otters	850-word texts on important advances in history of science
Study phase – restudy/free recall – delayed final short-answer test	Study phase – restudy/free recall/short-answer test – delayed final short-answer test
Testing effect for verbatim questions (rote learning)	Testing effect for closed questions (rote learning)
Testing effect for inference questions (meaningful learning)	No testing effect for open questions (meaningful learning)



Theoretical background: The influence of text length

- Methodological difference Karpicke and Blunt (2011) and Kester et al. (2011): text length (276 words versus 850 words)
- Text length/number of ideational units may influence testing effect in meaningful learning
- Build semantic network from text that contains important concepts and interrelations
- The longer a text, the more difficult it is to build a semantic network during the study phase



Theoretical background: The influence of prior knowledge

- Prior knowledge plays pivotal role in meaningful learning
- *Desirable difficulties framework* (Bjork, 1994, 1998):
Difficult but successful processing is more beneficial for retention than difficult but unsuccessful processing
- *Retrieval effort hypothesis* (Pyc & Rawson, 2009):
if retrieval is successful, more difficult retrieval is better for retention than less difficult retrieval
- Successfulness and difficulty retrieval attempt is influenced by learners' level of prior knowledge
- Prior knowledge might also influence learners' ability to build semantic network from text



Research question

The occurrence and magnitude of the testing effect in meaningful learning is influenced by (1) text length and more specifically, the number of ideational units, and (2) prior knowledge



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Hypotheses

Hypothesis 1	For <u>novice learners</u> , taking a free-recall test is expected to result in <u>higher performance on the verbatim questions</u> of a delayed short-answer test taken after one week than restudying <u>independent of text length</u>
Hypothesis 2	For <u>novice learners</u> , taking a free-recall test is expected to result in <u>higher performance on the inference questions</u> of a delayed short-answer test taken after one week than restudying <u>for the short text</u>
Hypothesis 3	For <u>novice learners</u> , taking a free-recall test <u>is not expected to have any beneficial effects on performance on inference questions</u> of a delayed short-answer test taken after one week over and above restudying <u>for the long text</u>
Hypothesis 4	For <u>more advanced learners</u> , taking a free-recall test is expected to yield <u>higher performance on both verbatim and inference questions</u> of a delayed short-answer test taken after one week compared to restudying <u>for both the short and the long text</u>
Hypothesis 5	<u>Restudying</u> is expected to yield the <u>highest delayed short-answer test performance after 5 minutes</u> independent of text length or learners' level of prior knowledge

Method:

Participants and materials

Participants

Fourth-year students in secondary education (Study 1a) and students from higher education (Study 1b)

Materials

- Two texts about important advances in history of science; one text is short (300 words) and one text is long (900 words)
- Multiple-choice prior knowledge test
- Initial free-recall test
- Delayed final short-answer test



Method: Design

Design

2 x 2 x 2 mixed factorial design with the factors:

- Text length/number of ideational units (short/low versus long/high)
- Learning strategy (free-recall test versus restudy)
- Retention interval (five minutes versus 1 week)

Dependent variables:

- Performance on verbatim questions short-answer test
- Performance on inference questions short-answer test
- Transfer of retrieval from initial test to delayed final test



Method: Procedure

Procedure

- Prior knowledge test (one week before experimental session)
- Study text 1 (5 or 15 minutes)
- Sudoku puzzle (2 minutes)
- Restudy or free-recall test (10 minutes)
- Sudoku puzzle (2 minutes)
- Study text 2 (5 or 15 minutes)
- Sudoku puzzle (2 minutes)
- Restudy or free-recall test (10 minutes)
- Sudoku puzzle (5 minutes)
- Delayed final short-answer test (after 5 minutes or 1 week)





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