Does testing help learning?
Mindset and testing's impact on memory and accuracy of judgments

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Introduction

When making choices about studying students must decide what study techniques to use and make judgments about the learning those study efforts afforded. Two study techniques are testing (such as flashcards) and re-exposure to the information (such as rereading). Previous research has shown that testing is a more effective study strategy (Kornell & Son, 2009). Testing may also provide students a better sense of how well they know the material. Despite this, students often choose the less effective strategies (Kirk-Johnson et al., 2019).

Kornell and Son (2009) performed a study where they exposed individuals to vocabulary words in another language and then either tested them on the words or showed them the word pairs again. For the groups that were tested, some received feedback and others did not. The researchers found that when participants were tested they later remembered more of the words than if they were simply re-exposed to the word pairs. Whether they received feedback during initial testing or not had no impact on memory. The present study was a partial replication of this study and similar results were expected.

While studying, learners need to judge how well they know the information and what they may need to do to learn (Bjork et al., 2013). Judgments of learning may or may not be accurate. Kornell and Son (2009) found higher judgments of learning when participants were simply exposed to the word pairs a second time rather than when tested on the pairs. Participants in the present study were expected to have higher judgments of learning when they were re-exposed to the word pairs, as opposed to when they were tested on the pairs.

One factor that may influence how well strategies work is mindset. Entity theorists tend to view their abilities as fixed and unchangeable while incremental theorists believe their abilities can change and their intelligence can grow (De Castella & Byrne, 2015) . In past research individuals with a more malleable mindset (incremental theorists) tended to believe in the benefits of self-testing (Yan et al., 2014) . By paying more attention to their own abilities, those with a malleable mindset may better judge their learning in a memory task.

Hypotheses

1) Memory will be better for items studied in the test condition than in the re-exposure condition, regardless of feedback.
2) Judgment of learning will be higher for items studied in the re-exposure condition than items in the test condition, regardless of feedback.
3) The accuracy gap (the gap between judgment of learning and actual memory) will be larger for those with a fixed mindset than for those with a malleable mindset.

Method

Participants
142 students were part of the study, with 125 providing complete data on the judgments of learning and the memory task.
- 63% female, 27% male
- Mean age 19.7, SD = 2.11
- 41.5% first year students, 28.2% sophomores, 18.1% juniors, 8.7% seniors

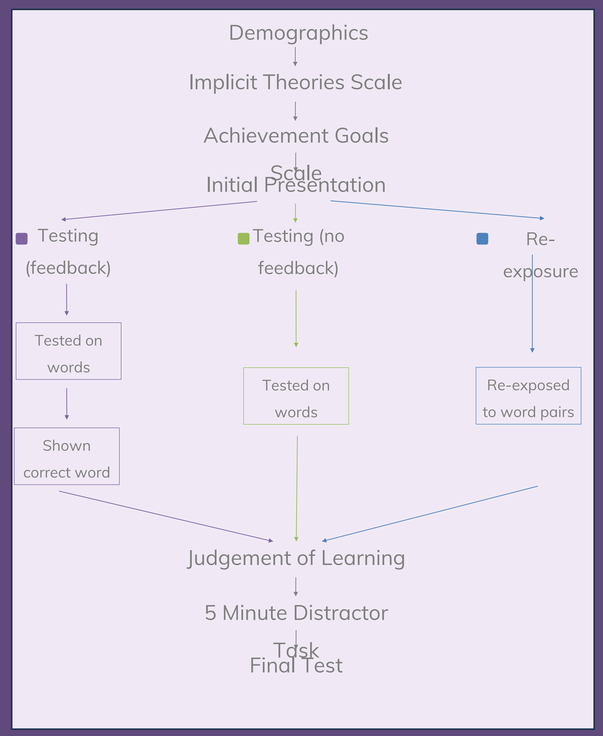
Materials
The Implicit Theories Scale (DeCastella & Byrne, 2015) is a 16-item scale assessing mindset for both oneself and for others. Higher scores indicate a greater entity (fixed) mindset.

A scale assessing achievement goals was also used for this study but is not covered on this poster because of space limitations.

The memory task was based on Indonesian vocabulary lists from Kornell and Son (2009). Each list contained 12 words, with 4 easy, 4 moderate, and 4 difficult words per list.

Judgment of learning (JOL) was assessed with a question asking how many items out of 12 they would remember when tested.

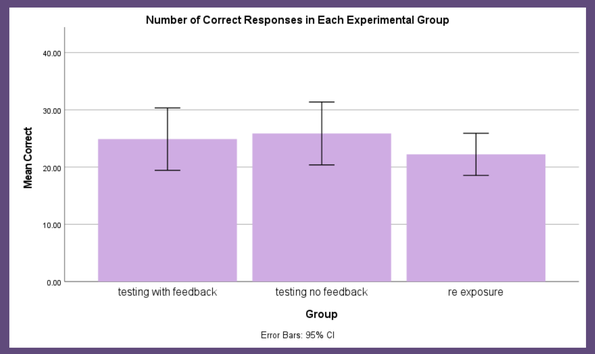
The final test asked participants to type in the Indonesian word when given the English word.



Results

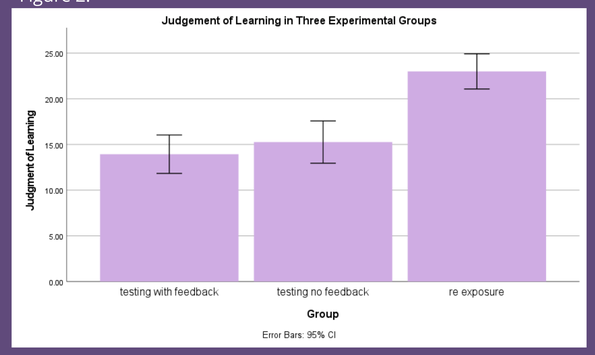
Hypothesis 1
Memory will be better for items studied in the test condition than in the re-exposure condition, regardless of feedback.
As seen in Figure 1, the number of words participants remembered was similar in all of the conditions F(2,139) = 0.73, p > .05.

Figure 1.



Hypothesis 2
Judgment of learning will be higher for items studied in the re-exposure condition than items in the test condition, regardless of feedback.
As seen in Figure 2, the judgment of learning was higher in the re-exposure condition than in the two testing conditions, F(2,127) = 23.32, p < .001 . A post-hoc test, Tukey's HSD, indicated a significant difference between each testing condition and the re-exposure condition.

Figure 2.



Hypothesis 3
The accuracy gap (the gap between judgment of learning and actual memory) will be larger for those with a fixed mindset than for those with a malleable mindset.
Accuracy was significantly correlated with mindset. Those with a malleable mindset concerning their own abilities tended to be more accurate in their judgment of learning, r(125) = .26.

Conclusion

Contrary to expectations based on Kornell and Son's (2009) study, no difference was found between the testing groups and the re-exposure group in memory of the words. This finding is quite surprising given that this part of the study was a direct replication of the original study, even using the same lists of words. Lack of power was not the issue as our sample size was much bigger than Kornell and Son's 35 participants. Additional replications may help sort out the discrepancy in the findings.

As hypothesized, the re-exposure group made higher judgments of learning than the two groups that were tested. The testing groups predicted they would be able to recall fewer words. These groups were more accurate in their judgments. This finding suggests that integrating testing into one's studying creates a better judgment of actual learning and could lead to better study decisions.

In this study a larger gap between judgment of learning and actual memory was correlated with a fixed mindset, as was hypothesized. Individuals with a malleable mindset may be more willing to use additional study opportunities to reflect on what they know and don't know, allowing them to be more accurate in their judgments of learning.

Additional studies using this methodology would be helpful to sort out why the present study failed to replicate Kornell and Son's study. An additional study investigating mindset and judgment of learning is also warranted. Asking participants with a malleable mindset how they made their judgments of learning may help other students to better judge their knowledge of information and, therefore, make better decisions in their studying.

References

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