

Test-Enhanced Learning in the Classroom: The Columbia Middle School Project



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BACKGROUND

Tests are usually thought to serve assessment purposes, but they can also benefit long-term learning better than repeated studying¹

Multiple tests are better than single tests in enhancing learning¹

Feedback provided after testing also enhances learning²

Prior laboratory research supports these principles, yet none have been thoroughly tested in a classroom setting using a true experimental design

We examined whether a test-enhanced learning program, integrated with daily classroom practices, is effective in a middle school setting

METHOD

Subjects: 122 sixth grade students at a public middle school in Illinois

Materials

Four Social Studies chapters: Ancient Egypt, Mesopotamia, India, and China, with approximately 24-32 target facts per chapter

Quizzes were comprised of multiple-choice test questions followed by immediate feedback

Within-subjects design: Half of the target facts were quizzed during lessons, half were not tested (but non-tested items were covered during the class lecture by the teacher)

Procedure

Students took a multiple-choice pre-test over tested items

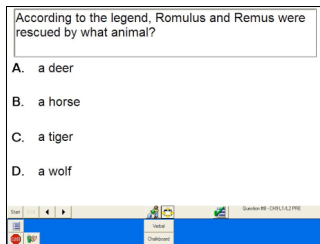
The teacher was not present for the pre-test and did not know which target facts were tested

Following the pre-test, the teacher taught the lesson for the day

Immediately after the lesson, students took a multiple-choice post-test over tested items

Approx. 2 days later, students took a review test over tested items

Retention was measured 2-14 days later with multiple-choice and free recall chapter exams comprised of all (tested and non-tested) target facts



EXPERIMENT 1

Compared performance on tested vs. non-tested items

All reported differences are significant, $p < .01$

	Tested items	Non-Tested Items
Multiple-Choice Chapter Exam	.91	.80
Free Recall Chapter Exam	.31	.21
Delayed Cumulative Multiple-Choice Exam	.77	.67

Further analyses show that students with lower standardized test (Iowa Test of Basic Skills) scores showed a larger testing effect ($r = -.38$)

EXPERIMENT 2

Three Social Studies chapters: Ancient Rome, Africa, and the Middle Ages

Added a third condition where some target facts were read (instead of tested)

Compared performance on tested vs. read vs. non-tested items

	Tested Items	Read Items	Non-Tested Items
Multiple-Choice Chapter Exam	.89	.83	.76
Free Recall Chapter Exam	.26	.24	.19
Delayed Cumulative Multiple-Choice Exam	.60	.54	.55

Again, the size of the testing effect was negatively correlated with students' standardized test performance ($r = -.30$)

SUMMARY

Testing enhanced later retention in a middle school Social Studies classroom

This benefit occurred relative to re-reading the material

Testing effects persisted over a delay

Students with lower pre-test and standardized test scores benefited more from testing than students with higher pre-test and standardized test scores

CONCLUSIONS

A test-enhanced learning program can be successfully implemented in a classroom setting

Students who score lower on pre-tests and standardized tests reap the greatest benefit from testing

Results are consistent with the notion of desirable difficulty³: more effortful learning conditions (e.g., testing) produce larger long-term benefits than less effortful learning conditions (e.g., re-reading)

Educational implications: When facilitating long-term learning, educators and students should be encouraged to use quizzes as a method to enhance learning⁴

References

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