Test-Enhanced Learning: Transfer of Knowledge in Middle School Classrooms

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BACKGROUND

Tests are usually thought to serve assessment purposes, but they can also benefit long-term learning better than repeated studying.1 Of great importance to educators is enhancing students’ ability to transfer knowledge to novel situations.2 There has been some evidence of transfer across different levels of Bloom’s Taxonomy of Learning,3 but this has not yet been demonstrated systematically in a classroom setting.

METHOD

This research was conducted at a public middle school in Illinois with textbook material from 8th grade Science classrooms (Ecology & Environmental Units).

3 (Initial Quiz Format: Application, Definition, Not Tested) X 2 (Unit/Semester Exam Format: Application, Definition) within-subjects design.

All items were covered during the teacher’s lecture.

Initial Quizzes

Initial quizzes were presented three times: before the lesson, after the lesson, and the day before the final unit test. Items on the initial quizzes were always presented in the same format across the three presentations and students received immediate feedback on all items.

Definition Q: What is the struggle between organisms to survive in a habitat with limited resources?

A Parasitism
B Competition
C Limited Factors
D Predation

Application Q: Both foxes and raccoons on Long Island eat pheasant, which in recent years, has been in decline. The foxes and raccoons’ situation is an example of what ecological process?

A Parasitism
B Competition
C Limited Factors
D Predation

Unit and Semester Exams

Retention and transfer were measured at the end of the unit and at the end of the semester with multiple-choice exams comprised of all items (tested and not tested).

Definition Q: A group of 500 pandas are living in a reserve. Recent dry weather has reduced the bamboo populations, which the pandas rely on. The pandas are in what type of relationship?

A Predation
B Limiting Factors
C Parasitism
D Competition

Application Q: What is the struggle between organisms vie for limited environmental resources?

A Predation
B Limiting Factors
C Parasitism
D Competition

UNIT EXAM RESULTS

Students received an exam at the end of the unit (24-hour delay) to measure retention and transfer of concepts.

(N = 73, 5 items/condition)

Initial Quiz Format

Application Definition Not Tested

Congruent conditions led to higher performance than incongruent conditions (interaction significant, p < .05).

A significant testing effect for the incongruent application-definition condition demonstrates transfer of knowledge from initial application quizzes to the unit definition exam.

SEMESTER EXAM RESULTS

Students received an exam at the end of the semester (4-month delay) to measure long-term retention and transfer of concepts.

(N = 70, 3 items/condition)

Initial Quiz Format

Application Definition Not Tested

After a delay, only the congruent application-application condition produced a significant testing effect (p < .05).

CONCLUSIONS

A test-enhanced learning program, and a complex experimental design examining transfer, can be successfully implemented in a classroom setting.

A consistent testing effect was obtained: students better remembered information that was previously tested using classroom quizzes, in comparison to information that was not tested.

On the unit exam, a pattern consistent with the transfer appropriate processing framework emerged.4 Congruent initial quiz and unit exam formats yielded the highest performance.

Initial application quizzes resulted in significant testing effects on application and definition unit exams, as well as a significant testing effect on the application semester exam.

Educational implications: When facilitating long-term learning, educators and students should be encouraged to use application initial quizzes with feedback as a method to enhance immediate transfer and long-term retention of concepts.

References


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