Science & engineering goals: Learning about the control-of-variable strategy from picture books

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Background

Control-of-Variable Strategy (CVS) is an experimental approach in which a single variable is isolated.[1]

Children younger than 7 fail to conduct controlled tests even when provided with direct instruction.[2,3]

We examined whether children's CVS can be scaffolded with picture books[4,5] focused on either a science (process focused) or engineering (outcome focused) approach.[6]

Research Questions

1. Can picture books facilitate children's use of CVS?
2. Do children learn CVS similarly from picture books with a science and engineering approach?

Methods

Participants: 93 6- to 8-year-olds (*M* = 7.46, *SD* = 0.83)

Procedure:

Two Picture Book Conditions

Pre-test
CVS Task
(2 trials)

Science
"So if I wanted to figure out if the height of my ramp makes my cars go farther, then height is a variable?" said Charlie.

Engineering
"So if I wanted to figure out the height that I want to build my ramp, I have to measure it?" said Charlie.

Post-test
CVS Task
(2 trials)

Transfer
CVS Task
(2 trials with new variables)

CVS Task

Pre- and Post-test Question: "Can you show me how you would find out if the *surface/height of the ramp* affects how a ball goes down the ramp?"

Transfer Question: "Can you show me how you would find out if the *size of the ball/the starting position of the ball* affects how a ball goes down the ramp?"

Results

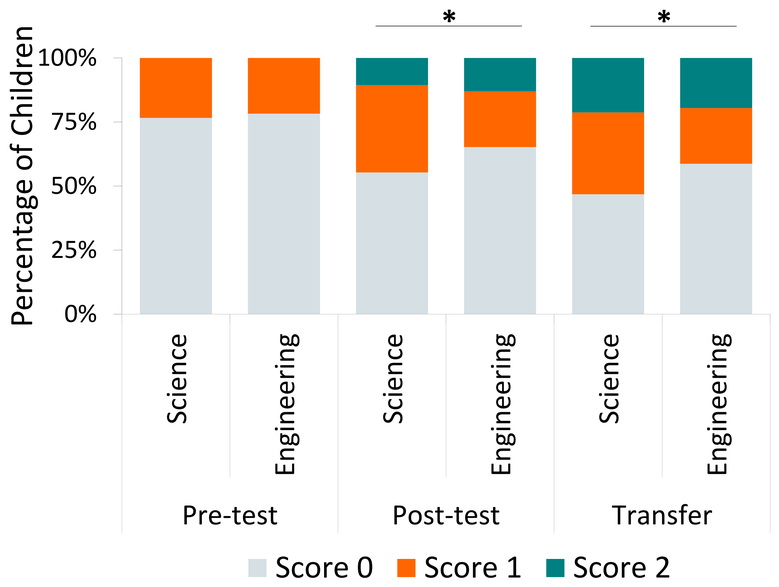
Coding CVS Task

- Each trial – coded 1 (CVS) or 0 (all other set-ups).
- Each test phase – scores ranged from 0 to 2.

Generalized Estimated Equations

- There was a main effect of age. Six-year-olds used significantly fewer CVS than 7- ($p < .001$) and 8-year-olds ($p < .001$). There were no difference between 7- and 8-year-olds.
- There was a main effect of test phase. Compared to pre-test, children in both conditions used more CVS at post-test ($p = .008$) and transfer ($p = .002$).
- There was no main effect or interaction for condition.

Percentage of children a function of test phase and condition



Conclusions

Children as young as 6-years-old improved their CVS ability with both familiar and novel variables when they learned about ramps.

Both the science and engineering picture books facilitated CVS equally.

Future work will examine children's explicit understanding of CVS, and will extend the research to other scientific domains.

References

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