



The Effects of Self-Focused Feedback on Students' Mathematics Problem Solving

Nicholas A. Vest & Emily R. Fyfe

Department of Psychological and Brain Sciences, Indiana University



Focus

1. What are the effects of self-focused feedback on students' problem solving in mathematics?
2. Does the evaluative context in which feedback is presented influence learning?

Background

The effects of feedback vary and are not universally beneficial (Mory, 2004). In fact, feedback can hinder learning relative to no feedback (Fyfe & Brown, 2018).

One theory suggests feedback is more likely to have negative effects when it draws attention to one's self and abilities rather than to the task (Kluger & DeNisi, 1996).

Thus, we hypothesize that feedback may be less effective when provided in an evaluative context.

Method

PARTICIPANTS

Experiment 1: 114 undergraduate students enrolled in an introductory psychology course at Indiana University-Bloomington (M age = 20.2; range = 18.0-24.3; 34% female).

Experiment 2: 177 undergraduate students (M age = 20.1 years; range = 18.0-27.1; 34% female).

DESIGN AND PROCEDURE

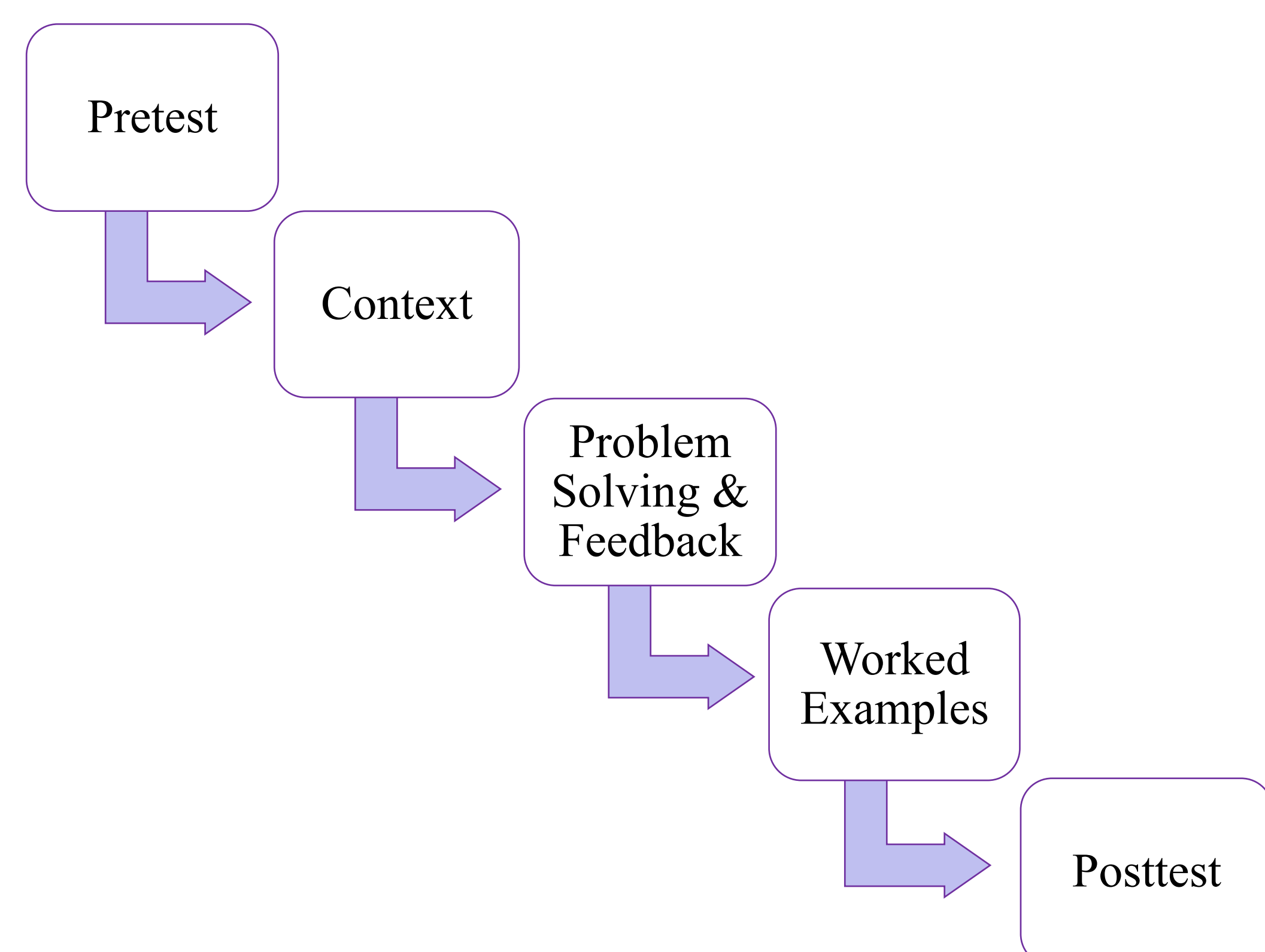
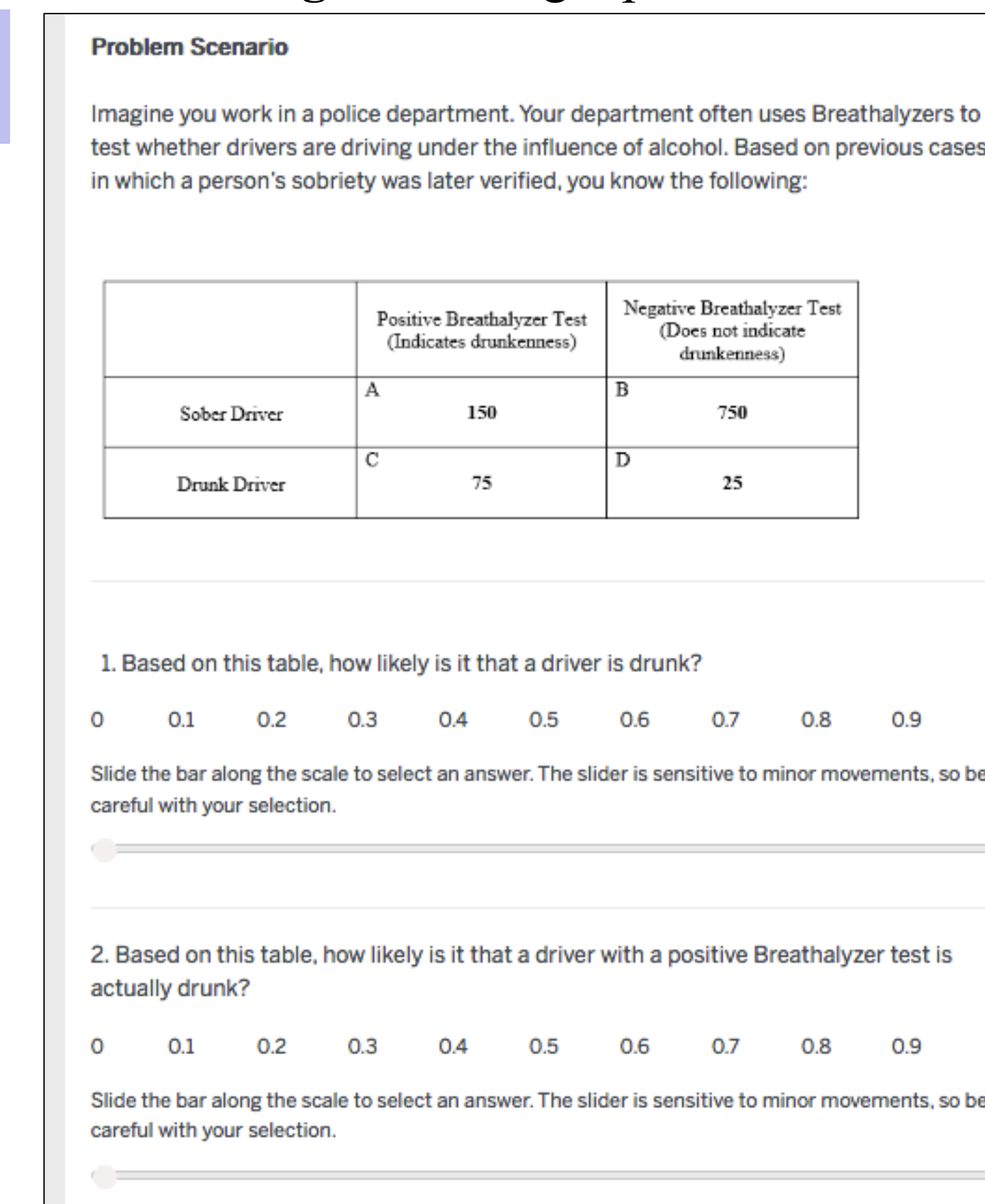


Table 1. Condition differences.

	Context	Task	Feedback
Experiment 1	Non-evaluative	Now you're going to solve a set of problems that are very similar to the problems you just solved...	The response provided is incorrect. The correct response is 0.9.
Experiment 2	Evaluative	The purpose of this study is to evaluate your ability to solve these kinds of math problems correctly...	You made a mistake and your response is incorrect. You should have responded with 0.9.
		Experiments 1 & 2	None
			The response has been recorded. Proceed next.

Figure 1. Target problem.



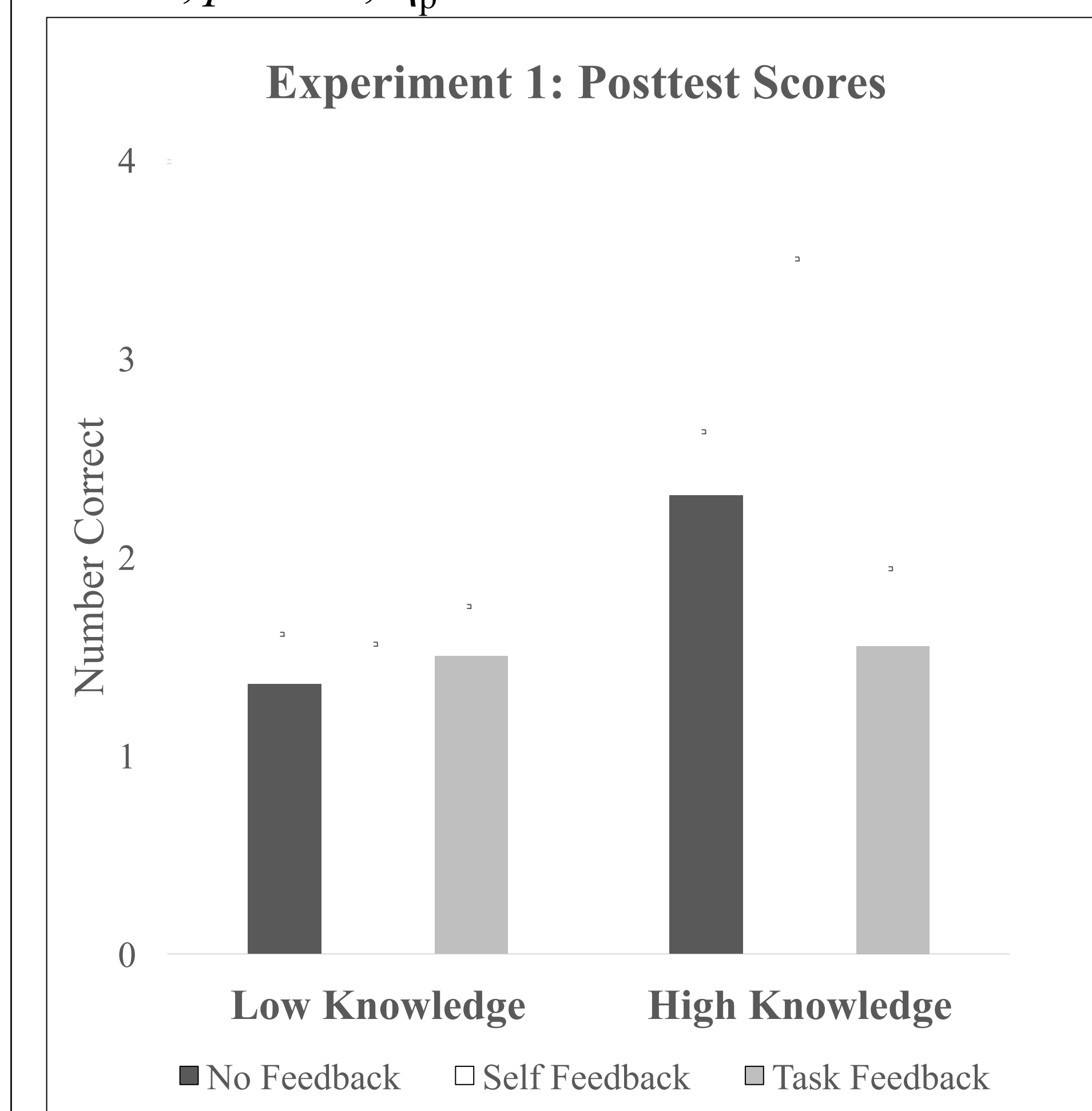
Experiment 1 Non-evaluative

Pretest

Low-knowledge group (n = 74)
High-knowledge group (n = 40)

Posttest

Feedback by prior knowledge interaction, $F(2, 108) = 3.81, p = .03, \eta_p^2 = .07$. Main effect of feedback for high-knowledge group, $F(2, 108) = 5.40, p = .01, \eta_p^2 = .09$.



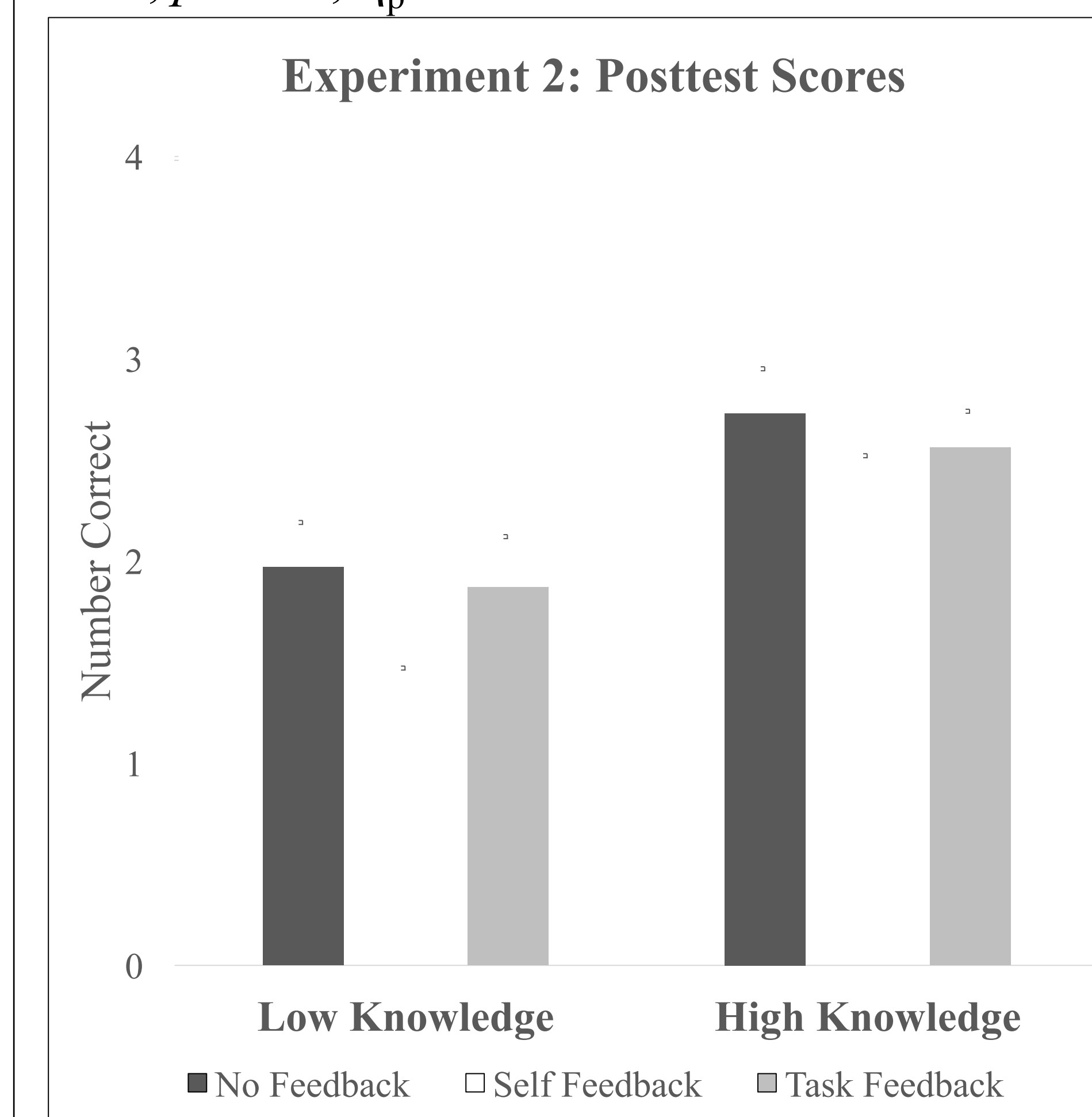
Experiment 2 Evaluative

Pretest

Low-knowledge group (n = 79)
High-knowledge group (n = 98)

Posttest

No feedback by prior knowledge interaction, $F(2, 171) = 0.31, p = .74, \eta_p^2 = .00$. Main effect of feedback across pretest groups, $F(2, 171) = 3.32, p = .04, \eta_p^2 = .04$.



Conclusions

Self-focused feedback provided during an online math lesson can have both positive and negative effects.

When students solved probability problems in a non-evaluative context, self-focused feedback had beneficial effects on posttest performance compared to both task-focused feedback and no feedback, at least for students with sufficient prior knowledge.

When students solved probability problems in an evaluative context, self-focused feedback had hindering effects on posttest performance.

Implications

We need to consider the learner's cognitive interpretations of the feedback message (e.g., Butler & Winne, 1995; Hattie & Timperley 2007).

Students may learn less when they complete a mathematical task with feedback than without feedback.

Self-focused feedback may be effective in exploratory, non-evaluative learning environments. In contrast, self-focused feedback may be ineffective when it is provided in an evaluative learning environment in which learners know their performance will be assessed or graded.

References & Contact

Butler, D. L., & Winne, P. H. (1995). Feedback and self-regulated learning: A theoretical synthesis. *Review of Educational Research, 65*, 245-281.

Fyfe, E. R., & Brown, S. A. (2018). Feedback influences children's reasoning about math equivalence: A meta-analytic review. *Thinking & Reasoning, 24*(2), 157-178.

Hattie, J., & Timperley, H. (2007). The power of feedback. *Review of Educational Research, 77*, 81-112.

Kluger, A. N., & DeNisi, A. (1996). Effects of feedback intervention on performance: A historical review, a meta-analysis, and a preliminary feedback intervention theory. *Psychological Bulletin, 119*, 254-284.

Mory, E. H. (2004). Feedback research revisited. In D. Jonassen (Ed.), *Handbook of research on educational communications and technology: A project for the Association for Educational Communications and Technology* (2nd. pp. 745-783). Mahwah, NJ: Lawrence Erlbaum Associates.

For more information, email nvest@indiana.edu.