



Leave Her out of It: Person-Presentation of Strategies Is Harmful for Transfer

Anne E. Riggs,^a Martha W. Alibali,^a Charles W. Kalish^b

^a*Department of Psychology, University of Wisconsin-Madison*

^b*Department of Educational Psychology, University of Wisconsin-Madison*

Received 16 June 2014; received in revised form 27 October 2014; accepted 29 October 2014

Abstract

A common practice in textbooks is to introduce concepts or strategies in association with specific people. This practice aligns with research suggesting that using “real-world” contexts in textbooks increases students’ motivation and engagement. However, other research suggests this practice may interfere with transfer by distracting students or leading them to tie new knowledge too closely to the original learning context. The current study investigates the effects on learning and transfer of connecting mathematics strategies to specific people. A total of 180 college students were presented with an example of a problem-solving strategy that was either linked with a specific person (e.g., “Juan’s strategy”) or presented without a person. Students who saw the example without a person were more likely to correctly transfer the novel strategy to new problems than students who saw the example presented with a person. These findings are the first evidence that using people to present new strategies is harmful for learning and transfer.

Keywords: Transfer; Problem solving; Abstraction; Mathematics instruction

1. Introduction

A common practice in textbooks is to introduce general principles using specific people. For example, the Universal Law of Gravitation is often presented by describing an apple falling on Issac Newton. Students may be accustomed to this practice and recognize that the information extends beyond the particular person. Alternatively, associating a principle with a particular individual may suggest, perhaps implicitly, that the principle is specific to the person involved. This issue could be especially problematic in mathematics textbooks, in which strategies are often introduced as “belonging” to a student (e.g.,

“Jane’s strategy”). Of course, these strategies are not specific to the person presenting them; they are general strategies that the student is meant to learn. If students perceive that these strategies are idiosyncratic to the person presenting them, they may be less likely to learn and transfer these strategies to new problems. Alternatively, connecting strategies to people may increase the likelihood that students perceive these strategies as personally relevant, which could promote learning and transfer. The present research investigates whether the practice of using specific individuals to present strategies (henceforth, person-presentation) affects learning and transfer of those strategies.

1.1. Background

Mathematics textbooks utilize several different approaches to present new strategies: Strategies can be named (e.g., “the invert and multiply strategy”), they can be presented abstractly, or they can be described as implemented by a particular individual. To date, no research has investigated the benefits and costs of presenting a strategy as specific to an individual. This practice, however, is common in curricular materials. In an analysis of middle school mathematics textbooks, we found that person-presentation occurred in seven of the nine textbooks sampled. In those seven textbooks, person-presentation occurred at least once in an average of 72% of all units or chapters (range = 50%–100%; see Appendix). Despite the frequency of person-presentation in curricular materials, there is no evidence regarding its effects on student learning and transfer. However, there is some relevant debate over whether or not textbooks should present material in “real-world” contexts. The practice of person-presentation may function in similar ways to using real-world contexts.

Research illustrating the benefits of using real-world contexts in textbooks has found that this practice increases student engagement (Alexander & Jetton, 1996), highlights the personal relevance of concepts to students (Walkington, 2013), and decreases mathematics anxiety (Martinez, 1987). These benefits may also apply to person-presentation of strategies—a student may be more interested in a strategy that another person uses and more likely to perceive that strategy as relevant to them. Additionally, when strategies are associated with a person, textbooks often include pictures or background detail about that person, which may capture students’ attention and facilitate encoding and recall of the strategies (Durik & Harackiewicz, 2007; Hidi, 1990; Sadoski, Goetz, & Fritz, 1993). These increases in cognitive engagement may foster learning by helping students make sense of new information (i.e., generative processing; Mayer, 2008, 2014). Thus, person-presentation of strategies may benefit learning and transfer through both motivational and cognitive processes.

Alternatively, using real-world contexts may negatively affect learning by interfering with students’ processing of new strategies or concepts (the “seductive details effect”; Mayer, 2009; Sanchez & Wiley, 2006). The pictures and details included to create a real-world context may increase initial engagement, but ultimately detract attention from the concepts themselves (Harp & Mayer, 1998; Sung & Mayer, 2012). If students’ attention is focused on the person presenting the strategy, they may devote inadequate attention to the strategy itself, which may reduce learning or transfer of the strategy.

Other work has suggested that concrete examples may hinder transfer by tying students' knowledge too closely to the original learning context. Kaminski, Sloutsky, and Heckler (2008) found that presenting concepts with concrete examples leads to worse transfer than presenting concepts generically. Along similar lines, when people learn principles in a specific context (e.g., learning principles of Signal Detection Theory in the context of a doctor diagnosing patients), they often have difficulty applying those principles in a new context (e.g., in the context of a farmer determining the sweetness of melons; Son & Goldstone, 2009). When concrete examples are used, students may rely too heavily on their knowledge of the particular context to solve problems, rather than conceiving the problems in more general terms. However, it is important to note that this work manipulated the content of the problem itself, rather than person-presentation of the problem. Along similar lines, a strategy presented with a person may be understood within a specific problem context, which suggests potential costs for transfer.

A related possibility is that presenting strategies as particular to a specific person may lead students to interpret the strategy as idiosyncratic to that person. For example, learning that an apple fell on Newton's head in 1666 does not obviously generalize to other people, objects, or times. Research in the history of science argues that specific observations become general principles through a process of "modality deletion." A novel finding is initially referred to with respect to an author and date of publication: for example, "Newton (1687) argues that gravitational attraction decreases with the square of distance." As the result is shown to be general, the modalities of time and date are dropped, resulting in "the inverse square law" (Fuchs, 1992; Latour & Woolgar, 1986).

If students associate a strategy with a particular person, they may be less likely to transfer that strategy to problems in which the person is not present. Transferable knowledge, by definition, is not tied to a particular person or a particular context (Klahr & Chen, 2011). Prior research has demonstrated that children exhibit poor memory and transfer for general facts that are labeled as specific to a person because they restrict those facts to that person (Cimpian & Erickson, 2012; Riggs, Kalish, & Alibali, 2014). Instead, children and adults remember the specific details of that person or stimulus (Archambault, O'Donnell, & Schyns, 1999), which may block their memory for the facts themselves (Sabbagh & Shafman, 2009). Additional background detail or pictures of the person presenting the strategy may further indicate that the strategy is specific to the person, rather than a general strategy. The more students know about the person presenting the strategy—that is, the more "modalities"—the less likely they may be to construe the strategy as broadly applicable.

1.2. Present research

The present research examines whether using a person to present a strategy affects transfer of that strategy to new problems. Previous research has not manipulated person-presentation specifically, but rather has focused on aspects of the problems themselves. Thus, it is currently unknown whether linking strategies with particular people would be beneficial or detrimental. One hypothesis is that person-presentation of a strategy could benefit transfer, potentially by increasing engagement and relevance to the student. Alternatively, person-

presentation could harm transfer, either by distracting students from the strategy or leading students to tie strategies so closely to the people presenting them that they have difficulty transferring those strategies to contexts in which the people are absent.

To test these hypotheses, we presented students with algebra problems about constant change (adapted from Alibali, Bassok, Solomon, Syc, & Goldin-Meadow, 1999), which are problems describing scenarios in which some quantity changes at a constant rate over an interval. Students are given the initial and final quantities and asked to determine the total quantity over the entire interval. Constant change problems lend themselves to (at least) two distinct problem-solving strategies. People often solve constant change problems using an *additive* strategy. We taught them a *multiplicative* strategy, which is far more efficient, but much less commonly used. We manipulated the presentation of the multiplicative strategy by either introducing it as specific to a particular person (with varied levels of personalized details) or introducing it more abstractly, either with the strategy labeled (“the continuous strategy”) or unlabeled. Participants then completed five transfer problems, in which we examined their use of the target strategy.

2. Methods

2.1. Participants

One hundred and eighty undergraduate students (82 males) in an Introductory Psychology class at the University of Wisconsin-Madison served as participants. They received extra credit in exchange for their participation.

2.2. Design

Students were randomly assigned to one of six conditions, in which we manipulated the presentation of the strategy (Table 1).

One group of four conditions involved *person-presentation* of the strategy. All four included the person’s name (Juan). Two other variables were tested in a 2×2 design: inclusion of a picture of the person (yes or no) and inclusion of background information about the person (yes or no). Thus, one of the conditions included name, picture, and

Table 1
Experimental conditions

Condition Group	Condition
Person-presentation	Person with name, picture, and background information
Person-presentation	Person with name and picture
Person-presentation	Person with name and background information
Person-presentation	Person with name
Non-person-presentation	Labeled “the continuous strategy”
Non-person-presentation	Strategy not labeled



Juan has been working at a cheese factory in Hilmar, California for 15 years. His job is to fill the cheese vats with milk. He has to be able to figure out how many total gallons of milk have been pumped into a vat. Over a period of 12 minutes, the rate at which milk is pumped into the vat increases steadily over the interval, from 7 gallons per minute to 128 gallons per minute. Juan has to know how many gallons of milk he pumped in total over the 12 minute interval. Here's Juan's strategy:

Steps:

1. Find the average rate. To do this, add the initial rate (rate at minute 1) to the final rate (rate at minute 12) and divide by 2.
2. Multiply the answer from step 1 by the number of minutes.

$$\frac{7 + 128}{2} \times 12 = \mathbf{810} \text{ gallons of milk}$$

Fig. 1. Person-presentation example including name, picture, and background information.

background information (see Fig. 1), one included name and picture only, one included name and background information only, and one included name only.

A second group of two conditions did not involve person-presentation. In one of these conditions, the example was presented with a label (the "continuous strategy") and in the other it was not labeled.

2.3. Materials

Students received a packet of seven word problems about constant change, based on those used in Bassok and Olseth (1995) and Alibali et al. (1999). Students first completed

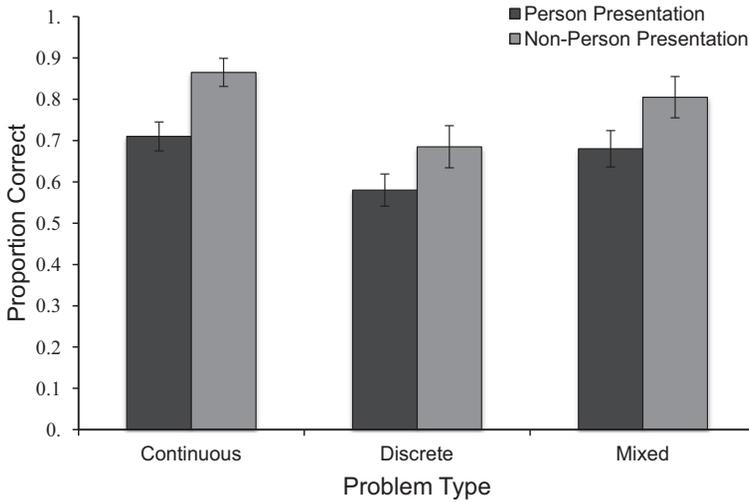


Fig. 2. Proportion of correct uses of multiplicative strategy across conditions and problem types. *Note.* Error bars represent standard errors of the mean.

two problems that served as a pretest. These problems were worded to cue a discrete representation of change in several ways: They presented the change as occurring over a series of steps, included explicit reference to a constant, used amount-like units (e.g., books on a shelf) for both the initial and final amounts, and mentioned individual units of time or space (e.g., bookshelves; see Table 2).

Following these pretest problems, students read a lesson, which consisted of an example of a multiplicative strategy (see Alibali et al., 1999), embedded in a story problem about measuring milk in a cheese vat. As described above, there were six different ways in which the example was presented, four of which involved person-presentation and two of which did not (see Table 1). The example was worded to cue a continuous representa-

Table 2
Sample problems

Discrete wording

In a library, there is a bookshelf with six shelves. The number of books on each successive shelf from top to bottom increases by a constant from the number of books on the shelf above it. There are 10 books on the first shelf and 40 books on the sixth shelf. How many books are there in total on the six shelves?

Continuous wording

A sapling grows for a period of 8 weeks. The rate at which it grows increases steadily over the interval, from 4 mm per week to 60 mm per week. How many millimeters does the sapling grow in total over the 8-week interval?

Mixed wording

A farmer harvests potatoes over a period of 8 days. The rate at which he gathers bushels of potatoes increases steadily over the 8-day harvest. On the first day he gathers nine bushels, and on the eighth day, he gathers 65 bushels. How many bushels does he gather in total over the 8 days?

tion of change in several ways, including explicit reference to a rate, use of rate-like units for the initial and final amounts (e.g., 4 mm per week), and mention of the entire interval of time or space (see Table 2).

After the example, students solved a five-item transfer test. The first two items on the transfer test were designed to test *near transfer* of the multiplicative strategy, that is, transfer to highly similar problems. These problems were expected to support students' analogical transfer of the multiplicative strategy and to increase the likelihood that they would use this strategy on later problems. The first was a problem with the same surface features as the example (i.e., milk in a vat), but different numbers. Like the example, this problem was worded to cue a continuous representation of change. The second item also involved continuous (rather than stepwise) change and was worded to cue a continuous representation, but it involved novel surface features.

Following these near-transfer problems, students completed three *far-transfer* problems, all of which involved change that was stepwise rather than continuous (see Table 2). Two of these far-transfer problems contained discrete wording (referred to as *discrete* problems), and one contained a mixture of continuous and discrete wording (see Table 2) (referred to as the *mixed* problem). The far-transfer problems were presented in one of two orders, with the mixed problem appearing either before the two discrete problems or after them. The order of the far-transfer problems did not affect performance, so it will not be discussed further.

2.4. Procedure

Students were tested in a classroom in groups of 5–10 people. They were given 30 minutes to complete the entire study, and they were not allowed to use calculators. Prior to receiving the packets, students were told to work through the problems in the order presented, to read the example on the third page, and to not return to any previous page while working through the problems. They were also asked to show their work and to circle their final answers. Students who were observed looking back to the example were discarded from the final sample ($n = 10$). At the end of the testing session, students were given a debriefing form that explained the purpose of the study and the manipulation.

2.5. Coding

Each problem was coded according to which solution strategy (additive, multiplicative, or other) the student implemented and whether or not the student generated a correct or incorrect answer (via any strategy). For the five transfer items, we also coded whether or not students correctly applied the multiplicative strategy, which involved correctly setting up the problem, and obtaining the correct answer via that strategy. Criteria for coding additive and multiplicative strategies are presented in Table 3. Strategies that were coded as “other” were typically conceptually flawed (e.g., subtracting the initial from the final amount to find the average, or multiplying the initial value by the number of intervals).

Table 3
Coding criteria for additive and multiplicative strategies

Strategy Type	Procedure
Additive strategy	Participant finds the constant increase, calculates the value for each interval, and adds those values together
Multiplicative strategy	Participant finds average rate by averaging the initial and final rate, and then multiplies by the number of intervals

Data from a subsample of 33 participants were recoded by a second coder to establish inter-rater reliability. Agreement between the coders was 99% ($N = 224$ problems).

3. Results

Participants who correctly used the multiplicative strategy on the pretest were excluded from analysis ($n = 14$), as they already knew the multiplicative strategy so could not learn it during the study. Each participant knew the multiplicative strategy so could not learn it during the study. Each participant received a score on the pretest problems, reflecting the number of correct answers (0, 1, or 2) they produced. We examined whether including pretest scores as a potential covariate would improve the fit of any of the models we tested, but it did not.

For each of the problems on the transfer test, we examined whether or not participants produced the correct answer and whether or not they correctly applied the multiplicative strategy. We then analyzed whether likelihood of reaching a correct answer via any strategy differed across conditions using mixed-effects logistic regression. A likelihood ratio test of model comparisons revealed that the model including condition did not provide a better fit to the data than the model without condition, $\chi^2(5) = 3.87$, $p = .57$, implying that the likelihood of correctly solving the transfer problems did not differ across conditions.

We next tested whether the four person-presentation conditions differed from one another in the likelihood that participants correctly implemented the multiplicative strategy on the transfer problems. The four conditions comprised a 2 (picture: yes or no) \times 2 (background information: yes or no) design. Note that all four of these conditions included the person's name. To analyze the data, we used mixed-effects logistic regression with picture (yes/no) and background information (yes/no) as fixed factors and participant as a random factor.

There were no significant differences among the four person-presentation conditions in the likelihood that participants correctly implemented the multiplicative strategy. The model including picture did not provide a better fit to the data than the model without picture, $\chi^2(1) = 0.0033$, $p = .95$, and the model including background information did not provide a better fit to the data than the model without background information, $\chi^2(1) = 0.0047$, $p = .95$. Additionally, a model including the interaction between picture and background information did not provide a better fit to the data than a model without

the interaction, $\chi^2(1) = 0.14$, $p = .71$. Given these results, we collapsed the four person-presentation conditions for subsequent analyses.

We next examined whether the two non-person-presentation conditions differed from one another in the likelihood that participants correctly implemented the multiplicative strategy on the transfer problems. A model including condition (labeled strategy and unlabeled strategy) did not provide a better fit to the data than a model without condition, $\chi^2(1) = 0.15$, $p = .70$. Thus, we collapsed the two non-person-presentation conditions for subsequent analyses.

Our primary question was whether or not participants in the person-presentation conditions would differ from participants in non-person-presentation conditions in the likelihood that they successfully implemented the multiplicative strategy on the transfer problems. The best-fitting model for these data included both condition group and problem type as predictors. Likelihood ratio tests of model comparisons revealed that the model that included condition group provided a better fit to the data than the model without condition group, $\chi^2(1) = 6.84$, $p = .0009$, indicating that participants were differentially likely to correctly implement the multiplicative strategy across condition groups. Follow-up analyses showed that the odds of correctly implementing the multiplicative strategy were 2.36 times greater (95% CI = 1.25, 4.45)¹ in the non-person-presentation conditions than in the person-presentation conditions. Thus, participants in the non-person-presentation conditions were more likely to correctly use the multiplicative strategy on the transfer problems than participants in the person-presentation conditions (see Fig. 2).

We also used model comparisons to test the effect of problem type. The lesson was presented in the context of a continuous problem; therefore, we considered successful use of the multiplicative strategy on the continuous problems to reflect *near transfer* of the multiplicative strategy, and successful use of the multiplicative strategy on the discrete and mixed problems to reflect *far transfer* of the multiplicative strategy. As expected, a model that included problem type provided better fit to the data than a model without problem type, $\chi^2(2) = 26.34$, $p < .0001$. The odds of correctly implementing the multiplicative strategy were 2.82 times greater (95% CI = 1.90, 4.18) on continuous problems than on discrete problems. Additionally, the odds of correctly implementing the multiplicative strategy were 2.05 times greater (95% CI = 1.28, 3.29) on the mixed problem than on the discrete problems. Thus, in both condition groups, students were more likely to transfer the multiplicative strategy to the continuous problems (i.e., to display *near transfer*) than to transfer it to the mixed and discrete problems (i.e., to display *far transfer*).

Although there was not a significant interaction between condition and problem type, $\chi^2(2) = 1.61$, $p = .45$, we wished to know whether the effect of condition group on implementation of the multiplicative strategy held for near-transfer and far-transfer problems separately. For the near-transfer problems, a model that included condition group provided a better fit to the data than the model without condition group, $\chi^2(1) = 8.00$, $p = .005$. The odds of correctly implementing the multiplicative strategy on the near-transfer problems were estimated to be 2.36 times greater (95% CI = 1.25, 4.45) in the non-person-presentation condition than in the person-presentation condition. For the far

transfer problems, the model that included condition group provided a marginally better fit to the data than the model without condition group, $\chi^2(1) = 3.80$, $p = .051$. The odds of correctly implementing the multiplicative strategy were estimated to be 2.12 times greater (95% CI = 1.02, 4.43) in the non-person presentation conditions than in the person-presentation conditions. Therefore, the primary finding—that correct implementation of the multiplicative strategy depended on condition group—held when analyzing the near- and far-transfer problems separately.

We also examined whether or not participants attempted to use the multiplicative strategy, but set it up incorrectly. For example, some participants subtracted the initial rate from the final rate (rather than averaging those rates) before multiplying. In total, 19 participants set up the multiplicative strategy incorrectly; 16 of these were in one of the person-presentation conditions (14.3%), and three were in one of the non-person-presentation conditions (5.2%). Thus, a greater proportion of participants set up the multiplicative strategy incorrectly in the person-presentation conditions than in the non-person-presentation conditions, $\chi^2(1) = 3.62$, $p = .057$.

4. Discussion

Our findings demonstrate that presenting strategies as particular to a specific person limits the success with which students transfer those strategies to new problems. In this study, students displayed the highest rates of transfer when strategies were labeled impersonally (e.g., “the continuous strategy”) or were unlabeled, rather than associated with a specific person. This effect held even for far transfer problems that cued a discrete rather than a continuous representation of change. These findings add to the growing debate about whether or not textbooks should include real-world contexts when presenting new strategies or concepts. In particular, these findings are the first evidence to suggest that the common practice of using people to present new strategies is harmful for learning and transfer.

There are many potential explanations for why person-presentation hinders transfer of new strategies. One explanation is that personal details distract students’ attention from the targeted mathematical content. This explanation would suggest that the more detail about the people presenting strategies, the worse learning and transfer of the strategies should be. One past study has provided some evidence that detail about the person in a problem scenario may matter. In their study of variations in context, Son and Goldstone (2009, Experiment 3) found that a problem context about a generic person led to better performance than a problem context about a specific, familiar person; however, the results were significant only in an analysis by items, and not in an analysis by participants. Our study did not involve a manipulation of person information as part of the problem context, but rather manipulated whether the strategy was presented by a person. We found no differences in transfer across the four personalization conditions, which varied in the amount of detail about the person who used the target strategy. Thus, it seems likely that the effects we observed were not due solely to extraneous detail distracting students from the strategies.

Instead, the present results suggest that students interpret strategies presented by a person as specific to that individual. The strategies in the person-presentation conditions were given a specific, non-generic label (“Juan’s strategy”), which prior research suggests could inhibit encoding and transfer of the strategy itself (Cimpian & Erickson, 2012; Riggs et al., 2014). In addition, students may have interpreted the strategy as idiosyncratic to the person in the example, rather than a more general and efficient solution. This view aligns with Laupa and Becker’s (2004) finding that students sometimes interpret their teachers’ strategies as arbitrary conventions or personal choices rather than logical truths, leading students to persevere on their own incorrect strategies. Students in the person-presentation conditions may have had a similar interpretation, leading them to ignore the target strategy in favor of their own strategy.

The present results provide additional support for the view that including real-world contexts when presenting problems may negatively influence transfer. Kaminski, Sloutsky, and Heckler (2009), who found an advantage for abstract over concrete examples, hypothesized that concrete examples lead students to rely on prior knowledge or physical constraints to help them solve problems. The virtue of abstract presentation is that students cannot rely on specific context knowledge, so they develop a more general solution (see also Son & Goldstone, 2009). The current results suggest a different—or perhaps additional—mechanism by which contextualization affects learning and transfer. Associating a person with a strategy may lead students to interpret the strategy narrowly, as specific to that person, and thus make them less likely to transfer the strategy to new problems.

Although this study found that person-presentation is harmful for transfer, it may be helpful in other ways. Prior research has shown that using materials that “catch” student interest promotes motivation, particularly among students with low interest in mathematics (Durik & Harackiewicz, 2007). When textbooks present strategies associated with people who are similar to the student (e.g., in age, gender, etc.), students may be more likely to infer that those strategies are relevant to them and worthwhile to learn (Good, Woodzicka, & Wingfield, 2010). Motivation and engagement with curricular materials is an important contributor to learning outcomes, and one that we did not measure in the current experiment. Future research should examine whether, in some contexts or for some students, these potential benefits outweigh the costs of reduced transfer when associating a person with a strategy.

Given that the current results demonstrate a cost in transfer when strategies are associated with particular people, but other research suggests benefits for student interest, what is the best recommendation for curriculum designers? Children readily generalize information demonstrated by a particular person, but labeled more generally (Riggs et al., 2014). Thus, textbooks could include people when presenting strategies, but label the strategies impersonally. For example, a textbook could present a sample student solving a problem with a generally labeled strategy (e.g., “This is Jane. She is using the continuous strategy”). This may decrease the likelihood that students interpret the strategy as particular to Jane, but still lead them to perceive the strategy as relevant because Jane is a student, like them.

The current results demonstrate that the context used to present new information to students is critical to their ability to learn and transfer this information. Specifically, associating a strategy with a particular person limits the success with which students learn that strategy and transfer it to new problems. This finding has important implications for curriculum design, in which person-presentation of new strategies is common. If students interpret information as specific to an individual, they are less likely to generalize that information; thus, it is better for learning if new information is presented impersonally.

Note

1. Confidence intervals reported here are odds ratios. Confidence intervals that do not contain 1.0 are considered statistically significant.

References

- Alexander, P. A., & Jetton, T. L. (1996). The role of importance and interest in the processing of text. *Educational Psychology Review*, 8(1), 89–121.
- Alibali, M. W., Bassok, M., Solomon, K. O., Syc, S. E., & Goldin-Meadow, S. (1999). Illuminating mental representations through speech and gesture. *Psychological Science*, 10(4), 327–333.
- Archambault, A., O'Donnell, C., & Schyns, P. G. (1999). Blind to object changes: When learning the same object at different levels of categorization modifies its perception. *Psychological Science*, 10(3), 249–255.
- Bassok, M., & Olseth, K. L. (1995). Object-based representations: Transfer between cases of continuous and discrete models of change. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 21(6), 1522.
- Burton, G. M., Maletsky, E. M., Bright, G. W., Helton, S. M., Hollis, L. Y., Johnson, H. C., McLeod, J. C., Neufeld, E. M., Newman, V., Perciante, T. H., Schultz, K. A., & Thatcher, M. B. (1999). *Math advantage*. Chicago, IL: Harcourt Brace & Company.
- Charles, R. I., Barnett, C. S., Briars, D. J., Crown, W. D., Johnson, M. L., Leinwand, S. J., & Van de Walle, J. (2000). *Math* (California edition). Glenview, IL: Addison Wesley Longman Inc.
- Charles, R. I., Crown, W., & Fennell, F. (2004). *Mathematics*. Glenview, IL: Pearson Education Inc.
- Charles, R. I., Dossey, J. A., Leinwand, S. J., Seeley, C. L., Vonder Embse, C. B., & Bolster, L. C. (1999). *Middle school math*. Menlo Park, CA: Addison Wesley Longman Inc.
- Cimpian, A., & Erickson, L. C. (2012). Remembering kinds: New evidence that categories are privileged in children's thinking. *Cognitive Psychology*, 64(3), 161–185. doi:10.1016/j.cogpsych.2011.11.002.
- Clements, D. H., Jones, K., Moseley, L., & Schulman, L. (1999). *Math in my world*. New York: McGraw-Hill School Division.
- Durik, A. M., & Harackiewicz, J. M. (2007). Different strokes for different folks: How individual interest moderates the effects of situational factors on task interest. *Journal of Educational Psychology*, 99(3), 597.
- Fuchs, S. (1992). *The professional quest for truth: A social theory of science and knowledge*. Albany: State University of New York Press.
- Good, J. J., Woodzicka, J. A., & Wingfield, L. C. (2010). The effects of gender stereotypic and counter-stereotypic textbook images on science performance. *The Journal of Social Psychology*, 150(2), 132–147.
- Greenes, C. E., Larson, M., Leiva, M. A., Shaw, J. M., Stiff, L., Vogeli, B. R., & Yeatts, K. (2005). *Houghton Mifflin Math* (Vol. 1). Boston, MA: Houghton Mifflin.

- Harp, S. F., & Mayer, R. E. (1998). How seductive details do their damage: A theory of cognitive interest in science learning. *Journal of Educational Psychology*, *90*(3), 414.
- Hidi, S. (1990). Interest and its contribution as a mental resource for learning. *Review of Educational Research*, *60*(4), 549–571.
- Kaminski, J. A., Sloutsky, V. M., & Heckler, A. (2008). The advantage of abstract examples in learning math. *Science*, *320*(5875), 454–455.
- Kaminski, J. A., Sloutsky, V. M., & Heckler, A. (2009). Transfer of mathematical knowledge: The portability of generic instantiations. *Child Development Perspectives*, *3*(3), 151–155.
- Klahr, D., & Chen, Z. (2011). Finding one's place in transfer space. *Child Development Perspectives*, *5*(3), 196–204.
- Latour, B., & Woolgar, S. (1986). *Laboratory life: The construction of scientific facts*. Princeton, NJ: Beverly Hills, CA: Sage.
- Laupa, M., & Becker, J. (2004). Coordinating mathematical concepts with the demands of authority: Children's reasoning about conventional and second-order logical rules. *Cognitive Development*, *19*(2), 147–168.
- Maletsky, E. M., Andrews, A. G., Bennett, J. M., Burton, G. M., Luckie, L. A., & McLeod, J. C. (2004). *Math* (Indiana edition). Orlando, FL: Harcourt Inc.
- Martinez, J. G. R. (1987). Preventing math anxiety A prescription. *Intervention in School and Clinic*, *23*(2), 117–125.
- Mayer, R. E. (2008). Applying the science of learning: Evidence-based principles for the design of multimedia instruction. *American Psychologist*, *63*(8), 760–769.
- Mayer, R. E. (2009). *Multimedia learning* (2nd ed.). New York: Cambridge University Press. doi:10.1017/CBO9780511811678.
- Mayer, R. E. (2014). Incorporating motivation into multimedia learning. *Learning and Instruction*, *29*, 171–173.
- Riggs, A. E., Kalish, C. W., & Alibali, M. W. (2014). When you've seen one, have you seen them all? Children's memory for general and specific learning episodes. *Developmental Psychology*, *50*(6), 1653.
- Sabbagh, M. A., & Shafman, D. (2009). How children block learning from ignorant speakers. *Cognition*, *112*(3), 415–422. doi:10.1016/j.cognition.2009.06.005.
- Sadoski, M., Goetz, E. T., & Fritz, J. B. (1993). Impact of concreteness on comprehensibility, interest, and memory for text: Implications for dual coding theory and text design. *Journal of Educational Psychology*, *85*(2), 291.
- Sanchez, C. A., & Wiley, J. (2006). An examination of the seductive details effect in terms of working memory capacity. *Memory & Cognition*, *34*(2), 344–355.
- Son, J. Y., & Goldstone, R. L. (2009). Contextualization in perspective. *Cognition and Instruction*, *27*(1), 51–89.
- Sung, E., & Mayer, R. E. (2012). Five facets of social presence in online distance education. *Computers in Human Behavior*, *28*(5), 1738–1747.
- Walkington, C. A. (2013). Using adaptive learning technologies to personalize instruction to student interests: The impact of relevant contexts on performance and learning outcomes. *Journal of Educational Psychology*, *105*(4), 932–945.

Appendix: Textbooks analyzed for use of person-presentation

Textbook Name	Publisher	Percentage of Units With Person-Presentation (%)
<i>Middle Grades Mathematics</i>	McDougal Littell	0
<i>Activities in Mathematics</i>	Scott, Foresman and Company	0
<i>Harcourt Math</i>	Harcourt	56
<i>Addison Wesley Middle School Math</i>	Addison Wesley	67
<i>Math in My World</i>	McGraw Hill	100
<i>Houghton Mifflin Math</i>	Houghton Mifflin	58
<i>Math Advantage</i>	Harcourt, Brace & Company	50
<i>Mathematics</i>	Pearson Education	100
<i>Math (California Edition)</i>	Addison Wesley	75