The Derring Effect: Deliberate Errors Enhance Learning

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ABSTRACT

Errors have traditionally been viewed as aversive events or, at best, serendipitous accidents. Challenging these views, the present study tested the counterintuitive learning benefits of deliberately responding incorrectly. Across two experiments (N = 160), we show that guiding learners to deliberately err even when they know the correct answers enhances learning—a phenomenon we termed the *derring effect*. Deliberately committing and correcting errors not only produced superior knowledge retention, but also promoted higher order learning in applying educational material to analyze a novel news event, relative to errorless copying with underlining and elaborative studying with concept-mapping (Experiment 1). Moreover, the advantage of deliberate erring was not attributable to a generation or an elaboration benefit (Experiment 2). Deliberate erring is an effective strategy of systematically making errors in low-stakes contexts to enhance meaningful learning.

INTRODUCTION

- Learning from our errors is important, but often easier said than done
  - Traditionally, errors have been avoided (Skinner, 1958)
  - Failure hurts the ego (Eskreis-Winkler & Fishbach, 2019)
- Yet, errors can enhance learning when accompanied by corrective feedback (Kornell, Hays, & Bjork, 2009; Metcalfe, 2017; Potts & Shanks, 2014; Wong & Lim, 2019)
- **How can errors be strategically positioned to optimize learning opportunities?**
- *Deliberately* committing and correcting errors in low-stakes learning contexts as a counterintuitive strategy
  - Benefits of making errors oneself (Metcalfe & Xu, 2018)
  - More systematic than "naturalistic" errors
  - Ego concerns are minimized—errors can be attributed to the learning approach instead of low ability
- **Hypothesis: Deliberately committing and correcting errors even when one knows the correct answers produces superior learning than avoiding errors—the *derring effect***
  - Learning assessed as not only knowledge retention, but also higher order application of knowledge (Bloom, 1956)

METHOD

Experiment 1

Participants

- 120 undergraduate students (87 were female)

Design

- Learning Method (*copy* vs. *concept-map* vs. *concept-error*) as the primary between-subjects factor of interest
- Study Text (*"volcanoes"* vs. *"food allergies"*) as a control variable to insure that effects persisted across text topics

Materials

- Two scientific expository texts on "volcanoes" and "food allergies" (Griffin, Wiley, & Thiede, 2019)
- Two news article excerpts on actual historical events—the 1980 eruption of Mount St. Helens volcano vs. a local young boy who suffered a life-threatening allergic reaction

Procedure

- **Study phase**
  - **Copy method**: Learners copied the text and underlined the key concepts in each sentence (Dunlosky et al., 2013).
  - **Concept-map method**: Learners drew a concept map that represented all key information in the text (Chularut & DeBacker, 2004; Fiorella & Mayer, 2016; Novak, 2005).
  - **Concept-error method**: Learners wrote down each sentence in the text such that it contained a plausible conceptual error, before ~~striking out~~ this error, and writing the actual concept (i.e., deliberate erring with correction).
  - All learners then made a judgment of learning (JOL) to predict how much of the material they would remember.
- **Test phase**
  - **Application test**: Learners applied what they had learned to analyze the news event related to their studied text.
  - **Free recall test**

Experiment 2

- To test the extent that the derring effect was attributable to a generation or an elaboration benefit (Craik & Tulving, 1975; Jacoby, 1978; Slamecka & Graf, 1978).

Participants

- 40 undergraduate students (32 were female)

Design

- Single-factor (Learning Method: *concept-synonym* vs. *concept-error*) within-subjects design

Materials and Procedure

- Identical to Experiment 1, except:
  - **Concept-synonym method**: Learners elaborated on the text by writing down each sentence such that it contained a conceptual synonym (i.e., an alternative word or phrase that was conceptually the same as the actual concept), underlined this synonym, then wrote the actual concept.

RESULTS

Experiment 1

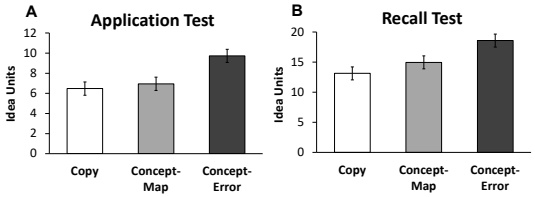

Figure 1. Results of Experiment 1. (**A**) and (**B**) show the mean application test and recall test scores, respectively. The maximum possible score for the recall test was 40. Error bars represent standard errors.

- **Application test:** Deliberate erring outperformed both copying and concept-mapping [p = .001 and .003, d = 0.77 and 0.70, 95% CI = (1.41, 5.09) and (0.94, 4.61), respectively]; both errorless conditions did not differ, p > .05.
- **Recall test:** Deliberate erring produced superior recall than copying and concept-mapping [p = .001 and .02, d = 0.75 and 0.54, 95% CI = (2.43, 8.47) and (0.61, 6.64), respectively]; both errorless conditions did not differ, p > .05.
- **Metacognitive judgments:** Yet, learners were largely unaware that deliberate erring had been helpful for them—their JOLs did not differ across learning conditions, p > .05.

Experiment 2

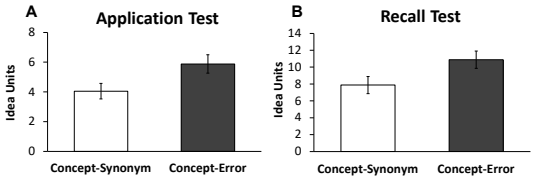

Figure 2. Results of Experiment 2. (**A**) and (**B**) show the mean application test and recall test scores, respectively. The maximum possible score for the recall test was 40. Error bars represent standard errors.

- **Application test:** Deliberate erring enhanced learners' performance in applying the material to analyze a novel news event, relative to generating alternative correct elaborations, p = .006, d = 0.46, 95% CI = [0.55, 3.10].
- **Recall test:** Deliberate erring produced a recall advantage over the concept-synonym method, p = .002, d = 0.51, 95% CI = [1.13, 4.87].
- **Metacognitive judgments:** Yet, learners inaccurately predicted no difference in their learning across the concept-error and concept-synonym conditions, p > .05.

DISCUSSION

- Deliberately committing and correcting errors is an effective strategy to enhance not only knowledge retention, but also higher order application of learning.
- The benefits of deliberate erring surpassed those of popular errorless learning techniques (Experiment 1).
- The derring effect was not simply due to a generation or an elaboration advantage, but was specific to having first produced an error rather than any other novel (correct) response (Experiment 2).

Educational Implications

- Deliberately incorporating errors in learning is more potent than avoiding them entirely.
- Since learners are often unaware of the benefits of deliberate erring, teachers should explicitly guide students into intentionally committing and correcting conceptual errors (e.g., in class discussions, homework assignments, and self-regulated study) as part of the learning design.

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AUTHOR NOTE

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