Table 1. Examples of Each Question Type Used in Study 3

Question type	Example
Factual	What is the purpose of adding calcium propionate to bread?
Seductive detail	What was the name of the cow whose cowpox was used to demonstrate the effectiveness of Edward Jenner's technique of inoculation against smallpox?
Conceptual	If a person's epiglottis was not working properly, what would be likely to happen?
Inferential	Sometimes bats die while they are sleeping. What will happen if a bat dies while it is hanging upside down?
Application	Psychologists have investigated a phenomenon known as "attitude inoculation," which works on the same principle as vaccination, and involves exposing people to weak arguments against a viewpoint they hold. What would this theory predict would happen if the person was later exposed to a strong argument against their viewpoint?

this increased external-storage capacity could boost performance on tests taken after an opportunity to study one's notes. Thus, in Study 3, we used a 2 (laptop, longhand) × 2 (study, no study) design to investigate whether the disadvantages of laptop note taking for encoding are potentially mitigated by enhanced external storage. We also continued to investigate whether there were consistent differences between responses to factual and conceptual questions, and additionally explored whether the note-taking medium affected transfer of learning of conceptual information to other domains (e.g., Barnett & Ceci, 2002).

Participants

Participants were students (final $N = 109$; 27 male) from the University of California, Los Angeles Anderson Behavioral Lab subject pool. One hundred forty-two participants completed Session 1 (presentation), but only 118 returned for Session 2 (testing). Of those 118, 8 participants were removed for not having taken notes or failing to respond to the test questions, and 1 was removed because of a recording error. Participant loss did not differ significantly across conditions. Participants were paid $6 for the first session and $7 for the second session.

Stimuli

Materials were adapted from Butler (2010). Four prose passages—on bats, bread, vaccines, and respiration—were read from a teleprompter by a graduate student acting as a professor at a lectern; two "seductive details" (i.e., "interesting, but unimportant, information"; Garner, Gillingham, & White, 1989, p. 41) were added to lectures that did not have them. Each filmed lecture lasted approximately 7 min.

Procedure

Participants completed the study in large groups. They were given either a laptop or pen and paper and were instructed to take notes on the lectures. They were told they would be returning the following week to be tested on the material. Each participant viewed all four lectures on individual monitors while wearing headphones.

When participants returned, those in the study condition were given 10 min to study their notes before being tested. Participants in the no-study condition immediately took the test. This dependent measure consisted of 40 questions, 10 on each lecture—two questions in each of five categories adapted from Butler (2010): facts, seductive details, concepts, same-domain inferences (inferences), and new-domain inferences (applications). See Table 1 for examples. Participants then answered demographic questions. All responses were scored by raters blind to condition. Longhand notes were transcribed, and all notes were analyzed using the *n*-grams program.

Results

Laptop versus longhand performance. Across all question types, there were no main effects of note-taking medium or opportunity to study. However, there was a significant interaction between these two variables, $F(1, 105) = 5.63$, $p = .019$, $\eta_p^2 = .05$. Participants who took longhand notes and were able to study them performed significantly better (z-score $M = 0.19$) than participants in any of the other conditions (z-score Ms = −0.10, −0.02, −0.08), $t(105) = 3.11$, $p = .002$, $d = 0.64$ (see Fig. 5).

Collapsing questions about facts and seductive details into a general measure of "factual" performance, we found a significant main effect of note-taking medium, $F(1, 105) = 5.91$, $p = .017$, $\eta_p^2 = .05$, and of opportunity to study, $F(1, 105) = 13.23$, $p < .001$, $\eta_p^2 = .11$, but this was qualified by a significant interaction, $F(1, 105) = 5.11$, $p = .026$, $\eta_p^2 = .05$. Again, participants in the longhand-study condition (z-score $M = 0.29$) outperformed the other participants (z-score Ms = −0.04, −0.14, −0.13), $t(105) = 4.85$, $p < .001$, $d = 0.97$. Collapsing performance on conceptual, inferential, and application questions into a general "conceptual" measure revealed no significant main effects, but again there was a significant interaction between note-taking medium and studying, $F(1, 105) = 4.27$, $p = .04$, $\eta_p^2 = .04$. Longhand-study participants (z-score