

Ink on Paper: Some Notes on Note-taking

I went to college long before the era of laptops, so I learned to take notes the old-fashioned way: ink on paper. But that does not mean my note-taking system was simple. Indeed it was an intricate hieroglyphic language, in which asterisks and underscoring and check marks and exclamation points all had precise meaning, if only to me.

It's a lost art. Many college students have some kind of electronic note-taking device nowadays, and most will swear by them. And really, only a Luddite would cling to pen and notebook in the 21st century. Typing is faster than longhand, producing more legible and more thorough notes for study later on.

But has anyone actually compared the two? Is it possible that laptops somehow impair learning -- or conversely, that pen and paper convey some subtle advantage in the classroom? Two psychological scientists, Pam Mueller of Princeton and Daniel Oppenheimer of UCLA, wondered if laptops, despite their plusses, might lead to a shallower kind of cognitive processing, and to lower quality learning. They decided to test the old and the new in a head-to-head contest.

Of course, students could develop an elaborate hieroglyphic system using a laptop. Keyboards have asterisks and exclamation points and so forth. They could also go beyond mere verbatim transcription, summarizing and paraphrasing. These are the strategies that in theory lead to deep processing and firmly encode new material in memory. But do typists do this, or do they just type as fast as they can? That is one of the questions that Mueller and Oppenheimer wanted to explore in a real-world setting.

They ran a few experiments, all basically the same. In the first one, for example, college students were assigned to classrooms, some of which were equipped with laptops and others with traditional notebooks. They all listened to the same lectures, and they were specifically instructed to use their usual note-taking strategy. Then, about half an hour after the lecture, all of the students were tested on the material covered in the lecture. Importantly, they were tested both for factual recall (How many years ago did the Indus civilization exist?) and for conceptual learning (How do Japan and Sweden differ in their approaches to social equality?).

This experiment provided preliminary evidence that laptops might be harmful to academic performance. The students using laptops were in fact more likely to take copious notes, which can be beneficial to learning. But they were also more likely to take verbatim notes, and this "mindless transcription" appeared to cancel out the benefits. Both groups memorized about the same number of facts from the lectures, but the laptop users did much worse when tested on ideas.

At least right away. Remember that they were tested half an hour after the lecture, without opportunity for review. But what if these students did what students commonly do -- leave the lecture, go back to the dorm, go about their lives, and at some point in time pull out their notes to study for an exam? Would having more thorough, transcribed notes prove an advantage in this more natural setting?

The scientists tried to simulate this in another experiment. As before, some of the students took notes with a laptop, others with pen and notebook, as they listened to talks on various topics. They knew in advance that the exam would take place in a week, and that they would have a chance to study beforehand. As before, the test covered simple facts as well as concepts, inferences and applications of the material.

The findings, which Mueller and Oppenheimer describe in a forthcoming issue of the journal *Psychological Science*, were a bit surprising. Those who took notes in longhand, and were able to study, did significantly better than any of the other students in the experiment -- better even than the fleet typists who had basically transcribed the lectures. That is, they took fewer notes overall with less verbatim recording, but they nevertheless did better on both factual

learning and higher-order conceptual learning. Taken together, these results suggest that longhand notes not only lead to higher quality learning in the first place; they are also a superior strategy for storing new learning for later study. Or, quite possibly, these two effects interact for greater academic performance overall.

The scientists had an additional, intriguing finding. At one point, they told some of the laptop users explicitly not to simply transcribe the lectures word-by-word. This intervention failed completely. The laptop users still made verbatim notes, which diminished their learning. Apparently there is something about typing that leads to mindless processing. And there is something about ink and paper that prompts students to go beyond merely hearing and recording new information -- and instead to process and reframe information in their own words, with or without the aid of asterisks and checks and arrows.

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