

# Designing a Restrictive Interface:

Encouraging students to make shorter selections when copy-pasting notes

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## Project Overview

My research into online note-taking interfaces for learning has found that while copy-pasting is more efficient than typing, producing equivalent learning in less time, students perform better when they copy-paste smaller selections [1]. Though this suggests the possibility of improving learning by encouraging shorter selection size, my initial attempt to design an interface that did so failed, as the interface was disliked and used less than a standard selection interface. In this document I describe a design process intended to produce a more effective interface by rapidly exploring multiple options and coordinating qualitative observational data with empirical data from user tests [2,3].

## Procedure

Interface solutions differ along certain interactive dimensions. With regards to designs intended to encourage shorter selections, the interface can either **recommend** that long selections be modified, or **restrict** students from making long selections. Another dimension regards whether interventions are given **in process**, i.e. as soon as the selection crosses a predetermined length boundary or **post-process**. The first step in my design process was to define as many of these interface dimensions as possible. When pre-existing solutions are available, this is possible through competitive analysis. In this case, I first had to brainstorm potential solutions with colleagues, and then evaluate the differences between potential interfaces.

Once the dimensions were defined, I developed representative interfaces to assess user responses to the different dimensions. Students were then exposed to enough interfaces in **think-aloud user tests** to give them experience with different levels of each dimension. **Questionnaires** involving Likert-scale items assessing responses to individual dimensions were then given, and averaged ratings were associated with observations from the user tests. Finally, **semi-structured interviews** asked users questions regarding general note-taking strategy and allowed the opportunity for participatory design.

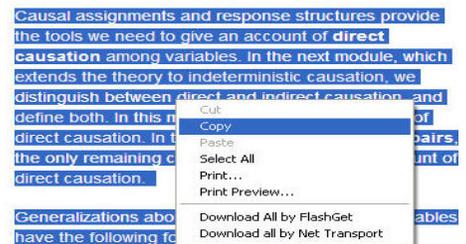
## Sample Findings from User Tests

Students often made selections for reasons that had nothing to do with note-taking. This previously undocumented **selection-to-read** behavior mostly occurred for more difficult material, with students reinforcing the contents of their selections with speech. Students report that selecting text helps them pay attention in general, and focus specifically on the ideas in the selection. The user tests also showed that users frequently made large selections accidentally through motor errors, though these errors were generally remedied by the time the mouse was released. These two behaviors are important, because they cannot be distinguished from selections made intentionally for copy-pasting, meaning interventions can occur for non note-taking behaviors.

There is an interesting interaction between the two dimensions mentioned above. While recommendations should be enforced post-process, restrictions should be enforced in process. Popups recommending shorter selection-size during selection affected reading patterns, which was especially inappropriate when students were only selecting-to-read. On the other hand, students responded

**Design Problem:** How to design a copy-paste note-taking interaction that encourages shorter selections?

### Copy-Pasting Large Selections



- Variable X is a direct cause of variable Y relative to the set of variables Z under background conditions B.

EXAMPLE: Form of Causal Generalizations: Chicken Pox

Large selections such as this are associated with poor learning outcomes

**Goal of User Tests:** Associate qualitative data with ratings of interface dimensions in order to provide anecdotal and quantitative evidence for design decisions.

### Early Interface: Recommendation

Causal generalizations are only meaningful relative to a given context. First, causal generalizations are relative to a set of background conditions that are usually left unstated. Second, claims about the causal relations between two variables X and Y are relative to the set of variables Z that are explicitly under discussion.

#### Background Conditions

Causal generalizations are always to be understood as relative to a particular set of background conditions. For example, consider the claim: "Eating red meat selects multiple sentences can reduce learning one's life." It is better to individually select these sentences millennium, where diets tend to contain lots of calories

When the user makes a selection the interface deems to be too long, a message pops up recommending the user make a shorter selection.

better to interfaces that did not allow them to make large selections than they responded to interfaces that reduced a large selection after it was made. Students also adapted their selection-to-read behavior to these in-process restrictions without complaint. Having the observational data allowed to elucidate this interaction through by viewing specific instances in which the interventions occurred.

## Experimental Interfaces

One experimental goal was to determine whether recommendations could change the way students behaved. Therefore, the final designs included one restricted and one recommended interface. These two interfaces were compared with an unrestricted selection interface and a treatment in which students were not allowed to take notes. The experiment followed a between-subjects design, and gathered a variety of behavioral and learning outcomes.

**Restriction:** The restricted interface allowed students to select any material within a sentence, but stopped selections from crossing sentence boundaries, and also gave students the option of selecting any sentence by clicking on it. This was a combination of two prior interfaces suggested by a student during the interview.

**Recommendation:** The recommendation interface used a carrot and stick approach. Students were only given nag popups for multiple-sentence selections when they had been observed to make bad copy-paste (not just selection) actions. Once they began to make smaller pastes, the nag popup disappeared.

## Key Experimental Outcomes

Both the restricted and recommended interface produced shorter selections than the unrestricted interface. Surprisingly, **the restricted interface showed increased user satisfaction** relative to the unrestricted tool, providing validation for the design study.

Students using the interventions performed equivalently to students using the unrestricted interface on learning outcomes, indicating that **encouraging shorter selections does not increase learning**.

Selection-to-read behavior, previously unreported in the literature, was observed in a larger scale study. This behavior is relevant to other online selection interfaces, such as double-click advertising which appears when users double-click on words.

## References/Further Information

I reported this work at the Joint Conference on Digital Libraries [2]. More information on this study (including video demonstrating test interfaces) and the design procedure in general is available on my website ([www.aobauer.com](http://www.aobauer.com)) and in my dissertation [3]. My dissertation also describes an additional project developing highlighting interfaces, in which this design process was systematized.

1. Bauer, A., Koedinger, K.R. (2007) Selection-Based Note-Taking Applications. In Proceedings of *ACM Conference on Human Factors in Computing Systems (CHI '07)*. pp. 981-990 ACM Press (Honorable Mention Best Paper)
2. Bauer, A. and Koedinger, K. R. (2008) Note-taking, selecting, and choice: designing interfaces that encourage smaller selections. In Proceedings of the *8th ACM/IEEE Joint Conference on Digital Libraries (JCDL '08)*. pp. 397-406. ACM Press
3. Bauer, A., (2008) *Designing Note-Taking Interfaces for Learning*. Carnegie Mellon University, Human-Computer Interaction Institute, Doctoral Dissertation - CMU-HCI-08-103.

### Early Interface: Restriction

Causal generalizations are only meaningful relative to a given context. First, causal generalizations are relative to a set of background conditions that are usually left unstated. Second, claims about the causal relations between two variables X and Y are relative to the set of variables that are explicitly under discussion.

### Background Conditions

Causal generalizations are always to be understood as relative to a particular set of background conditions.

For example, consider the claim: "Eating red meat several times a week reduces the length of one's life." In America in the beginning of the 3rd

*When the user makes a selection the interface deems to be too long, each sentence contained within the selection is reselected individually, so the user cannot paste them all at once.*

### Sample User Quotes\*

"This is sick!"- *Response of user 3 to the interface automatically reselecting the first sentence after initially allowing him to select multiple sentences.*

"I know, I didn't mean to... You're killing me!" - *Response of user 1 to the interface popping up a recommendation shorter selections as soon as her selection crossed a sentence boundary.*

\* All quotes would be presented to designers with associated video.

Unfortunately, due to human subjects considerations, I cannot make these videos available online. Video demonstrating the interfaces described here is available on my website, at [www.aobauer.com](http://www.aobauer.com).