EFFECTS OF COMPUTER-AIDED GLOSSING ON PROSE RECALL

PAUL J. BLOHM
University of Southwestern Louisiana

Merging glossing with computer-aided instruction seems natural for directing readers' use of skills and strategies to comprehend and remember information from text. Glossing, as an instructional technique for actively involving students in the process of reading, has been developed to increase readers' attention to places in text where the application of specific skills and strategies—such as parphrasing and monitoring comprehension—would be appropriate for deriving meaning from expository material (Otto, Whie & Camperell, 1980). And results of pilot investigations with classroom students have been encouraging (see Otto, White, & Camperell, 1980, for detailed results of pilot studies and subsequent investigations and for examples of "glossed" materals). To date, however, gloss notations have been constructed on paper for use with groups of students—not indiviuals. To truly individualize this procedure, another method of glossing needs to be explored and refined. What is needed is a system which allows the learner to determine when a particular gloss notation is necessary and then to activate just that gloss to direct comprehension.

Computer-aided instruction could provide the flexibility necessary to allow learners to monitor their levels of comprehension while reading and activate at will specific skills and strategy glosses for interacting meaningfully with text. Computer-aided instruction is designed to provide instant service to the learner (i.e., activating and receiving a specific gloss notation). The computer has infinite patience so the learner may process the text at a comfortable rate. Also, since the organization of the courseware is determined by the teacher, gloss notations can appropriately reflect that teacher's expectations for the assigned reading. The ultimate goal for this line of research would be to develop an independent text-authoring system for computer-aided glossing that can be programmed for use by classroom teachers with little or no programming experience (Blohm, in progress). At the present, however, a prototype system has been developed that can be used with college students who have regular access to computer terminals to both direct students' prose learning and to research treatment effects on that learning.

For this initial investigation, the following questions were generated. First, would the students who are provided the opportunity to activate gloss phrases while reading on the computer recall more information than those who are not provided with the gloss paraphrase option? Second, would the number of gloss paraphrases activated influence the quantity of recall? And third, would those opting to activate gloss paraphrases while reading take significantly longer to complete the reading than those not offered the option?

Method

The design of the study was a 2×2 factorial with eighty college undergraduate Education majors. Each student was randomly assigned to one of the four experimental groups. The first factor was the topic of reading selection which was either heat flow or electrical conductivity. The second factor was the type of treatment which was either reading with glossed paraphrase notations or without gloss paraphrases. The treatment selections for the experiment were the "abstract" versions of two pssages used in Royer and Cable (1975). The length, in words, of the heatflow selection was 780 and 672 for the electrical conductivity selection. These selections were then programmed in PL/1 computer-language as the text content for the computer-aided courseware used in this experiment. A gloss paraphrase/no-gloss paraphrase option was included for both selections in the "control" file of the courseware program to automatically arrange the sequencing of the selection and treatment in the experiment. Also included in the courseware were separate "gloss-direction" and "no-gloss-directions" files to guide and direct subjects through the assigned treatment and a record-keeping "dump-statistics" file to store each subject's activation of gloss paraphrases by page and sequence and reading rates-per-page for subsequent analysis. (See Blohm, in progress, for detailed description and examples of the courseware program.)

The subjects were run in groups ranging in size from one to five. They were instructed by their respective directions to read their assigned text for the purpose of recalling as much information given as possible. These directions explained that no screen pages could be reread after they signalled for a new page. The gloss paraphrase treatment directions for the two selections instructed those assigned subjects to activate *all*

gloss paraphrases they felt would be necessary for helping them recall the text content. At the same time, however, they were encouraged to activiate *only* those glosses that were really necessary. In contrast, the no-gloss treatment directions for the two selections simply explained to those subjects assigned that no more than eight lines of text would appear on the terminal-screen page at any one time. Following the separate introductory statements and procedures for the two treatments, all subjects were instructed in the courseware to read the treatment selectin on the terminal using the assigned technique at their most comfortable reading rate. No time limits were imposed for reading. After they finished their assigned selection,t the subjects were asked to write down, in complete sentences, everything they could remember from their reading. They were allowed as much time as they desired for completing this recall task. A graduate assistant who was naive to the purposes of the experiment scored each of the recall protocols against a list of "idea units" established in Royer and Cable (1975).

Results and Discussion

Results of the study indicated that the group which received the reader-activated gloss paraphrase option on the computer for the heatflow selection recalled more idea units on the free recall measure ($\bar{x} = 18.57$) than any of the other three groups (gloss/electricity—$\bar{x}$=16.15, no-gloss/heatflow—$\bar{x}$=12.21, no-gloss/electricity—$\bar{x}$=7.15). Both groups receiving the reader-activated gloss option recalled more idea units than did the groups not receiving the gloss option, regardless of selection read. Results of an analysis of variance indicated that the differences were significant between the mean idea units recalled by the two treatment groups ($p < .000$) for both selections. No significant differences were found for the interaction between treatment and selection ($p < .007$). Further analyses indicated that no significant correlation existed between the number of gloss paraphrase activated and the number of idea units recilled for either selection. Evidently, the *number* of gloss paraphrases activated by students in the gloss option treatment while reading did not increase the quantity of their recall. Finally, results of T-tests indicated that no significant differences existed between the two treatment groups in terms of time spent reading ($p < .000$). The mean reading time was 12.1 minutes for the gloss group and 10.32 for the no-gloss group.

An apparent interpretation for the significant treatment effect found for offering optional reader-activated gloss paraphrases while reading is that the technique facilitated recall. The gloss paraphrase, when activated by the student during reading on the computer, might have activated the student's immediate comprehension by providing restatements of the text which more closely matched that student's prior knowledge and experience. That no significant correlation existed between the number of glosses activated and amount of recall may have been due to the comprehension-monitoring ability of the student which was promoted through the computer-aided treatment. Since the student was encouraged through the gloss paraphrase option to decide regularly while reading if the knowledge structures in the selection were being effectively encoded for later retrieval, the number of gloss paraphrases activated would depend on his or her prior experience with the knowledge contained in the selection. In addition, one activated gloss paraphase might have had a facilitative transfer effect for understanding other segments of the original text. Hence, the inclusion of the reader-activated gloss paraphrase option may have encouraged the student to not only monitor comprehension in terms of previous experience and learning but also in terms of actively relating earlier segments of text learning to later segments—an important metacognitive skill (Brown & Deloache, 1978; and Yussen, Mathews, & Hiebert, in press). Since the number of idea units contained in the two selections were not equal (i.e., heatflow=67, electricity=52), the significant difference found between the two selections was to be expected. That both selections were significantly better recalled by the reader-activated gloss option group substantiates the overall effectiveness of the treatment.

While no statistical differences were found for time spent reading, educationally, the gloss treatment group did spend 15 percent longer reading than did the no-gloss group. Over a longer reading assignment, the number of minutes spent might make quite a difference. Still, the results do suggest that implementing the computer-aided gloss treatment would not severely impinge on teachers' classroom instruction time. However, more testing with this treatment will be necessary before any educationally profitable conclusion may be drawn about the effects on time.

The results and interpretations of this investigation provide the foundation for further research and development of the computer-aided gloss option technique for ultimate implementation and experimentation in the classroom. Data from this experiment should first be reanalyzed for qualitative effects—depth of processing—as well as quantitative effects. Then replications of the experiment should be conducted to increase the data-base for examining the effect of a particular activated gloss on the depth of processing exhibited in the recall of knowledge structures paraphrased to explain the effect of the activated gloss paraphrase. Incorporating additional features (e.g., backpaging, reverse-image highlighting) in the courseware as well as promoting more comprehension skills and strategies (e.g., noting details, seeing author's organization) in the reader-activated gloss notations may further improve students' comprehension of text. The future for the use of such courseware in the classroom is very encouraging. This study and related investigations are viewed as my attempt to capitalize on the use of the computer in the classroom for promoting reading skills and metacognitive strategies to facilitate students' ability to learn from text.

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