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Contributions of different feedback assistance to text memorial representation

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Subjects were assigned to read one of two descriptions of a town. The route version was based on the town as a driver would encounter it, while the survey version provided a spatial description. Three feedback conditions were provided: (1) limited access to a map, (2) limited review of previously read sentences, and (3) an opportunity to read the entire text after processing. There were no differences in amount of material recalled or discrimination between old text and paraphrases, but feedback differentially assisted inferential reasoning. Feedback that supplemented the version provided proved more efficacious.

One of the more ubiquitous beliefs among both researchers and practitioners in teaching concerns the supposed efficacy of instructional assistance, particularly feedback (Berliner & Rosenshine, 1977). For example, even while Kulhavy (1977) was demolishing a number of sacred and simplistic assumptions regarding feedback, he still concluded that it should be given as often as possible. Our own research, however (Langer, Keenan, & Cumbo, 1992), suggests that insofar as text comprehension is concerned, feedback is not always that effective.

Originally, we axiomatically accepted the premise that feedback was an instructional necessity. Therefore our efforts were initially directed toward estimating the contributions of feedback to the comprehension of reconstructed text. Subsequently, we expanded our concept of assistance to include such devices as signaling (Langer, Keenan, & Culler, 1989). However, the inconsistency of our findings led us to conclude that the belief that "any help is better than no help" is not true. College students seemed to do rather well in reconstructing text of varying degrees of familiarity with or without external assistance. Indeed our initial interest in feedback subsequently resolved itself into two related issues: feedback and text comprehension (Langer, Keenan, & Nelson, 1991). This expansion of the problem is not very common, however. Reviews of the literature in educational research indicate that insofar as teaching is concerned, studies have generally been focused on the contributions of feedback to reading skills and outcomes (Moore, 1988). Absent has been any idea of a particular model of text comprehension. As we shall point out shortly, this is a serious deficit.

Feedback is usually defined as any form of assistance subsequent to a response, designed to inform or correct student performance (Langer & Keenan, 1984). The feedback may range from a rather simple yes/no, to assistance that not only provides the correct answer, but also directs the student to engage in self-corrective behavior (Andre & Theiman, 1988). However, the more complex feedback procedures may become instructional tasks in themselves (Kulhavy, 1977). The form of feedback itself is another issue. Holding (1965) pointed out that the feedback provided may vary along any number of dimensions such as type, timing, density (i.e., constant or intermittent), and so forth. The number of permutations and combinations is awesome. To make matters even more interesting, in an analysis of the contributions of feedback to concept discrimination, estimates of effect sizes for interactions were greater than those for principal effects (Getsie, Langer, & Glass, 1985). Indeed, our own research efforts in recent years have been focused on interaction effects (Langer et al., 1992).

The question of whether feedback is motivational or an information provider seems to have died down. The original assumptions that categorized feedback as reinforcement were a product of the development of programmed instruction within a behavioristic framework (Kulhavy, 1977; Langer et al., 1992). However, an accumulation of research findings suggesting that praise for a correct response (i.e., reward) was not as effective a contributor to learning as was being informed of an incorrect response (i.e., punishment) seems to have drawn the issue to a close (Barringer & Gholson, 1979; Getsie et al., 1985). Of course, it also seems evident to us that if feedback primarily provides information, the information must bear some relation to not only what is to be learned but how the material is being processed. Unfortunately, the latter issue has not always been considered. That is, arguing for the success of feedback based solely on some set of outcomes can be misleading.

Andre and Theiman (1988), for example, found differences in the relative contributions of feedback of adjunct questions in terms of concept acquisition as opposed to learning facts. Indeed all too often experiments designed to estimate the effects of feedback have required a factual level response. The early and persistent influence of

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ırism contributed to the problem, insofar as an as-
ɔnist model was accepted as a given. This model
archers to decompose more complex learning into
'erifiable units, generally at a level related to facts
/y & Anderson, 1972).
ıe other hand, the absence of any systematic em-
nt of text comprehension models is also a serious
ı. If anything, typical educational designs involv-
h activities as the study of reciprocal teaching on
nprehension (Moore, 1988) ignore how the infor-
is being processed and stored. As Kulhavy (1977)
out, students do not necessarily come to every
ional event completely naive regarding content.
ssistance in the form of generic instructional pro-
ɔan only lead to eventual incorporation of super-
procedural behaviors, especially if there is some
: effect.
ır work, we have incorporated Kintsch's (1988)
ction-integration paradigm and categories of uni-
representation (Kintsch, Welch, Schmalhofer, &
1990). Our data led us to acknowledge that unless
k is tied to some model of how the assistance fits
going text manipulation, there is little hope of deriv-
meaningful relation between help and comprehen-
ınger et al., 1992). Kintsch (1988) argued that the
ɛxt propositions are formed directly from the text
ıt are then elaborated and integrated into a coher-
-based representation, guided by the prior knowl-
ailable. Clearly this is an iterative process in which
.t to be incorporated is checked against the current
e. The model suggests that several layers of knowl-
teract simultaneously in the task of understanding
se. Evidence for the model may show a surface rep-
ion of verbatim text, a propositional representation
ıntic meanings, and a situation representation of
tic interpretations. Linguistic elements and syntactic
(surface representation features) interact with prop-
(semantic representations) and situation elements
h et al., 1990).
situation representation was tested in a series of
ıents by Perrig and Kintsch (1985). In that inves-
., there were two descriptions of a mythical town
Baldwin. One version was composed in terms of
ɛntial set of instructions for driving through the
ınd the other in the context of a spatial or geo-
layout. Surface representation was detected by
tion of verbatim sentences, text-based represen-
/as detected by propositional recall, and situation
ntation was assessed by inferences.
study is the fourth in a series based on Perrig and
's (1985) work. The current research differs from
lier work in several important ways: (1) The text
ɛnted in appropriate canonical order rather than
led, (2) several different feedback types are used,
feedback in these studies is defined in terms of
ıce given in response to an overt request for aid,
: assumption that it is influencing current process-
manner similar to hypothesis testing. The origi-
nal description of the town has been slightly modified, so we chose to call our town Mapleton. As in Perrig and Kintsch's research, there are two descriptive versions of the town, each 25 sentences long. One is a spatial or survey description, while the other is a route version that guides the driver through the town. The stories were typed one sentence to a card and read aloud one at a time. This was designed to control the reading process. The feedback provided was, as in previous studies, a map of Mapleton, a chance to review previously read text during the processing, or an opportunity to read the complete text at the end of the processing. We uncovered in our third study a statistically significant version × feedback interaction, which we decided was worth pursuing. Such findings of interactions have been limited in previous work. There are, however, two differences in the present study: (1) In order to enhance recall scores, which have been quite low in the past, all three feedback groups read the complete text after the feedback conditions, and (2) in order to provide a common direction orientation for both versions, for the route version one sentence provided a specific reference to direction, and the map indicated north.

METHOD

Our subjects were 42 general psychology students. As in the past, the sentences were printed one to a card, and the subjects read each card aloud. Three feedback conditions were provided, as follows: (1) In the *map* condition, the subjects, after reading a sentence, were allowed to see a schematic map of Mapleton for up to 10 sec. They could make five such requests, totaling 50 sec. (2) In the *sentence* condition, the subjects, after reading a sentence, could study a sentence they had just read for an additional 10 sec. They could make five such requests, totaling 50 sec. (3) In the *text* condition, after reading the 25 cards, the subjects had the complete text made available, which they could study for 50 sec. Then all groups read the complete text. This gave us a six-group comparison, based on a two versions (route/survey) × three feedbacks (map/sentence/text) design.

So that we could assess semantic representation, after reading the cards the subjects were first asked to write down what they remembered. This recall protocol was scored for both number of propositions and order of report. Upon completion of the protocol, the subjects were presented with a 32-card deck, consisting of old sentences from both versions as well as new sentences. The latter were paraphrases written in either the route or the survey style, and they could be either true or false inferences.

Situation memory was determined as follows: The subjects read each sentence aloud and determined whether the sentence was "true" or "false." True and false cards were placed in separate piles. It follows that an original sentence from either version is a true inference, by definition, whereas paraphrases, as previously noted, could be either true or false.

To assess surface representation, the subjects then went through the "true" pile and indicated which were "old" sentences. This recognition measure constituted our index of surface memory—that is, verbatim sentence recognition. Obviously, an original sentence from the other version as well as a paraphrase written in either version style could be seen as true, but could not appropriately be classified as old, given the version the subjects had previously read.

RESULTS

Again, following Perrig and Kintsch's (1985) previous work, we measured three dimensions of memory. Seman-

tic memory was assessed by total number of propositions recalled, as well as the agreement of recall order with original order (tau). Discrimination between old and new sentences measured surface memory, and situation memory was assessed by inferential reasoning. The d' statistic was used for our analyses of surface and situation memory.

Neither the main effects nor the interactions for recall and recognition were statistically significant, nor were they even very interesting. Yet there were trends consistent with previous studies. For example, propositional recall (i.e., semantic memory) was marginally superior for the route version (44.20) in comparison with survey (39.29). The sentence (44.83) and text (43.14) feedback conditions were marginally superior to map feedback (36.57). For recognition, the differences were all statistically nonsignificant. The route and survey mean differences were hardly distinguishable, whereas among the feedback conditions, text was marginally superior.

Our assessment of inferential reasoning created some problems. Initially, we decided to separately analyze inferential reasoning on the basis of the version read as distinct from the version not read. The reader will recall that subjects reading either version used a common set of mixed statements. For inferential reasoning, again, there were old and new sentences from both versions. The first results yielded negative d's, which are rather difficult to explain. However, an item analysis revealed that a number of the paraphrases were more in the nature of trick-item test questions, so we decided to eliminate the four worst offenders, two from each version. We then combined all inferences, and the following discussion is based on those modifications.

Although the findings for inferential reasoning were also not statistically significant, the interactions were reliable and in a direction we have seen earlier (Langer et al., 1992). Map feedback (.48) was superior to text (.04) for the route version and only marginally lower than sentence (.56) feedback. In contrast, contributions in the sentence (.67) and text (.43) feedback conditions increased for the survey version, whereas the map (.07) contributed very little. It seemed to us that the spatial information provided by the map added to an understanding of the route version, which is basically a verbally guided tour of the town, whereas the verbal feedback provided by the sentence and text feedback conditions supplemented the spatial or geographic description of Mapleton. Figure 1 shows the essentially parallel gains for both the text and the sentence feedback conditions, while map assistance decreases dramatically.

DISCUSSION

Aside from the experimental findings that we will discuss in a moment, and unlike many of our colleagues in educational research, we believe that valuable information regarding text processing can be obtained within a controlled laboratory setting. From an instructional point of view, it would appear that assistance in this study was effective in

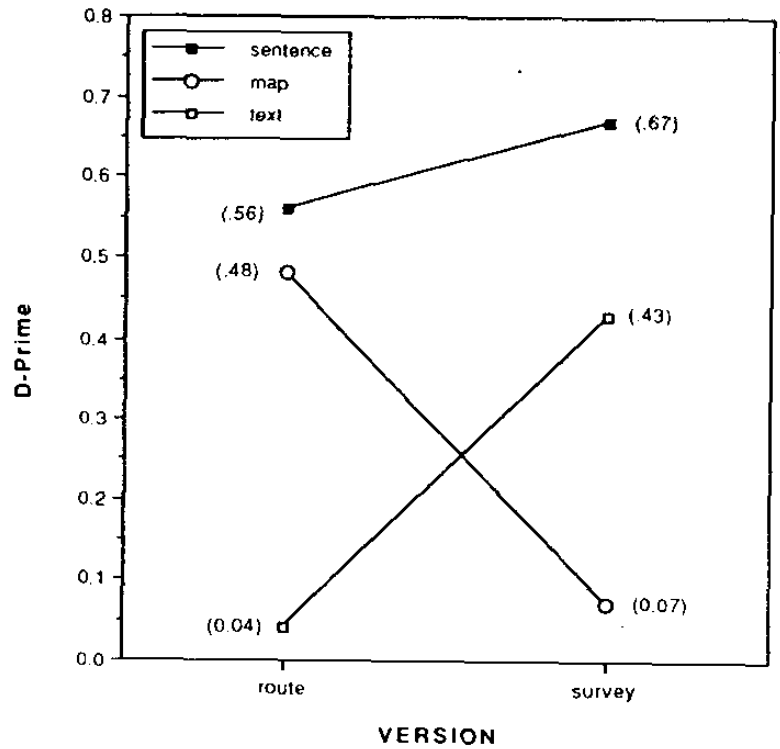

Figure 1. Route and survey versions × map, sentence, and text feedback interactions for selected data.

.g supplemental information to assist processing for the text pro-
'here is little reason to suspect that feedback served basically
tive function. Again, when subjects request assistance, we as-
at it is the outcome of a direct decision to test certain assump-
out understanding. Indeed we have argued in the past that text
ng is not too dissimilar from problem solving, insofar as it in-
esting hypotheses. Currently we treat such requests as actual
points in the processing, with feedback providing the needed
iental information.
, in Kintsch's (1988) model and in Kulhavy's (1977) work, there
ear recognition that information possessed or obtained by the
nodifies subsequent processing. For example, early in our own
(Langer, Keenan, & Medosch-Schonbeck, 1985), we found
iects were able to get the gist of scrambled discourse even though
atively few actually knew much about the historical referent,
a this case was the development of the atom bomb at Chicago
:o Fermi. That is, they could tell us it was about the atom bomb
ld War II, but not much more. It could be argued, of course,
lege students may have mastered the recall of little-understood
ls to an art form.
rtheless, we believe that what students have learned, or are cur-
:quiring, must be reviewed in the context of some model of pro-
While there are any number of models of reading comprehen-
ilable (e.g. Britton & Black, 1985), failure to incorporate any
tic analysis of how text is processed can lead to the indiscriminate
djunct aids, feedback being the first choice. We continue to be-
at assistance must be based on assumptions about the learning
es involved rather than a set of a priori principles of manage-
ised on too-often low-level outcomes.

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