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Limited evidence suggests that different kinds of inserted questions may be differentially effective in promoting learning from text. In this experiment one of four groups had inserted knowledge-level questions and a second group, comprehension questions. It was argued here that: (1) in previous adjunct-question research, treatment groups have been forced to study in a manner that would not obtain outside of experimental conditions; (2) valid control groups have not been employed. Therefore, adjunct groups were permitted freedom to study according to preference, and two controls were run: idiosyncratic study, and passive reading. Subjects in the idiosyncratic condition consistently outperformed the others, but overall differences of test means were not significant. (Author)

A COMPARISON OF IDIOSYNCRATIC STUDY, PASSIVE READING AND INSERTED QUESTION TREATMENTS IN LEARNING FROM TEXT

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Limited evidence suggests that different kinds of inserted questions may be differentially effective in promoting learning from text. In this experiment one of four groups had inserted knowledge-level questions and a second group comprehension questions. It was argued here that: 1. in previous adjunct-question research, treatment groups have been forced to study in a manner that would not obtain outside of experimental conditions; 2. valid control groups have not been employed. Therefore, adjunct groups were permitted freedom to study according to preference, and two controls were run: Idiosyncratic study; and Passive reading. Ss in the Idiosyncratic condition consistently outperformed the others ($p<.001$) but overall differences of test means were not significant.

A COMPARISON OF IDIOSYNCRATIC STUDY, PASSIVE READING AND INSERTED QUESTION TREATMENTS IN LEARNING FROM TEXT

It is now generally believed by researchers interested in developing an understanding of how students learn from text that inserted post questions asking about specific information enhance the learning of that information (Rothkopf, 1966) and of information categorically related to the questions (Rothkopf & Bisbicos, 1967). Given that S hasn't the capacity or interest to learn or memorize everything that may be asked about the text he has studied, it is not surprising that question related learning is raised where the passage just read is sufficiently short and clear enough to persist in immediate memory while the question is being answered, since the S has an opportunity for selective rehearsal of the questioned information (McGaw & Grotelueschen, 1972). The rather surprising finding of many inserted question studies has been that acquisition of information not directly related to the inserted post question answers is also raised.

To enable as clear an analysis of the learning process as possible, Rothkopf (1966) and subsequent investigators had directed the inserted post-question groups to study their text under the constraint that, once the S sought to answer a post question, preceding text upon which the question was based could not be reviewed throughout the remainder of the experiment. Since it is unrealistic to suppose that students preparing for examinations in their regular school work would accept such a restriction on their study activity, the results of these well-controlled experiments cannot be readily generalized to natural settings. In a recent experiment which per-

mitted reviewing, inserted question groups actually demonstrated acquisition inferior to the controls on a test which covered information having only an incidental relationship to the inserted questions (Hiller, 1972). In the study reported here, Ss having inserted post question treatments were permitted to review their text as they wished.

A second problem relating to external validity concerns the standard control groups which have traditionally been directed to read passively. Questionnaire data concerning how college students study in non-experimental settings has shown that passive reading is quite rare (Hiller, 1972). According to anonymously supplied information by 428 Ss, 47% usually write notes while reading, while another 41% claim to write notes sometimes--only 12% reported that they never write notes. Data concerning underlining presented the same pattern of overt study activity. Perhaps surprisingly, 50% reported that they outline usually or sometimes. Thus it would appear that passive reading does not represent a valid procedure for estimating the effect of experimental treatments which are intended for practical application. Therefore, a control group, designated Idiosyncratic study, was employed in addition to the standard Passive reading control. Furthermore, the inserted question groups were also permitted to exercise their active study skills.

A third element of the research conducted for this report related to the nature of the questions asked of the S. Increasingly, educators and researchers alike have been concerned with promoting levels of cognitive learning higher than knowledge or rotely acquirable information. Toward this end, inserted post questions classified by the Bloom Taxonomy as in

the Comprehension domain were compared for effectiveness with Knowledge questions. Previous research on this topic has not produced consistent results (Denzel, 1971; Hunkins, 1968 & 69; McKenzie, 1972; Quiring, 1972).

METHOD

Subjects

The Ss (90 in all) were students enrolled in Educational Psychology, and they were fulfilling a course experimentation requirement.

Lesson and Tests

The lesson was about a particular theory of economic growth in nations, and was taken verbatim from the Kropp & Stoker (1966) collection. The text contained 1500 words, was rated by the Ss as being of average readability, and was presented in a booklet with approximately 200 words on each of eight pages. The test, also adapted from Kropp & Stoker, contained twenty knowledge and twenty comprehension multiple-choice questions which, by judgment, could not be answered by using any of the information covered by the inserted question treatments. Since the fact of question related learning is undisputed, the test did not include the inserted questions.

Treatments

As described above, two control groups were run: 1. Passive reading, in which the Ss were instructed to study as they wished except that they were not to mark the lesson pages nor to write notes on any other paper; 2. Idiosyncratic study, in which the Ss were instructed to study in any manner they wished including the opportunity to write on the lesson, or

underline, etc. One of the two treatment groups had eight inserted knowledge post questions, one question after each page, and the other group had comprehension questions. The inserted questions were randomly drawn from the item pool used to form the criterial tests. The inserted question groups were informed by their instructions that there would be a question after each page and that they should not go on to any question until they felt confident about the page just read. The directions described the questions as study aids or check points. The Ss were required to respond to the questions on their data sheets without looking back at the text. However, the directions made it clear that they could review the lesson after answering the question; while looking ahead, or erasing answers to the inserted questions were barred and described as defeating the study technique. In addition, the Ss were given the same explicit permission to employ active study techniques as was given the Idiosyncratic control.

Questionnaire Data

Immediately after finishing the lesson, but prior to the test, all Ss were given a questionnaire which asked them to rate the utility of their study technique, the readability level of the lesson, and their interest in the lesson's topic. The rating scale was scored from 1-5, with 5 most favorable.

Procedures

The Ss were randomly assigned treatments as they entered a large lecture hall. They were seated in alternate spaces, given all materials in envelopes, and afforded up to 35 minutes study time. The general purpose

of the experiment, to develop information concerning the relative effectiveness of different study methods, was explained and their cooperation was solicited. All Ss were informed before studying that the test to follow would cover "your retention of facts and your understanding of the ideas presented." In summary, the Ss studied the lesson at a self-controlled pace, filled out the questionnaire, and then immediately took a combined knowledge and comprehension test. Observation by the Es indicated that lack of time did not directly affect studying nor testing.

RESULTS

Learning for all Ss was substantial in that the overall combined test average was 61% correct for the 40 items. Inspection of test means, see Table 1, shows that the Idiosyncratic group performed slightly better than the others on both the Knowledge and Comprehension questions. However, each ANOVA for the subtests and the combined test showed that differences among treatment means were not significant at $p < .10$.

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Insert Table 1 about here

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A second, finer grain analysis focused on the pattern of results demonstrated by the forty, criterion test items. From acquisition results in Hiller, 1972, it could be hypothesized that test performances would be ranked:

Ha: Idiosyncratic > Passive reading > Knowledge > Comprehension,

under an assumption that the inserted knowledge questions were relatively

easy and the comprehension questions relatively hard. (This assumption was verified by the data since the inserted knowledge questions had a difficulty level of 81%, while the comprehension questions had a difficulty level of 59%.) The number of items for which each treatment earned the highest score (the proportion of Ss correct, counting ties) was:

Idio.= 23; Pass R. = 6; Know Q. = 9; Comp Q. = 6.

Means for the item ranks were (highest rank scored as 4 and lowest as 1):

Idio = 3.24; Pass R. = 2.28; Know Q. = 2.48; and Comp Q. = 2.06.

An L test corresponding to Ha yielded L = 1071.5 for the 40 test items, so that Ho was rejected at $p < .001$. The rejection of the null hypothesis is due primarily to the correct prediction of Idiosyncratic as highest and Comprehension as lowest, since the Knowledge group was slightly higher than Passive reading. A Chi Square test of the difference between Idiosyncratic and Knowledge item performance was also significant, $\chi^2 = 6.4$, $p < .01$.

The questionnaire data showed that S interest in the lesson was predictive of test performance, and liking for the study technique was predictive of comprehension test performance to a minor extent (see Table 2).

Insert Table 2 about here

The lesson received ratings describing it as average for both interest and readability. Ratings for the study methods did not significantly differ.

DISCUSSION

In contrast to the currently held generalization concerning the value of inserted post questions for incidental learning, the present results

suggest that incidental learning is slightly lowered, if it is affected at all. The difference between these results and those of previous studies may be attributed to changes in the experimental treatment directions. With review permitted, but note writing, underlining, etc. not allowed, Hiller (1972) had found that relatively hard questions (difficulty level of 53%) produced a significant depression of learning for a lesson of average readability. With the arbitrary restriction on active study skills removed, this experiment found the depression to be of a slight, nonsignificant magnitude; although it is not completely certain that reduction of the depression is entirely attributable to the eased restriction, since the lesson employed here had a significantly higher interest rating than the lesson used by Hiller, and interest correlated with learning.

The finding that Comprehension and Knowledge treatments were not differentially effective is consistent with previous research by Hunkins (1969), Quiring (1972) and Denzel (1971). Denzel (1971) compared the effects of Application and Analysis inserted post questions (review not permitted) along with Knowledge and Comprehension and did not find any differences among these treatments, nor between these treatments and a Passive reading control, for incidental learning. It would seem that a text processing analysis is needed to explain hypothetical effects specific to question types. In the present study, inspection of the inserted questions revealed that both the Knowledge and Comprehension types could be answered primarily by information contained in only one, or a very few, lesson sentences. Thus, answering the questions did not force careful,

extended processing of text incidental to the questions. In fact, one may perceive something of a dilemma here, since learning would not have been classified as incidental had the inserted questions required such extended processing.

Concerning practical implications that may be drawn from this study, it would seem at first glance that the net effect of inserted questions ought to be positive, because incidental depression appears slight while direct instructive effects may be substantial. However, there yet remains an important practical question unanswered by this and similarly designed experiments--how will students actually use inserted questions when studying for real examinations? If the study questions did not form a significant part of their examinations, we may predict that attention to them would extinguish. On the other hand, if the inserted questions did form a major part of their tests, we may predict that students would look ahead to find the questions while studying, and thereby risk the loss of incidental learning found by Rothkopf (1966) and others for pre-question treatments. If this analysis is correct, then an effective pedagogical use of inserted questions would require that they comprehensively represent both instructional objectives and examination test items.

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TABLE 1

Mean Criterion Scores for all Treatment Groups

Treatments	N	Knowledge		Comprehension		Total		Total %
		M	SD	M	SD	M	SD	
A - Comprehension Question	23	12.61	2.88	10.87	3.15	23.48	5.67	58.70
B - Knowledge Question	22	12.77	3.36	11.41	2.93	24.18	5.11	60.45
C - Idiosyncratic	23	13.61	3.33	12.44	3.31	26.04	5.72	65.10
D - Passive Reading	22	13.09	3.45	10.86	3.53	23.95	6.38	59.90

TABLE 2

Overall Questionnaire Ratings, Test scores, & Intercorrelations

			Intercorrelations[1]				
	M	S.D.	1	2	3	4	5
1. Passage Interest	3.1	1.1					
2. Passage Readability	3.0	.7	56**				
3. Method Liking	3.5	1.1	43**	10			
4. Knowledge Subtest	13.0	3.3	24*	01	05		
5. Comprehension Subtest	11.4	3.3	34**	15	28**	56**	
6. Total Test	24.4	5.8	33**	09	19	88**	88**

[1] *p. <.05; **p <.01 (two tail tests)