

readers in the reading of text; and one of the more frequently used steps in these strategies is the use of questions. (E.g., Washburne, 1929; Robinson, 1941; Gerken, 1953; Wrenn and Larsen, 1955; Morgan and Deese, 1957; Robbins, 1957; Hare and Pulliam, 1980).

Utilization of questions during reading may take two forms. Most frequently the form is one which makes use of teacher-prepared, author-prepared, or text or commercially-prepared questions. Less frequently used is the technique which involves student preparation or generation of questions over the material read or being read. On the basis of such earlier studies as those reported by Germane (1920), by Distad (1927), by Washburne (1929), and by Holmes (1931), and results obtained in many other studies since then, it has generally been conceded that teacher-developed or generated, or other-than-student-generated, questions serve to facilitate reading comprehension and recall. More recently, the effect, nature, and types of questions used and question location and frequency within a prose passage have been the concerns in a number of studies, such as those by, e.g., Frase (1967, 1968); Frase, Patrick, and Schumer (1970); Rothkopf, (1966); Strollo and Bliesmer, (1972); Watts and Anderson, (1971); and in a recent review of the literature by Anderson and Biddle (1975).

Particular impetus was given to studies in this area by Rothkopf's introduction of the term or concept, "mathemagenics," in the 1960's (see, e.g., Rothkopf's 1966 report and Frase's of 1968.) and by Rothkopf's and Frase's extensive research in this area. Many of the mathemagenics studies have also indicated that questions have facilitative effects on recall and that this recall is enhanced when questions come at the ends of passages rather than at other positions. (Bruning, 1968; Frase, 1967, 1968; Rothkopf & Bisbicos, 1967). This has not been a consistent finding, however. Strollo and Bliesmer (1972) found that none of their five treatment conditions (questions before or after selections or passages, interspersed before or after short sections within passages, or no questions) yielded results significantly superior to any of the other treatments. (It should be pointed out, however, that students in some of the groups had emotional problems and appeared to view questions as "test-like events" which, to them, were threatening.)

Benefits also appear to be stronger when student-constructed, rather than multiple-choice, responses are required. Further, higher level questions, such as inference-, evaluation-, and appreciation-type questions, seem to prompt more thorough study and recall and to improve incidental as well as specific learning and recall.

During the past several years, several investigators have been concerned with the effect on comprehension of having students generate their own questions while reading, with the belief, as Morse has stated, "that students can direct their own attention to relevant material through self-questions." (Morse, 1975, p. 2). As a result of one of their studies, Frase and Schwartz (1975) also recommended that students should be urged to ask their own questions while reading so that they might better develop as independent readers. In their study, Frase and Schwartz assigned high school students to tutorial pairs and had them read a biographical passage of some 1,200 words which was divided into three sections. The partners of each pair alternated in generating and answering questions, after each had read the selection. Each partner then read the third selection and studied on his/her own. The means of the questioning and answering conditions test scores differed significantly from those obtained under the read/study condition; but they did not differ significantly from one another.

In a second experiment by Frase and Schwartz (1975), college students (freshmen) read only the first two sections of the biographical passage, with each student generating questions about the first section as he read but reading and studying the second section without generating questions. Test scores obtained

USE OF STUDENT-GENERATED QUESTIONING PROCEDURES TO STIMULATE AND PROMOTE READING COMPREHENSION SKILLS OF STUDENTS

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Teachers have been advised, instructed, and urged to use questions and questioning procedures for successive periods over the years. (Hasty examination of the teacher's guides or manuals which accompany various basal reading series for the primary grades will help in quick verification of this.); and they have been and are doing so with relatively great frequency. Various strategies for using questions have evolved and been proposed for guiding readers into doing effective reading of text, especially since the time of Thorndike's oft-cited 1917 report, (Thorndike, 1917), Thorndike suggested that exercises with oral reading be replaced by silent reading in which the student be "guided" in his reading to find the answers "to given questions or to give a summary of the matter read, or to list questions which it answers" (1917, p. 332). Since Thorndike's time, many reading strategies have been proposed to guide

revealed a significant difference in mean scores between the question-generating condition and the read/study condition.

In Schmelzer's study (1975), college student subjects were assigned to one of four treatment groups and read a logic text selection of approximately 1500 words. One treatment group previewed the passage for five minutes and then generated five questions about it; students in a second treatment group were given the passage divided into five sections and were instructed to read each section and generate a question covering the content of that section; a third group read the entire passage and generated five questions about it; the fourth group read the passage twice. While the effects, as judged on the basis of criterion test scores, were "not strong," each of the three questioning groups scored significantly higher than the read/reread group, when the high school rank factor was controlled.

Duell (1977) studied the effects of student-generated questions on comprehension of four passages which described psychological processes by assigning each of his college student subjects to one of three experimental groups. One group received the 4 passages, a list of objectives, and instructions to write questions to match the objectives; a second group was instructed to read and study the passage and the objective; the third group was instructed to take the criterion posttest without reading the passage. The criterion test included lower level, or recognition, items which required recognizing an example of a process copied from the text and higher level, or application, items which required identifying the names of the process represented by new examples of the process. Analysis of test scores revealed significant advantages for writing questions for both low and high level objectives over reading and studying the passages and objectives.

In a pilot study conducted by Chodos, Gould, and Rusch (1977), students in fourth grade classrooms were divided into 4 sections, and were then administered both an immediate and a delayed recall measure. Group 1 students read a 50-word prereading summary of each section and wrote four questions for which they might expect to find answers when reading the selection. Group 2 students generated questions following the reading of each section. Students in Group 3 were instructed to generate questions after reading each summary and also after reading each section (a combination of treatments 1 and 2). Group 4 students read and studied each section with a summary as an advanced organizer. Group 5 students were instructed to read and study each section. Students in Group 6 read and studied two sections at a time. Immediate recall test results indicated significant differences favoring the group which generated questions from a summary over the group which generated questions following the reading. However, on a delayed recall test (given a week later) the group which generated questions from a prereading summary was significantly superior only to the read/study group. There were indications that even poorer readers improved in ability to generate questions; facilitative effects of the student-generated question strategy were suggested; and significant differences found in immediate and delayed recall favored the group which generated questions from a pre-reading summary.

In a brief study reported by Andrei and Anderson (1978), rural high school seniors were assigned to either a questioning-with-training group or a read-reread group, with training in question-generating and administration of the *Wide Range Vocabulary Test* being done on one day and study of the two passages under the assigned treatment and the posttesting being done the second day. Results obtained indicated a greater effect of the question-generating strategy upon the performance of the low verbal ability student than upon that of the high verbal ability group, with the latter groups scoring about the same after the brief treatments, whether they had generated questions or read-reread. The investigators further reported,

after analysis of the generated questions, that a definitely higher possibility of answering a posttest item correctly ensued after generation of a good comprehension question than after generation of a "less than adequate" one.

In a second experiment by Andrei and Anderson (1978), with the same reading passages and training materials, rural senior high school students were randomly assigned to a questioning-with-training, a questioning-without-training, or a read-reread group. The practice passage at the end of the training materials was replaced with one of the 3 reading passages; so each student practiced on one of the 3 passages on the first day and received the remaining 2 for experimental purposes on the second day.

Both the question with-training and the question-without-training groups scored higher on the criterion test than the read-reread group; but the two questioning groups did not differ from each other. Further analyses indicated significant interaction between treatment and verbal ability and between item type and verbal ability, with a significant main effect for treatment and verbal ability. It was also reported that the trained group generated a significantly greater percentage of good comprehension questions and that the probability of correctly answering a posttest item was greater after having generated a good comprehension question than after having generated a "less than adequate" question.

The results reportedly obtained in the Andrei and Anderson studies and the several others which involved study of effects upon comprehension of student-generated question strategies give strong indication that student-generated questions can effect improved comprehension and that training in question-generation can lead to improved skill in constructing good comprehension questions which, in turn, apparently has a positive effect on comprehension improvement.

However, in several reported studies, use of student-generated question strategies did not reveal any significantly different effects. Pederson (1976), in a study in which he used the same materials as those used by Schmelzer (1975), whose study was referred to earlier, reported that he was not able to replicate Schmelzer's results. Bernstein (1973), in a 1973 study and Owens (1977) in a later study were also unable to find an effect for student questioning during a study.

The senior presenter carried on a very brief exploratory probe with two classes of students enrolled in a college reading improvement program during the recent Fall Term. Approximately 40 students were involved. Materials used were rate-comprehension selections from a fairly-widely-used series of commercially-prepared practice materials. Each selection was 400 words in length, was of a lower-high school difficulty level, and was followed by ten commercially-prepared questions over the selection. At the beginning of each of 3 successive class sessions, students were given a selection and were instructed to read the selection and to write five good three-response, multiple-choice questions over the selection. During the first session, a brief discussion of what is involved in or what makes for a good multiple-choice item was conducted before the reading of the selection. After they had read a selection and had written the five items, students submitted their items and the selection and were then given the ten commercially-prepared items to answer. At the fourth session, following the third and last question-writing session, the purpose of the probe was briefly explained; and students were asked to make written comments or suggestions concerning the probe.

This exploratory study was not formally conducted; nor were results formally analyzed. However, student's comments, questions, and performance on commercially prepared questions were read, studied, and analyzed informally. A number of students remarked that many of their questions were practically the same as the commercially-prepared ones; study of their questions supported this. Several commented that they thought

their questions were better than those which accompanied the material; this seemed to be supported in a number of instances too. Some also commented that they thought they were comprehending a selection better by the third session; and perusal and cursory study of successive score changes tended to support this also.

The junior author of this paper also conducted a brief exploratory study with Grade 7 and Grade 8 students in his developmental and remedial reading classes in a Pennsylvania rural area school system. Students tended to respond favorably to this work. Brief exploratory efforts to give training to students in generating their own questions yielded some definitely positive indications.

The real present concern of the present authors of this paper is not only with the possibility of definite significant effects of student-generated question strategies upon reading comprehension skill but also with the possibility of training students in the use of this strategy and with the relative effects of such training at various stages of a student's school life or years. While a few reported studies have involved children at elementary school levels, the majority apparently has been with senior high school and college level students, who have had a considerable number of years to develop, establish, and reinforce skills, be they good or bad. What might be the influence of training in generating questions on the comprehension skills and habit of students at early school levels, such as the primary grades? What types of training might be most beneficial? How long a period might be necessary? How much will the length of training vary according to the level at which such training is started?

It was questions such as those just raised, and study of reports referred to in this presentation and others, which prompted planning for an exploratory study which was discussed in a presentation at this conference last year. (Bliesmer, McMurtrie, and Johnson, 1981). The carrying out of plans for exploratory research and probes which were anticipated in that earlier report were delayed, partly because of "Buckley amendment aftermath" and partly because of unforeseen administrative changes in schools in which subjects for the investigation were to be found. This led to considerable curtailing of the procedures planned and the conducting of the much-briefer-than-planned probes which have been referred to. Study of the various reports and other factors referred to have led to the planning of a study at the dissertation level; and final preparation for formal dissertation proposals are presently in progress.

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