

Synthesis of Research on Teachers' Questioning

MEREDITH GALL

The hundreds of questions the typical American teacher asks on a typical day reflect the great popularity of the recitation method. A recitation is basically a series of teacher questions (usually about textbook content), each eliciting a student response and sometimes a teacher reaction to that response.

The prevalence of teaching by recitation has been found in previous reviews of research on teachers' questions, which include studies going back to the turn of the century (Gall, 1970; Hoetker and Ahlbrand, 1969). Recent studies of classroom teaching (Dillon, 1982a; Durkin, 1978; Sirotnik, 1983) confirm that the recitation method is still widely used.

Because questions occur so frequently in classroom teaching, we are led to wonder about their effects on

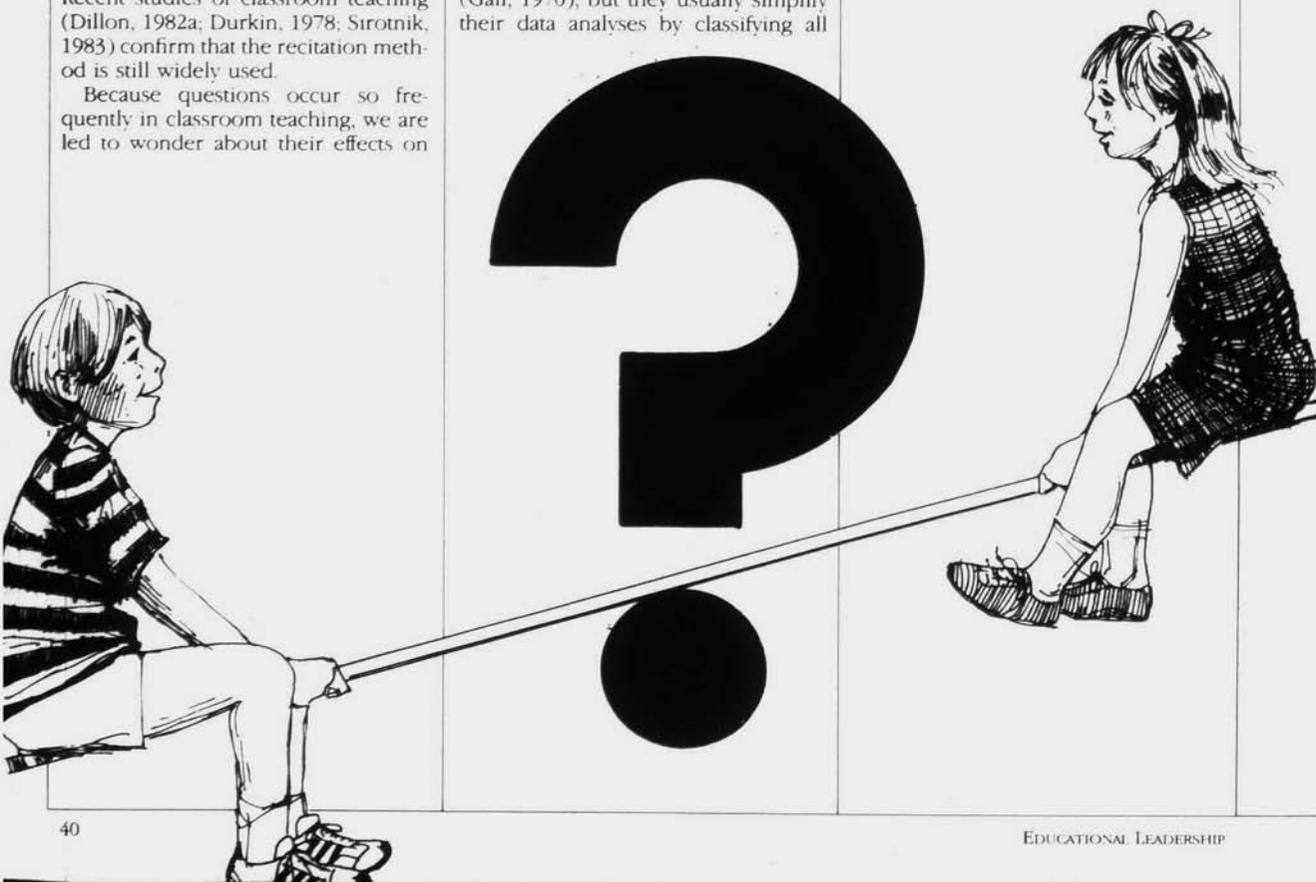
students. Do teachers' questions help students learn the curriculum? Do they promote the development of thinking skills? Are some questioning practices more effective than others? Research prior to 1970 provided few answers to these important questions; since then, however, many relevant investigations have been carried out.

Effects of Fact and Higher Cognitive Questions

Researchers have developed many systems for classifying teacher questions (Gall, 1970), but they usually simplify their data analyses by classifying all

teacher questions into just two categories: fact and higher cognitive. Fact questions require students to recall previously presented information, whereas higher cognitive questions require students to engage in independent thinking.

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Do students learn more when teachers emphasize fact questions or when they emphasize higher cognitive questions? When Dunkin and Biddle (1974) and Rosenshine (1971) reviewed early studies on this problem (most of them from the 1960s), they could find no clear trends in the research results. Heath and Nielsen (1974) strongly criticized these studies for their methodological flaws.

Rosenshine (1976) subsequently reviewed a set of three large correlational studies completed in the early 1970s. He interpreted their results as indicating that students learn best when teacher questions "tend to be narrow, pupils are expected to know rather than guess [the] answer, and the teacher immediately reinforces an answer as right or wrong" (p. 365). "Narrow" was Rosenshine's term for a fact question.

In addition to the correlational studies reviewed by Rosenshine, experiments have been conducted on the effects of emphasizing fact or higher cognitive questions in recitations. These experiments were reviewed by Winne (1979), who concluded that "whether teachers use predominantly higher cognitive questions or predominantly fact questions makes little difference in student achievement" (p. 43).

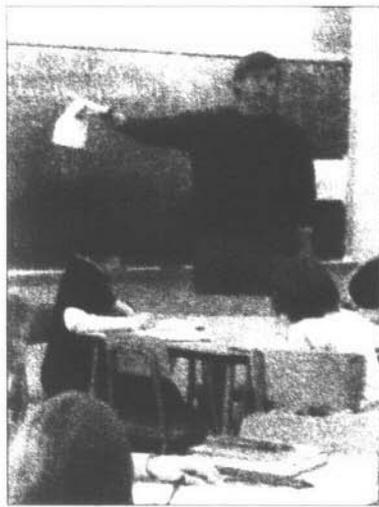
The same set of 18 experiments reviewed by Winne, plus two additional experiments, were subsequently reviewed by Redfield and Rousseau (1981). Instead of using Winne's "voting method" to pool results across experiments, they turned to the more sophisticated method of meta-analysis. Redfield and Rousseau concluded that "predominant use of higher level questions during instruction has a positive effect on student achievement" (p. 241). They did not define "predominant use," but it probably meant

a recitation in which at least 75 percent of the questions are at the higher cognitive level. Student achievement in the experiments was measured by tests requiring fact recall and demonstration of thinking skills.

Thus, the Rosenshine review and the Redfield and Rousseau review reached firm but contradictory conclusions about the effectiveness of fact and higher cognitive questions. The contradiction, can be resolved, I think, by analyzing the student populations represented in the two reviews. Each study reviewed by Rosenshine involved disadvantaged primary grade children. The studies reviewed by Redfield and Rousseau involved students representing a much wider range of ability and grade levels. Taking this difference into account, I would conclude that (1) emphasis on fact questions is more effective for promoting young disadvantaged children's achievement, which primarily involves mastery of basic skills; and (2) emphasis on higher cognitive questions is more effective for students of average and high ability, especially as they enter high school, where more independent thinking is required. While *emphasizing* fact questions, teachers of young disadvantaged children should take care to include some higher cognitive questions to stimulate development of their thinking skills.

Additional evidence favoring higher cognitive questions is found in research on the effects of having students answer questions that are inserted every few paragraphs in a textbook passage. Andre (1979) reviewed this research and concluded that higher cognitive questions generally facilitate better textbook learning than do fact questions.

Teachers' questions that require students to think independently and those that require recall of information are both useful but serve different purposes. The challenge for teachers is to use each type to its best advantage.



Despite the demonstrated effectiveness of higher cognitive questions, most teachers do not emphasize them in practice. In an earlier research review, I concluded: "About 60 percent of teachers' questions require students to recall facts; about 20 percent require students to think; and the remaining 20 percent are procedural" (Gall, 1970, p. 713). This conclusion continues to be supported by recent observational studies of classroom teaching (Hare and Pulliam, 1980). It appears that teachers emphasize fact questions, whereas research indicates that an emphasis on higher cognitive questions would be more effective.

The Process of Answering Teacher Questions

The research reviewed above does not explain the process by which fact and higher cognitive questions affect learning. Recent efforts to conceptualize and study this process (Gall, 1983) have shed new light on why questions of a certain type may facilitate learning in some students, but not in others.

The typical teacher question occurs in a recitation after students have been exposed to new curriculum content, usually by reading the textbook. Answering such a question appears to involve five steps.

1. *Attend to the Question.* The first step is to listen to the question as it is asked. Students who are off-task when the question is asked will be unable to generate a response or to profit from listening to another student's response. The need for attending may explain why research on young, slow-learning students has found that it is effective for teachers to ask narrow, easily answered questions *and* to use instructional behaviors that engage students' attention (Rosenshine, 1976).

2. *Decipher the Meaning of the Question.* If the student has attended to the teacher's question, the next step is to decipher its syntax to determine what is being asked. Gullo (1983) found that young children often can-

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not figure out what the question asks them to do. For example, when the word *what* appeared as the object term of a question, 85 percent of the children in his research sample could answer it correctly. When *what* appeared as the subject term, however, only 21 percent of the children could answer it correctly.

The ways teachers phrase questions can create difficulties for older students, too. Because teachers often generate questions spontaneously, some questions are likely to be poorly phrased. In everyday discourse, we can handle the problem by asking for clarification. In classroom situations, however, students may feel awkward about making such a request because it may be seen as criticism of the teacher.

3. *Generate a Covert Response.* Students need to think of an answer before they can put it into words. To generate the covert response, students must have relevant information stored in memory or available in curriculum materials; and they must possess appropriate cognitive abilities for manipulating this information.

An indirect measure of students' ability to generate a covert response is the degree of congruence between the cognitive level of the teacher's question and the cognitive level of the student's response. Several studies (Dillon, 1982a; Mills and others, 1980; Willson, 1973) found that only about half of students' responses were at the same cognitive level as the teachers' questions. Of the incongruent responses, Dillon and Willson found that from one-third to one-half were at a lower cognitive level than the teacher's question.

These results run counter to the popular belief, "Ask a higher-level

question, get a higher-level answer" (Lamb, 1976). Instead, a higher cognitive question poses a cognitive challenge that the student may or may not be able to meet. Training teachers in questioning techniques has been shown to reduce the incidence of question-answer cognitive incongruity (Klinzing-Eurich and Klinzing, 1982), but the process by which the reduction occurs is unclear.

Cognitive level is just one aspect of the student's response to a question. Gall (1970) and Ryan (1972) identified additional aspects, including whether each assertion contained in the response is clear, plausible, original, supported, and conditional.

The complexity of these response characteristics suggests that teachers should give students sufficient time to think before expecting a verbal response. Rowe (1974) found, however, that most teachers wait only one second for a response before repeating the question, calling on another student, or making a comment. Recent studies (Swift and Gooding, 1983; Tobin and Capie, 1982) found that extending wait time for several seconds has beneficial effects, including improved student engagement and longer verbal responses. In related research, Dillon (1981a) found that length of student responses increased when teachers asked fewer questions per minute.

These research findings argue against the common practice of rapid-fire questioning, which gives students little time to generate a substantial covert response followed by a substantial overt response.

4. Generate an Overt Response. Generating a covert response to the teacher's question does not ensure that the student will generate an overt response. A student may compete for

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"air time" with other students but not be called on to respond. Also, some students maintain a low profile so the teacher won't call on them.

Researchers have investigated whether there is systematic bias in who gives overt responses to teacher questions. Jackson and Cosca (1974) found that teachers of ethnically mixed classes were more likely to address questions to white students than to Mexican-American students. Also, white students responded more often to teacher questions; and more frequently initiated remarks of their own.

Lockheed and Hall (1975) concluded from their review of research that boys are more likely than girls to speak in class discussions. However, recent studies (Dillon, 1982b; Good, Cooper, and Blakey, 1980) have found slight or no differences in boys' and girls' opportunities to respond in class.

The consequences of teacher bias in giving students the opportunity to respond are not well understood. Covert responses evoked by the teacher's questions, or listening to another student's overt response, may be most critical for learning. If so, the student who listens carefully during the recitation or who answers each question covertly would learn as much informa-

tion as students who give oral responses. On the other hand, the student's own thoughts may not be fully clarified and developed until put into words.

5. Revise the Response. The student may rethink a covert or overt response to the teacher's question depending on what happens next. If the teacher redirects the same question to someone else, some students will revise their response in light of their classmate's contributions. Another option for the teacher is to ask one student probing questions that lead to improving the original response.

Wright and Nuthall (1970) found that teacher redirection of questions was positively correlated with student learning gains, but subsequent experimental research by Hughes (1971) failed to replicate this effect. In other research Riley (1981) found a positive effect for teacher redirection, but my colleagues and I found no effect for teacher redirection used in conjunction with probing questions (Gall and others, 1978).

The reason for these inconsistent findings may lie in how teacher redirection and probing were conducted in each study. That is, these instructional behaviors may have no effect unless they are explicitly focused on improving particular response criteria

(for example, clarity, plausibility, and accuracy).

Redirection and probing do not exhaust the possibilities for teacher response following the student's answer. Duffy (1983) suggested that teachers can facilitate learning by providing explanations that clarify and correct the student's response. Another option is to acknowledge the student's response by accepting and building on it. Researchers have conducted many studies of this technique as it was conceptualized by Flanders (1970). Gage (1978) concluded from his review of this research that teacher acceptance of student ideas is positively correlated with student learning gains.

The Effectiveness of Recitations

Most research on teacher questions over the past two decades has investigated the effectiveness of recitations in which questions vary in cognitive level. A more basic issue, however, is whether recitations, irrespective of cognitive level, are effective. Would students learn as much if teachers did not use the recitation method to help them review a section of the textbook that they have just read?

Few researchers have addressed this question directly. One relevant study (Gall and others, 1978) compared the learning of students who participated in a series of recitations with the learning of other students. Both groups had read the same textbook passages beforehand. The researchers found that students who participated in the recitations performed better than the no-recitation group on various measures of fact and higher cognitive learning.

Research on questions inserted in the text has yielded similar results. Faw and Waller (1976) and Andre (1979) reviewed research on the effectiveness of having the students read textbook passages with and without inserted questions. They concluded that students generally learn more when the passages contain inserted questions.

Questions apparently are *more* effective than no questions, but they are not necessarily the *most* effective instructional alternative. Dillon (1978) strongly criticized the effectiveness of teacher questions and proposed several nonquestioning alternatives such as "declaration of perplexity" and "deliberate silence" (1981b). The effective-

ness of these techniques relative to traditional recitation, however, has not been tested.

Why is recitation effective? Analysis of the recitation process suggests four reasons.

Practice and Feedback Effect. Students usually participate in a recitation immediately or soon after reading textbook content. The recitation gives students an opportunity to practice recalling the content and thinking about it. They also receive feedback about the accuracy and quality of their answers. Thus, recitation incorporates two processes, practice and feedback, which are of proven effectiveness in strengthening knowledge and skills.

Cueing Effect. Recitation questions provide cues that may focus students' attention on particular information in the text. Evidence for this function of questions comes from research on intentional and incidental learning. Intentional learning involves the learning of textbook content that is rehearsed by recitation questions, whereas incidental learning involves the learning of textbook content that is not rehearsed.

Recitations generally have a greater positive effect on students' intentional learning than on their incidental learning (Gall and others, 1978). In other words, students perform better on end-of-unit test items that have been asked previously as recitation questions than they do on test questions they have not heard before. This suggests that when students hear a question during recitation, they are likely to rehearse the answer carefully. Students do this because they develop an expectation, based on experience, that the same question will be included on a subsequent test. Conversely, they devote low study effort, or none at all, to textbook content not covered in the recitation.

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The hypothesized cueing effect of questions may explain a perplexing effect obtained in two experiments (Gall and others, 1978; Riley, 1981). In both experiments, students who participated in recitations containing 50 percent higher cognitive questions learned less well than did students whose recitations contained either a much lower or much higher percentage of higher cognitive questions. Since the 50 percent recitations did not emphasize *either* fact or higher cognitive questions, students may have become confused about the recitations' objective—was it to rehearse facts or to think about them? In contrast, students whose recitations emphasized one type of question or the other rehearsed the textbook content without the distraction of having to second-guess the teacher's intent.

Instruction and Test Similarity. The question-and-answer format of recita-

tion parallels closely the conventional test format for determining the amount of student learning at the end of a curriculum unit. This format consists of written test questions requiring a multiple-choice or short-answer response. Thus, the student performance elicited by recitation transfers directly to the performance required on most school tests. The practice provided by recitation certainly appears more relevant to subsequent testing than the practice provided by such instructional methods as lecture and inquiry teaching.

Modality Effect. Researchers have found that elementary school students are more engaged during teacher-led activities than during seatwork activities (Rosenshine, 1980). And they are most engaged when teacher-led activities involve recitations with an academic focus.

One explanation for these findings is that recitations involve speaking and listening, whereas seatwork involves reading and writing. For many students, speaking and listening may be more motivating and less demanding than reading and writing. This explanation is speculative but sufficiently compelling to warrant further research on the effectiveness of recitation and how it can complement instructional methods that emphasize other communication modalities.

Implications of Research for Practice

The research on teacher questions challenges typical classroom practice in several respects. For example, researchers have found that emphasis on higher cognitive questions generally produces better learning than emphasis on fact questions. There is no lack of books and pamphlets encouraging teachers to ask more higher cognitive questions, but apparently their admo-

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nitions have had little influence on classroom instruction. Educators need to search for more effective ways to influence teachers' instructional behavior.

Another challenge for practice comes from research on the question-answering process. The findings demonstrate clearly that teacher questions do not necessarily elicit good student answers. Improving the quality of teachers' questions, then, is not sufficient. Students also need to learn the response requirements of different types of questions. Recent work on this problem has yielded promising results. For example, Raphael and McKinney (1983) found that elementary school students were able to learn several question-answer relationships and use this knowledge to improve their reading comprehension.

Finally, educators need to come to grips with the question posed by Hoetker and Ahlbrand: "If the recitation is a poor pedagogical method, as most teacher educators have long believed, why have they not been able to deter teachers from using it?" (1969, p. 163). Part of the answer may be in the research findings reviewed here: teachers use recitation because it is effective in helping students learn the curriculum, which is largely textbook-based. Since there are few signs that this curriculum approach is changing, teachers will continue to use this method. Rather than trying to deter teachers from using recitation, therefore, teacher educators may be better advised to help them learn use it well. □

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