To Explain: A Review of Research

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THE concept of devoting a series of studies to the teacher's ability to explain was developed by N. L. Gage (1963, 1967, 1968). He argued that the previous research on teacher effectiveness was too broad, because too many aspects of the teacher's role were included in each study. For example, in long-term studies, the abilities to lecture, lead a discussion, introduce new material, review old material, maintain order, assign homework, and diagnose and remediate learning difficulties were intertwined in an assessment of teacher effectiveness. Gage proposed that we study teaching "in small, specifically defined aspects of the teacher's role" (1963, p. 120).

The specific aspect of the teacher's role that was selected for study by Gage and his associates was the ability to explain new material. "Explaining" was defined as the skill of engendering comprehension of a process, concept, or generalization. Gage (1968) believed that explaining comes close to the essence of instruction, so that when a teacher attempts to explain proportionality to a geometry class or irony to an English class, he behaves more like a teacher than when he attempts to motivate pupils, promote discussion, or maintain discipline.

The studies of the ability to explain which have evolved from these suggestions involve two changes in the design for the study of teaching effectiveness. First, only short segments of teaching have been observed; these segments are self-contained lessons ranging in length from five minutes to fifteen minutes. Second, the role of the teacher is limited to the explanation or presentation of specific cognitive material. The advantage of this approach is that it allows a detailed study of the behaviors of the teachers in a specific aspect of teaching.

Eight studies of the ability to explain have been completed involving four samples of teachers. Teacher-trainees of preschool children (Fortune, 1966), grades 4, 5, and 6 (Fortune, 1967), and grades 8 through 11 (Fortune *et al.*, 1966) were free to use any method to present the material; experienced twelfth grade social studies teachers were limited to the use of lecture (Belgard *et al.*, 1967; Dell and Hiller, 1968; Hiller *et al.*, 1968; Rosenshine, 1968; Unruh, 1968).

The design was the same in all eight studies: (a) the participating teachers were given identical new material and asked to present the material during a specified period of time; (b) following the presentation, all pupils took a comprehension test; and (c) the test scores were adjusted for the initial abilities of the pupils. These adjusted class mean scores served as the measure of teacher effectiveness for each lesson. In each study, every teacher presented at least two different lessons, and the presentations were recorded on video tape for future study. In

some of the studies, transcripts of the presentations were prepared, either on paper or on IBM cards.

Each investigator was concerned with one or more of three questions: (a) How consistent are the effects of teachers? (b) What ratings given by pupils and supervisors correlate with teacher effectiveness? and (c) What specific behaviors are exhibited more frequently by the high-achieving or low-achieving teachers?

Generality of Teacher Effects

The first question was whether a teacher's pupils tend to achieve the same adjusted scores when the teacher teaches two different lessons. Specifically, what is the correlation between the results when teachers teach (a) two different lessons to the same pupils, (b) the same lesson to different pupils, and (c) two different lessons to two different sets of pupils?

The most consistent correlations were obtained when teacher-trainees taught the same five- or fifteen-minute lesson to two different classes (Fortune *et al.*, 1966; Fortune, 1966; Fortune, 1967). The significant, positive correlations ranged from .39 to .70. However, these results are marred by the finding of Soar (1966) that the adjusted achievement scores of pupils taught by experienced teachers during one year correlated only .09 with the achievement obtained after a second year with different pupils.

The second strongest findings were obtained when teachers taught different lessons to the same pupils. Significant, positive correlations were obtained in studies of experienced twelfth grade teachers (Belgard *et al.*, 1967) and preschool teacher-trainees (Fortune, 1966); but there were no significant correlations when teacher-trainees teaching grades 4, 5, and 6 (Fortune, 1967) or grades 8 through 11 (Fortune *et al.*, 1966) were studied. Last, the correlations when teachers taught different lessons to different pupils were erratic, frequently negative, and usually quite small.

These findings suggest that there is such a thing as "good teaching," in that some teachers had classes whose adjusted mean achievement scores were significantly higher than others, but the correlations do not show that a teacher who produced high pupil achievement in one lesson necessarily produced high achievement in a second lesson. This interpretation is tentative because too few studies have been conducted in this area, and only two of the studies (Soar, 1966; Belgard *et al.*, 1967) involved experienced teachers. There is certainly a need for further research on the consistency of teacher effects.

Ratings of Teacher Effectiveness

The second question was: Which ratings given by pupils and supervisors correlated with teaching effectiveness? In four out of five studies there was a significant, positive correlation between the ratings of the clarity of the lesson and/or the ratings of the teacher's skill in presenting the lesson and the adjusted pupil achievement scores. These ratings were obtained when the raters were supervisors (Fortune, 1967), participating pupils (Fortune *et al.*, 1966; Belgard *et al.*, 1967), or nonparticipating pupils who observed video tapes of the lectures (Unruh, 1967). In the study by Fortune (1967), supervisors' ratings on the item "presentation of the lesson" correlated significantly with the adjusted class achievement scores for teacher-trainees in three subject areas—English, social studies, and mathematics.

Other cognitive variables, such as the organization and planning of the lesson, were frequently related to the adjusted achievement scores, although not as consistently as were the clarity of the lesson and the teacher's skill in presenting the lesson. In general, noncognitive variables such as warmth, poise, humor, voice, and teacher-pupil rapport were not consistently related to achievement.

In the study by Belgard *et al.* (1967), 43 twelfth grade, experienced teachers presented two lectures to their pupils, one on Yugoslavia and one on Thailand. In addition to significant correlations between pupil ratings on the clarity of the presentation and the

class mean adjusted achievement scores, the highest correlations were obtained on pupil ratings of how much they had learned and on pupil self-reports of how much attention they had paid to the lecture. If these results are replicated, such ratings may serve as useful measures of achievement in situations in which achievement tests cannot be given.

One of the disappointments in these studies is the finding that the ratings on more specific behaviors were not consistently correlated with the achievement scores. Such variables as stating objectives clearly, giving adequate amounts of detail, clearly indicating a shift from one topic to another, and using a summary at the end of the lesson were not consistently correlated with achievement in these studies. Although these results show that clarity is an important correlate of achievement, we cannot specify the rated behaviors which are necessary to achieve clarity.

Behavioral Correlates

The third question in this series of studies was whether any behaviors were exhibited more frequently by the teachers who obtained high adjusted mean achievement scores, or by the teachers whose pupil achievement scores were low.

Fortune developed a Tape Analysis Format which supervisors used to rate whether a teacher's use of specific behaviors was above average, average, or below average. In the study involving preschool teacher-trainees (Fortune, 1966), the high-achieving teachers gave more attention to three specific behaviors: (a) having pupils physically manipulate the content material; (b) verbal manipulation, in which the teacher explored the idea, concept, or characteristic of the concept with the pupils; and (c) praising pupils when they gave the correct response.

In the study of student teachers in grades 4, 5, and 6 (Fortune, 1967), several behaviors discriminated between the high- and low-achieving teachers in one of the three subject areas—English, mathematics, and social studies—but no behavior was significant across all three subject areas. This finding is in contrast to the report that the ratings of skill in presenting the lesson discriminated across all three subject areas. However, there were five specific behaviors which the high-achieving teachers in two subject areas were rated as using more frequently: (a) introductions involving an overview or analogy; (b) the use of review and repetition; (c) praise or repetition of pupil answers; (d) patience to wait for a response; and (e) integration of a pupil response into the lesson.

Two investigations were analyses of the video tapes and transcripts of the lectures on Thailand and Yugoslavia. These studies were innovative in that they dealt with specific behaviors not customarily measured in systematic studies of teaching behavior.

In the study by Rosenshine (1968), human coders counted the frequencies of the various syntactic, linguistic, and gestural events in the teachers' behavior. Rosenshine found three categories of behavior which significantly discriminated between the high-achieving and low-achieving teachers in both sets of lectures. The lectures of the high-achieving teachers contained significantly more gestures and movements, rule-example-rule patterns of discourse, and explaining links.

The term "rule-example-rule" refers to the use of a summary statement both before and after a series of examples. "Explaining links" are prepositions or conjunctions which are taken to indicate that the teacher is giving the cause, means, or purpose of an event or idea. Words and phrases such as "because," "in order to," "if . . . then," "therefore," and "consequently" were counted, as well as specified instances of words such as "since," "by," and "through." Words such as these explaining links may function to link phrases either within or between sentences so that a phrase or clause containing an explaining link elaborates and expands upon another phrase or clause.

Hiller *et al.* (1968) were interested in the use of "vagueness" words and phrases. They defined vagueness as an excessive pro-

portion of qualification, haziness, and ambiguity—words which were taken to indicate that the speaker is not certain about the material in his presentation. A "vagueness dictionary" consisting of 233 words and phrases in several subdivisions was constructed, and both the dictionary and the transcripts of the lectures on Yugoslavia and Thailand were entered on IBM cards. Instead of human raters, an IBM 360 computer was programmed to count the proportion of vagueness words and phrases in each lecture.

Hiller *et al.* found that the proportion of words classified in the sub-category *indeterminate qualifiers* and the proportion of words classified as *probability* had significant, negative correlations with the difficulty of both the Yugoslavia and Thailand lectures. Indeterminate qualifiers are words such as "rather," "very," "any number of," "more or less," "little," "few," "some," "pretty much," and "quite a bit." Probability words include "could be," "might," "possibly," "sometimes," "more often than not," "may," "usually," "likelihood," and "most of the time." The high-scoring lectures, then, had fewer indeterminate qualifiers and probability words.

Although the use of short words usually correlates positively with comprehension, Hiller's findings indicate that there are some pretty short words which, more often than not, might possibly detract very much from comprehension, more or less!

In summary, the research on the ability to explain has been primarily exploratory, but it represents a new approach to the study of teaching. This research has resulted in the identification of some interesting correlates of effectiveness such as the use of movement and gesture, explaining links, and vagueness words. The validity of these findings, however, must be tested by future experimental and correlational research. Several new correlational studies are currently under way at Stanford University. There is a need for experimental studies in which teachers who are low in class mean achievement scores are taught to use more explaining links, fewer vagueness words, and more rule-example-rule patterns. These teachers could then teach additional lessons, and the effects of the training could be assessed by measuring the subsequent achievement of their pupils.

There is a need for further exploration of the puzzling findings that the ratings of the teachers' clarity correlate consistently with pupil achievement, but the ratings of more specific behaviors such as the use of summary or clear transitions between parts of the lessons do not correlate consistently with pupil achievement; also, further study is needed on the apparent lack of consistent results when teachers teach different lessons to different pupils.

Further empirical work and the tryout of new research models may advance our understanding of teaching and of ways to improve it. Cautious optimism concerning such advances seems to be warranted on the basis of the work done so far.

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* Starred reports will be included in *Research into Classroom Processes*, edited by Ian Westbury and Arno A. Bellack, to be published by the Ontario Institute for Studies in Education and Teachers College Press, Columbia University. These reports will also appear in a memorandum to be issued by the Stanford Center for Research and Development in Teaching, School of Education, Stanford University, Stanford, California.

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