Developing Teachers' Questioning Skills: The Efficacy of Delayed Feedback

Merrill C. Sitko and Alan G. Slemon*
university of western ontario

The study investigates whether teachers change their questioning strategies after they learn a system for categorizing questions into objectively defined categories and receive feedback immediately following class about the types of questions asked. Carefully trained coders categorized the questions that twenty teachers asked during regular class periods into one affective and six cognitive categories. Observations were taken during four periods: during a baseline prior to learning the categories; during and immediately following learning; during the feedback period; and, finally, following termination of feedback. Changes in the types of questions and the distribution of questions were noted during the four periods.

L'étude a cherché à déterminer si les professeurs en réciclage changent leur facon de formuler les questions après avoir affris à classifier les questions selon des catégories où les objectifs sont bien définis et quand le feedback sur les questions posées est immédiat. Des classificateurs bien entrainés ont codifié et classifié les questions posées par vingt professeurs en réciclage durant une heure de cours, en une catégorie affective et six catégories cognitives. L'observation s'est échelonnée sur une durée de quatre cours: durant une période de base pour maîtriser les catégories, une seconde qui'a suivi immédiate cette maîtrise, une durant le feedback, et enfin une derniere au terme du feedback. Les différences concernant le genre de questions et la répartition de ces questions ont été soigneusement notiés durant ces quatre heures de cours.

The present study investigates whether systematic and maximally meaningful feedback to teachers concerning types of questions asked while teaching will alter their questioning behaviour. Variety and flexibility in questioning are considered to be important factors in teaching students to approach learning tasks systematically and to apply a variety of cognitive strategies to mathematics, reading, language arts, and other academic subjects. Teacher questioning techniques appear to set the pattern for student responses and to create expectations in students about appropriate forms of response during classroom interaction (Hillman, 1972; Lynch, Ames, Berger, Frazer, Hillman, & Wisehart, 1973; Sanders, 1966; Taba, 1966; and Wright & Nuthall, 1970). Although it is widely accepted that the variety of questioning types assists student learning, investigations show that most teachers ask predominantly cognitive-memory or factual-recall questions (Borg, Kelley, Langer, & Gall, 1970; Crawford, King, Brophy, & Everston, 1975; Cunningham, 1977; Gall, 1970; Gallagher & Aschner, 1966; Greenough, 1976; Guszak, 1967; Sitko & Slemon, 1978; Zimmerman & Bergan, 1971).

* This research project was funded under contract by the Ministry of Education, Province of Ontario.

The strong emphasis on factual-recall questions is particularly common in the area of reading and listening comprehension even though it is generally accepted that variation in types of questions strongly influences types of student information-processing strategies (Hillman, 1972; Lynch et al., 1973; Sanders, 1966; Sitko, Semmel, Semmel, Frick, & Hasselbring, 1976; Taba, 1966; and Wright & Nuthall, 1970). Hatcher (1971) and Forsyth, Haggerty, Patterson, and Snow (1971), found that the recommended questions in teaching manuals that accompany basal readers are usually factual in nature even though they are intended to enhance reading comprehension. Furthermore, there is evidence that teachers of handicapped children use a greater percentage of factual questions during reading instruction than teachers of non-handicapped elementary school children (Brady, 1977; Cawley, Goodstein, & Burrow, 1972; Fine, Allen, & Medyene, 1968; Lynch & Ames, 1973; and Minskoff, 1967). It appears that the major emphasis of teachers of handicapped children in their questioning is the development of orthographic decoding skills, and they tend to under-emphasize higher-level language strategies based on syntactic and semantic linguistic processing (Blanton, Sitko, & Gillespie, 1976). Hence, it is important for teachers to use high- and low-level questioning behaviours to modulate or shift the cognitive level of discourse, and to stimulate higher level pupil responses during reading and listening comprehension instruction.

This study investigates a training and feedback technique for promoting the use of more flexible questioning strategies by teachers. An ideal approach to improving teachers' questioning skills would involve longitudinal study of individual teachers' questioning practices, pinpointing deficiencies, and systematic coaching. In actual field conditions, however, most training reduces to "one-shot" workshops with groups of teachers. The assumption of this study is that substantial changes in teacher questioning behaviour can occur even with brief training if different types of questions are precisely defined and if, following a training period, teachers receive objective feedback about their questioning.

Three hypotheses about changes in teacher questioning behaviour resulting from training are investigated as follows:

1. Prior to training, elementary teachers will mostly ask low-level, factual questions, but after learning a hierarchical seven-category questioning system, the percentage of high-level questions requiring transformation of information will increase.
2. Prior to training, many teachers will tend to restrict their questions to a few categories, but a few teachers will spread their questions over most categories; after training most of the group will distribute their questions more evenly across categories.
3. The percentage of appropriate question-response matches will be greater than ninety per cent across the four phases of the project.

METHOD

Teachers

Permission was obtained from directors of education and principals to meet with teachers in their schools and request volunteers. Twenty elementary school teachers were selected from six schools in southwestern Ontario. They varied in grade levels taught, years of experience, subjects taught, rural or urban locations, and public or separate school. All teachers in the sample volunteered to participate for the entire three-month training phase of the project.

Questioning System

The self-instructional training module was a manual prepared by Sitko and Slemon (1977) based upon an earlier version by Sitko, Semmel, Heshusius, and Cohen (1976). Instructional development of the teacher questioning module followed a model designed and intended for development of teacher training materials (Thiagarajan, Semmel, & Semmel, 1974). It was a systematic category observation system for classifying teacher and pupil questions and answers into either an affective judgment category or one of six cognitive categories of information processing as follows:

Category	*Example*
1/Affective Judgment (AJ)	Do you like this story?
2/Discrimination (DSC)	Can you read the first word?
3/Recall (REC)	What was the father's job?
4/Sequencing/paraphrasing (SEQ)	What happened after the tree fell?
5/Conceptual Relating (CR)	What does charity mean?
6/Inference (INF)	What do you think she will do now?
7/Problem Solving (PS)	What would you do in her place?

Three coders, trained to a criterion of 90% inter- and intra-observer agreement, were used. They were trained on the category system using videotapes of isolated and continuous segments of classroom interaction. The coders observed teachers during regular classes, assigned each question and answer into one of the seven categories, kept track of whether it was a teacher or pupil asking a question or giving an answer, and categorized certain instructional or management behaviours that did not involve questioning. Coders entered observational data into a portable recorder called a Datamyte.

This data was fed through a terminal to the university PDP10 computer for analysis and printout. Figure 1 illustrates part of the printout. The most important calculations, displayed in both tabular and graphic form,

FIGURE 1

Example showing selected portions of feedback printout given to teachers following class

TOTAL NUMBER OF OBSERVATIONS MADE = 130

TOTAL TIME IN MINUTES = 20.94

TEACHER QUESTIONS

LEVEL	FREQUENCY N=	%=	PERCENTAGE GRAPH (0=QUESTION/+=RESPONSE) 0 15 30 45 60 75 90 100
1 AJ	0	0.0	0
			+
2 DSC	15	29.4	0000000000
			++++++++++
3 REC	10	19.6	0000000
			+++++++
4 SEQ	0	0.0	0
			+
5 CR	24	47.1	0000000000000000
			++++++++++++
6 INF	0	0.0	0
			+
7 PS	2	3.9	00
			++
TOTAL	51	100.0	

PERCENT HIGH LEVEL TEACHER QUESTIONS = 51

PERCENT LOW LEVEL TEACHER QUESTIONS = 49

PERCENT HIGH LEVEL PUPIL RESPONSES = 44

PERCENT LOW LEVEL PUPIL RESPONSES = 50

PERCENT NO RESPONSE BY PUPILS = 6

TEACHERS QUESTIONS BY PUPIL RESPONSES

TCHR	PUPIL RESPONSES							
QUES	AJ	DSC	REC	SEQ	CR	INF	PS	TOT
AJ	0	0	0	0	0	0	0	0
DSC	0	13	0	0	0	0	0	13
REC	0	0	10	0	0	0	0	10
SEQ	0	0	0	0	0	0	0	0
CR	0	1	0	0	19	0	0	20
INF	0	0	0	0	0	0	0	0
PS	0	0	0	0	0	0	2	2
TOT	0	14	10	0	19	0	2	45

TOTAL TEACHER QUESTION - PUPIL RESPONSE = 45

PERCENT APPROPRIATE MATCHES = 97.7778

are the percentages of each type of teacher question and pupil answer, percentages of high- and low-level teacher questions, percentages of high- and low-level pupil responses, and percentage of no response by students. The bivariate "Teacher Questions by Student Responses" table displays on the diagonal the number of times there was perfect agreement between level of teacher question and of pupil answer.

Design

The study involved four observational periods. Each period was about three to four weeks long, and there were three to five observations in each of these observational periods. The periods were defined as follows:

1. Baseline – pre-treatment observations, during which all teachers prepared and taught reading and listening comprehension lessons without receiving feedback of any kind,
2. Module – observations taken during and immediately after teachers had read the manual but were not yet receiving feedback,
3. Feedback – observations during the period when teachers received computer printouts which summarized their questioning behaviour immediately after they gave a class, and
4. Maintenance – observations taken several days following termination of feedback.

The training module received by teachers following the baseline phase trained teachers to recognize critical and irrelevant features of cognitive questions and to prepare questions appropriate to different categories. It stressed four main objectives: During reading and listening comprehension instruction the teacher should 1/ ask as many different types of cognitive questions defined by the category system as possible, 2/ maximize the percentage of, and time spent on, high-level teacher questions over total teacher questions, 3/ maximize the percentage of, and time spent on, high-level responses over total pupil responses, and 4/ maximize the percentage of, and time spent on, teacher questions that elicit responses in the same category.

Immediately following the module phase, the teachers received the computer printouts which summarized the teacher-pupil questions and responses during the previous six to eight lessons. The printouts summarized data relevant to each of the four stated objectives. Each teacher was then asked to evaluate the printouts summarizing the baseline and module lessons in light of the four training objectives. These training objectives were targeted for improvement subsequent to each lesson during the feedback phase of the project.

After each class in the feedback phase, the coder went to the school office and fed the data into the university computer by means of a portable terminal and telephone lines. The computer then fed back an

TABLE 1
Mean Percentage of High Level Teacher Questions Across the Four Project Periods

Baseline	*Module*	*Feedback*	*Maintenance*
37.9	51.5	45.1	44.6

analysis of the data to a portable printer, and the printout, in the form shown in Figure 1, was normally returned to teachers within 15 minutes.

Following the feedback phase, the teachers entered the maintenance phase. This phase was identical to the initial baseline phase since each teacher was observed without receiving feedback. The study used a multiple baseline repeated measures design.

At the completion of the project the teachers and administrators who had participated in the project were invited to a final information sharing and debriefing meeting. At this meeting they were asked to complete a project evaluation questionnaire and were provided with a cumulative graph which summarized the percentage of teacher questions and pupil responses across the four phases of the project. The 15 participants in this meeting received a report of the preliminary results and offered spontaneous observations about the project. Questionnaires were sent to participants who were unable to attend the meeting.

RESULTS

The first analysis investigated whether learning the manual affected the percentage of high-level cognitive questions. Percentage of high-level cognitive questions was calculated by dividing the total of Sequencing/Paraphrasing, Conceptual Relating, Inference, and Problem Solving questions by the total number of questions. The design used to analyze teacher-pupil observational data was a single-factor repeated measures ANOVA design (Winer, 1971) with one between factor, Teachers (N = 20) and one within factor, Periods (Baseline, Module, Feedback, Maintenance.)

Table 1 shows the mean percentage of high-level teacher questions in each of the four periods of the study. The analysis of variance source table indicated a significant main effect for period ($F(3, 57) = 5.52, p < .01$). To further clarify the relationships, Tukey post hoc analyses (Winer, 1971) were performed on the means in Table 1. The differences between baseline and module, between baseline and feedback, and between baseline and maintenance were all significant ($p < .05$). Hence, as predicted, the teachers in the project increased the percentage of high-level questions after studying the manual. None of the pairwise comparisons among the module, feedback, and maintenance periods were significant ($p > .05$).

FIGURE 2
Mean percentage of high-level questions and answers

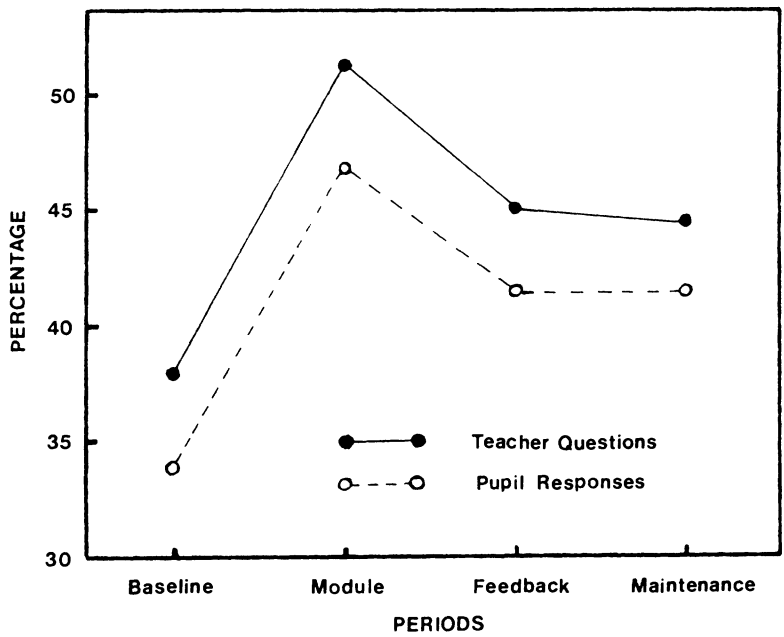


Figure 2 shows that the graph of the student answers closely parallels that of teacher questions. The correlations between percentages of high level teacher questions and student answers were calculated within each of the four periods. The average correlation was $r(18) = +.95$ ($p < .001$) confirming the very close relation predicted between level of teacher questions and of student answers.

All trainees had been requested to increase significantly the percentage of high-level pupil responses from the rate given during baseline. Table 2 shows the mean percentages of pupil high-level responses in each of the four teaching periods. The percentage of high-level cognitive pupil responses was calculated in the same way as the percentage of high-level teacher questions. The analysis of variance source table for percentage of high-level pupil responses indicated a significant main effect for period ($F(3, 57) = 6.79$, $p < .01$). To clarify the relations among the means which are plotted in Figure 2, Tukey post hoc analyses were performed. These analyses revealed that the percentage of pupil high-level responses was significantly higher during each of the module, feedback, and maintenance periods than during the baseline period ($p < .05$). Hence, as expected, teachers managed to increase significantly the mean percentage of high-level cognitive responses given by pupils. However, although the increased rate of pupil high-level response was maintained during

TABLE 2
Mean Percentage of High Level Pupil Responses Across the Four Project Periods

Baseline	*Module*	*Feedback*	*Maintenance*
33.9	47.2	41.5	41.5

feedback and maintenance periods, there were no further significant increases between the module and feedback periods nor between the feedback and maintenance periods ($p > .05$).

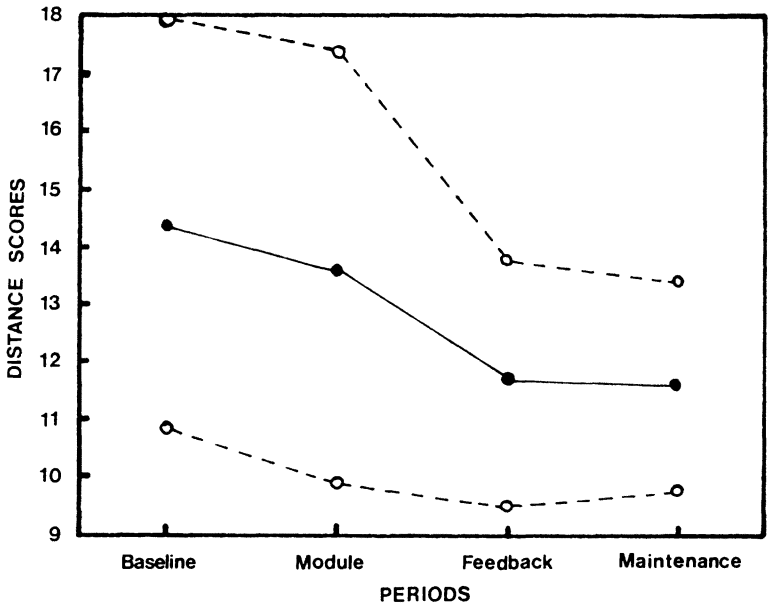
It was also predicted that after training and feedback the teachers would tend to distribute their questions more evenly over the seven categories. To test this hypothesis, a distance measure was used in which a score of zero indicated that a teacher had asked exactly the same number of questions in each of the seven categories. When scores vary from zero it indicates that teachers tend to concentrate questions in a limited number of categories. Figure 3 shows a decline in the mean distance scores during the four observational periods that indicates that teachers asked a greater variety of questions during the last two periods. There was no significant difference between baseline and module ($F(1, 19) = .44$, $p > .25$); however, there was a significant difference between baseline and feedback ($F(1, 19) = 8.18$, $p < .01$) and between baseline and maintenance ($F(1, 19) = 8.26$, $p < .01$). Figure 3 also shows that the variability among teachers in distribution of questions decreased as indicated by the reduced standard deviations. There was no significant difference in variance between baseline and module ($F(19, 19) = 1.09$, $p > .25$); however, there was a significant difference in variance between baseline and feedback ($F(19, 19) = 2.75$, $p < .025$), and between baseline and maintenance ($F(19, 19) = 3.79$, $p < .005$) in variance.

DISCUSSION

The study indicated that the treatment had been effective. Even with this relatively brief exposure to a questioning module, there was a significant increase in the percentage of high-level teacher questions and high-level pupil responses. The findings confirmed the close relationship between level of teacher questions and pupil answers. During the feedback and maintenance periods, the teachers used a greater variety of questioning categories than they had used during baseline.

The findings also demonstrated the feasibility of implementing in an inservice program a computerized printout as a means of providing feedback to teachers so they could evaluate objectively their performances in interactive teaching situations. Reactions during the debriefing

FIGURE 3
Mean and range of ±1 standard deviations for distance scores in each experimental period



session were generally favourable to this inservice project which extended over about three months. The teachers did not feel that the observers were intrusive of disrupting to the students. They felt they had become much more aware of the levels of questions they asked and of the levels of student answers. They did, however, feel that the knowledge that they were being coded on questioning influenced them to give lessons that specifically included questioning when coders were present. The reactions to the use of technology and computer printouts were generally favourable, because it provided very meaningful feedback with very little delay. However, they reported that they would like to discuss the printouts somewhat more thoroughly with the coders after each lesson and to receive interpretive feedback in addition to the printout. The manner in which teachers reacted to feedback varied considerably. One teacher had a list of the questioning categories posted at the rear of the classroom and as soon as he received the printout, he and his students would gather round a table to see how well he had distributed his questions.

In spite of these promising results, the authors now feel that a teaching manual that focuses exclusively on types of questions provides a restricted model. Informal observation of the lessons led to the conclusion that training materials should consider both the purposes of questioning and how teachers might follow up on student answers. Some teachers asked a

variety of questions without any apparent regard for the learning functions served by questions. Others appeared to have difficulty responding to and following up student answers. To reduce these problems, the authors are now developing a manual that emphasizes the goals and objectives of questioning[1]. To alleviate the lack of follow-up on student answers, the authors are preparing a manual to develop teacher feedback skills incorporating many of the changes that are being made in the questioning manual[2]. This more comprehensive questioning model thus includes the context in which questioning and teacher reactions to student answers occur. Brophy (1979) suggests that in coding questioning, the entire questioning sequence rather than the individual question should be used as the unit of coding and analysis. He foresees questioning studies that are confined to specific contexts with each context having its own short-term objectives and short-term outcome measures that would be used in studying them.

The authors have also made major changes in the categories in the questioning module. The dichotomy between high- and low-level questioning appears artificial, and research by Miller, Snowman, and O'Hara (1979) tends to reject a simple hierarchical model of questioning categories. Andre (1979) suggests that part of the problem with levels-of-questioning research lies in the specification of levels and the frequency, position in the presented text, and timing of adjunct questions. Rosenshine (1979) has also pointed out that levels of questions are not always clearly and consistently defined. As a result, there are difficulties in interpreting the results of this research. In addition, the implication that there are levels of questions may set up some false distinctions (Bachor, Sitko, & Slemon, 1980). Perhaps a more useful distinction contrasts non-transformation questions (discrimination and recall questions) with transformation questions. This distinction is consonant with Andre's (1979) suggestion that questions be categorized in terms of the type of information processing they require. Additional practical reasons for changing the categories included the fact that teachers found it difficult to distinguish among certain of the cognitive categories, particularly between inference and problem solving. In addition, the affective judgment category seemed out of place with six cognitive categories. In the new training manual the number of question categories has been reduced to four: discrimination, recall, relating concepts, and problem solving. This change is likely to decrease the information-processing demands on teachers, and it has an additional theoretical advantage in that categories approximate certain of Gagné's (1977) learning categories.

The computerized feedback used in this study suggests modifications in teacher training procedures now possible due to advances in computer technology. The development of portable microcomputers that can easily be set up in classrooms and can deliver feedback on teacher-pupil interactions by way of videoscreen allows teacher trainers to give

immediate as well as delayed feedback to teachers during the course of a lesson. These advances make possible a series of field studies comparing the effectiveness of different forms of feedback to preservice or inservice teachers. In our future work, we hope to examine some of the relations among teacher questioning strategies, pupil ability, and pupil engaged time with respect to pupil reading achievement in both regular and special classrooms. For example, we suspect that teacher questioning may have an important relationship with amount of time spent by a pupil with learning disabilities on a particular task. Current research on teacher effectiveness (Bennett, 1978; Berliner, 1979; Brophy, 1979; Medley, 1979; Rosenshine, 1979; Winne, 1979) suggests that any discussion of classroom questioning behaviour should consider the importance of active learning time or opportunities to learn when investigating the effects of any teaching procedures on pupil outcomes in specific content areas. As it stands, the validity of questioning techniques per se in changing the cognitive level of pupil discourse and promoting pupil achievement has not been adequately verified. Future research is also required to document more specifically the possible concurrent effects of teacher questions and the relationships among concurrent effects across specific lesson content.

NOTES

[1] A revised version of the questioning manual may be obtained by writing the senior author at the Faculty of Education, The University of Western Ontario, 1137 Western Road, London, Ontario, N6G 1G7. The training module has undergone a number of revisions and field tests and currently consists of a four-category observation system (the Teacher Pupil Request System, TPRS).

[2] The feedback manual developed by Slemon, Sitko and Bachor (1980) was constructed in order to guide teachers in reacting to pupil answers. The system contains five categories and may be obtained by writing Dr. Alan G. Slemon at the above address.

REFERENCES

Andre, T. Does answering higher-level questions while reading facilitate productive learning? *Review of Educational Research*, 1979, *49*, 280–318.

Bachor, D. G., Sitko, M. C., & Slemon, A. G. Information processing demands of questions on the student with special needs. In G. M. Kysela (Ed.), *The exceptional child in Canadian education*. 1980 Yearbook, Canadian Society for Studies in Education, Seventh Yearbook.

Bennett, S. N. Recent research on teaching: A drama, a belief, and a model. *British Journal of Educational Psychology*, 1978, *48*, 127–147.

Berliner, D. C. Tempus educare. In P. L. Peterson & H. J. Walberg (Eds.), *Research on teaching: Concepts, findings and implications*. Berkeley, California: McCutchan, 1979.

Blanton, L. P., Sitko, M. C., & Gillespie, P. Reading and the mildly retarded: Review of research and implications. In L. Mann & D. Sabatino (Eds.), *The third review of special education*. New York: Grune & Stratton, 1976.

Borg, W. R., Kelley, M. L., Langer, P., & Gall, M. *A microteaching approach to teacher education.* Beverly Hills: Macmillan Educational Services, 1970.

Brady, M. E. *A comparison of CATTS and audio feedback in developing teacher prompting skills in reading.* Paper presented at the annual meeting of the American Educational Research Association, New York, N.Y., April 1977.

Brophy, J. E. Teacher behavior and its effects. *Journal of Educational Psychology*, 1979, *71*, 733–750.

Cawley, J. F., Goodstein, H. A., & Burrow, W. H. *The slow learner and the reading problem.* Springfield, Ill.: Charles E. Thomas, 1972.

Crawford, W. J., King, C. E., Brophy, J. E., & Everston, C. M. *Error rates and question difficulty related to elementary children's learning.* Paper presented at the annual meeting of A.E.R.A., Washington, 1975.

Cunningham, R. T. Questioning behavior, or, how are you at P. R.? In J. E. Weigand (Ed.), *Implementing teacher competencies: Positive approaches to personalizing education.* Englewood Cliffs, N.J.: Prentice-Hall, 1977.

Fine, M. J., Allen, C. A., & Medyene, A. M. Verbal interaction patterns in regular and special classrooms. *Psychology in the Schools*, 1968, *5*, 265–271.

Forsyth, I., Haggerty, M., Patterson, R., & Snow, J. *Teacher questions and basal reading series.* Northridge, California: San Fernando Valley State College, 1971.

Gagné, R. M. *The conditions of learning* (3rd ed.). New York: Holt, Rinehart, & Winston, 1977.

Gall, M. D. The use of questions in teaching. *Review of Educational Research*, 1970, *40*(5), 707–721.

Gallagher, J. J., & Aschner, M. J. A preliminary report on analysis of classroom interactions. *Merrill-Palmer Quarterly*, 1966, *9*, 193–194.

Greenough, K. N. *The effects of anticipating or coding videotaped and written materials on developing the questioning skills of special education teacher trainees.* Unpublished doctoral dissertation, Indiana University, 1976.

Guszak, F. J. Teacher questioning and reading. *The Reading Teacher*, 1967, *21*, 227–234.

Hatcher, T. C. The development of comprehension skills in selected basal readers. *Dissertation Abstracts*, 1971, 3557-A.

Hillman, S. B. *Implications of effects of teacher mediated questions for experiments with mentally handicapped children.* Technical Report 11.2. Bloomington, Indiana: Center for Innovation in Teaching the Handicapped, Indiana University, 1972.

Lynch, W. W., & Ames, C. A. *Two experiments on modifying cognitive demand styles.* Bloomington, Indiana: Center for Innovation in Teaching the Handicapped, Indiana University, 1973.

Lynch, W. W., Ames, C. A., Berger, C., Frazer, W., Hillman, S., & Wisehart, S. *Effects of teachers' cognitive demand styles on pupil learning.* Bloomington, Indiana: Center for Innovation in Teaching the Handicapped, Indiana University, 1973.

Medley, D. M. The effectiveness of teachers. In P. L. Peterson & H. J. Walberg (Eds.), *Research on teaching: Concepts, findings, and implications.* Berkeley, California: McCutchan, 1979.

Miller, W. G., Snowman, J., & O'Hara, T. Application of alternative statistical techniques to examine the hierarchical ordering in Bloom's taxonomy. *American Educational Research Journal*, 1979, *16*, 241–248.

Minskoff, E. H. Verbal interactions of teachers and mentally retarded pupils. *Dissertation Abstracts*, 1967, *27*, 546a.

Rosenshine, B. V. Content, time, and direct instruction. In P. L. Peterson & H. J. Walberg (Eds.), *Research on teaching: Concepts, findings and implications.* Berkeley, California: McCutchan, 1979.

Sanders, N. *Classroom questions: What kinds?* New York: Harper and Row, 1966.

Sitko, M. C., Bachor, D. G., & Slemon, A. G. *Teacher questioning techniques: The state of the art.* Paper presented at the Annual Meeting of the Canadian Society for the Study of Education, CERA Division, Montreal, June 1980.

Sitko, M. C., Semmel, M. I., Semmel, D. S., Frick, T., & Hasselbring, T. *The effects of CATTS feedback in a preservice special education teacher training program.* Bloomington, Indiana: Center for Innovation in Teaching the Handicapped, Indiana University. Final Federal Report to the U.S. Office of Education, Bureau of Education for the Handicapped. (Grant #OEG-9-242178-4149-032, August 1976. Volume 1 (No. 5331); Volume II (Trainee Manual) (No. 5332)).

Sitko, M. C., Semmel, M. I., Heshusius, L., & Cohen, D. *The effectiveness of a computer assisted teacher training system (CATTS) in the development of reading and listening comprehension instructional strategies of preservice special education trainees in a tutorial classroom setting.* Bloomington, Indiana: Center for Innovation in Teaching the Handicapped. Indiana University, August 1976.

Sitko, M. C., & Slemon, A. G. *Teacher pupil question response system (TPQR).* Informal publication, Faculty of Education, The University of Western Ontario, 1977.

Sitko, M. C., & Slemon, A. G. *The development and evaluation of a training package for inservice teachers on hierarchical questioning strategies for teaching children with learning disabilities.* London, Ontario: Faculty of Education, The University of Western Ontario. Final Report to the Ministry of Education, 1978.

Taba, H. *Teaching strategies and cognitive functioning in elementary school children.* Cooperative Research Project, San Francisco State College, February 1966.

Thiagarajan, S., Semmel, D., & Semmel, M. I. *Instructional development for training teachers of exceptional children: A sourcebook.* Reston, Virginia: The Council for Exceptional Children, 1974.

Winer, B. J. *Statistical principles in experimental design* (2nd ed.). Toronto: McGraw-Hill, 1971.

Winne, P. H. Experiments relating teachers' use of higher cognitive questions to student achievement. *Review of Educational Research*, 1979, *49*, 13–50.

Wright, C. J., & Nuthall, G. Relationships between teacher behaviors and pupil achievement in three experimental elementary science lessons. *American Educational Research Journal*, 1970, 7(4), 477–491.

Zimmerman, B. J., & Bergan, J. R., Intellectual operations in teacher question-asking behavior. *Merrill-Palmer Quarterly*, 1971, *17*, 19–26.

Merrill Sitko is an Associate Professor and Alan G. Slemon is a Professor in the Department of Educational Psychology, Faculty of Education, University of Western Ontario, London, Ontario N6G 1G7.