ADAPTATIONS OF MODELING PROCEDURES AND THEIR EFFECT ON THE DEVELOPMENT OF HIGHER-ORDER QUESTIONING BEHAVIOR IN AN ELEMENTARY TEACHER-EDUCATION PROGRAM

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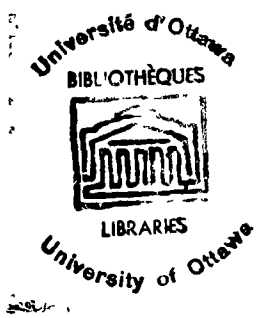

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CURRICULUM STUDIORUM

Patrick Babin was born June 18, 1932, in Fort Kent, Maine. He received the Bachelor of Science degree in Elementary Education from the University of Maine at Presque Isle, in 1959, and the Master of Science degree in Educational Administration and Supervision from the University of Maine at Orono, 1961. The title of his thesis was A Comparative Study of the Elementary-School Courses of Study in Madawaska, Maine, and Edmundston, New Brunswick. The recipient of a Ford Foundation Fellowship in 1967, he studied in Austin, Texas, and Cambridge, Massachusetts.

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INTRODUCTION

Pre-service teacher-education programs have generally focused on three dimensions; namely, curriculum content, professional knowledge, and classroom skills and behavior. The first two categories have been transmitted predominantly in the form of abstract concepts, and the third category has not usually attained realism until the student-teaching phase occurred, usually near the end of the teacher-education program. In the literature, teachers have been described as deficient in classroom skills and their deficiency attributed to the cursory attention given by teacher-training programs to these vital skills. The writer shares this view.

Researchers in teacher education recommend clinical studies of teaching as one way of ameliorating this deficiency. As a preliminary to classroom teaching, future teachers should be involved in acts of teaching subject to analysis and inquiry. This added component to teacher education would provide laboratory experiences in building specific skills and behavior patterns needed to effectively face a variety of classroom teaching-learning situations. This adjunct to existing teacher-education programs would provide a necessary bridge between theory and practice.

The problem, for this study, stemmed directly from the assumption that theory and practice must be drawn closer

together in the pre-service setting and the postulation that teacher-education programs must become both academic and clinical with provision for direct involvement in teaching prior to supervised practice teaching. The training component injected into this experiment is largely what is missing from most teacher-education programs according to Davies.[1] The development of professional skills in a controlled setting, largely lacking at present, is a must in the reconstruction of teacher education.

The experiment attempted to answer the question: Can the higher-order questioning behavior of selected trainees in the elementary-education program at Ottawa Teachers College be changed as a result of exposure to two modeling procedures with varied reinforcement employed in a pre-service microteaching program?

Higher-order questioning behavior was chosen as the teaching skill because empirical evidence discloses that teacher questioning practices, in general, are of a low cognitive level, designed to elicit recognition or recall of factual information.

The acquisition of questioning behavior by pre-service elementary-school teachers was encouraged through

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1 Don Davies, "Teachers Will Be Professionally Educated," in Margaret Lindsey (ed.), Teacher Education: Future Directions, Washington, The Association of Teacher Educators, 1970, p. 135, 137.

the utilization of combinations of training procedures conducted within the framework of a conceptual model of instruction. This study describes the learning of a complex teaching skill within the configuration of observational learning theory.

Pertinent literature on clinical experience in teacher education, teacher questioning behavior, and observational learning is reviewed in Chapter I along with a statement of the problem and its specific hypotheses. Chapter II delineates the design of the study. Chapter III presents the results. Chapter IV discusses their implications for educational practice and future research, and forms a conclusion. Also included are an annotated bibliography, appendices of material used in gathering data together with the actual results, and an abstract of the thesis.

CHAPTER I

REVIEW OF THE LITERATURE

The first section of this chapter justifies clinical experiences as a means of developing specific teaching skills in student teachers. Teacher questioning behavior, the criterion under scrutiny in this study, is then examined and relevant literature reviewed. Modeling procedures employed in clinical situations are investigated, with a focalization on teacher-education applications.

The chapter concludes with a statement of the problem and hypotheses which evolve from needs expressed in the literature.

1. Clinical Experiences in Teacher Education.

This section traces research in teaching, from the global criterion-of-effectiveness approach to the micro-criteria-of-effectiveness prototype currently in vogue. The disparity between theory and practice in teacher-education programs is underscored and the desirability of designing clinical settings for teacher development and educational research is supported in the literature. The rationale for breaking down the teaching act into discrete components such as higher-order questioning follows.

Criticizing the lack of an intermediate step between what is learned in education courses and actual classroom practice in pre-service teacher education, Flanders stated:

> One stumbling block is our inability to describe teaching as a series of acts through time and to establish models of behavior which are appropriate to different kinds of teaching situations.[1]

Conceptualization of what is taught through a systematic, vibrant, exploration of teaching is too infrequently promoted.

Where has research on teaching been? The years encompassing the first half of the nineteenth century produced a number of studies, substantial reviews and bibliographies of research on teaching. Unfortunately, "positive and significant results were seldom forthcoming, and they [research studies] survived replication even less often."[2]

The phrase, "criterion of teacher effectiveness," so popular among researchers in teaching as late as the 1950's, was too general, according to Gage,[3] to be really effective in identifying desired instructional methods.

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1 Ned Flanders, "Intent, Action and Feedback: A Preparation for Teaching," in Journal of Teacher Education, Vol. 14, No. 3, September 1963, p. 251.

2 N.L. Gage, "An Analytical Approach to Research on Instructional Methods," in Phi Delta Kappan, Vol. 49, No. 10, June 1968, p. 601.

3 Ibid., p. 601-602.

The implication in this approach was that a criterion of teacher effectiveness, largely a matter of values, was needed--a concrete, objective, universal criterion for teaching ability. "This kind of writing implies that there is some magic variable that applies to all of teaching, for all pupils, at all grade levels, in all subject matters, and in all objectives."[4]

Berelson and Steiner,[5] in their review of research in the area of teachers' behaviors and characteristics, dismissed most of the studies focusing on the so-called criterion problem as clearly inconclusive in accurately and adequately determining teacher effectiveness. Research, on the basis of predictive variables that had only tenuous theoretical justification, yielded numerous findings which lacked both sense and coherence.

An alternative path to the global criterion approach to teaching was necessary if fruitful research were to materialize. The 1960's, in particular, will be remembered as a decade triggering intensified examination, criticism, and experimentation in teacher education.

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4 Ibid., p. 602.

5 B. Berelson and G. Steiner, Human Behavior: An Inventory of Scientific Findings, New York, Harcourt, Brace, and World, 1964, xxiii-712 p.

Labeling teaching a technique, Dewey,[6] as far back as 1904, proposed a rationale for professional laboratory experiences in teacher education when he stated that the problems of training teachers were similar to those of training engineers, doctors, architects, and lawyers. Dewey felt that laboratory experiences would help the pre-service teacher "[...] make the transition from his more psychological and theoretical insight to the observation of the more technical points of class teaching and management."[7]

Conant's[8] concern with the disparity between theory and practice in teacher education and the fact that too little time was devoted to the right kinds of methodology led him to urge that a clinical professor be given the task of assessing the relevance and value of various aspects of the total collegiate curriculum to students' teaching performance in student teaching.

In the early 1960's, the permeating theme, as exemplified by Conant, was one of uncertainty about what knowledge and curricular organization were necessary to the professional education of teachers. Another study which

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6 John Dewey, "The Relation of Theory to Practice in Education," (originally published in the 1904 Yearbook of the National Society for the Study of Education), reprinted in Bulletin No. 17, Cedar Falls, State College of Iowa, The Association for Student Teaching, 1962, iv-24 p.

7 Ibid., p. 20.

8 James B. Conant, The Education of American Teachers, New York, McGraw-Hill Book Co., 1963, p. 214.

pointed to this uncertainty was the report[9] which followed a conference focusing on reappraisal of the professional aspects of teacher education.

The paucity of research on how teachers learn to teach is well illustrated by the sparse attention devoted to this topic in the Handbook of Research on Teaching.[10] The major research method, historically, has been to correlate measures of teacher characteristics with ratings on effectiveness.

Stern, in his summarization, reported "[...] no substantial progress along these lines, despite the marked trend toward the use of more reliable measures of predictor variables."[11]

Gage, at approximately the same time Stanford University educators were developing microteaching with its focus on a technical skills approach,[12] advocated reducing the

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9 Elmer R. Smith (ed.), Teacher Education: A Reappraisal, report of a conference sponsored by The Fund for the Advancement of Education, New York, Harper and Row, 1962, vii-213 p.

10 N.L. Gage (ed.), Handbook of Research on Teaching, Chicago, Rand McNally and Co., 1963, ix-1218 p.

11 George G. Stern, "Measuring Noncognitive Variables in Research on Teaching," in Gage (ed.), Handbook of Research on Teaching, p. 398-447.

12 Gage, "An Analytical Approach to Research on Instructional Methods," p. 602.

complexity of research in teaching through the use of "micro-criteria" of effectiveness.[13]

> Rather than seek criteria for the over-all effectiveness of teachers in the many, varied facets of their roles, we may have better success with criteria of effectiveness in small, specifically defined aspects of the role. Many scientific problems have eventually been solved by being analyzed into smaller problems, whose variables were less complex.[14]

Scientific study of teaching, used in this connotation, would involve experimentation and observation of teaching which would eventually yield manageable analyses--"sets of lawful relationships between variables."[15]

Meux and Smith,[16] bemoaning the fact that no studies of teaching yielded broad, predictive generalizations which are a long-range goal of inquiry into teaching, advocated purely descriptive studies of teaching as the most fruitful approach to investigating teaching at present. This level of inquiry would be a stepping-stone to the more sophisticated levels; namely, correlational studies and studies

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13 Gage, "Paradigms for Research on Teaching," in Handbook of Research on Teaching, p. 120.

14 Ibid.

15 --------, "An Analytical Approach to Research on Instructional Methods," p. 606.

16 Milton Meux and B. Othanel Smith, "Logical Dimensions of Teaching Behavior," in Bruce J. Biddle and William J. Ellena (eds.), Contemporary Research on Teacher Effectiveness, New York, Holt, Rinehart and Winston, 1964, p. 128.

designed to discover generalizations. Others have also justified the utilization of descriptive studies:

> If very little is known about a phenomenon, the way to begin an investigation of it is to observe and analyze the phenomenon itself. It must be observed, analyzed, and classified into its various elements. Until the factors which are involved in the phenomenon are understood and described, there is little likelihood that significant correlational, predictive, or causal studies can be made. In other words, the state of knowledge about a given phenomenon dictates to some extent the kind of inquiry of it which is appropriate.[17]

The need for properly designed clinical settings for teacher development and educational research was stressed by McIntosh[18] in his comparative analysis of sociological studies dealing with occupational training. These clinical studies of teaching "[...] would be teaching-learning situations involving actual acts of teaching that are subject to analysis and inquiry."[19]

More and more teacher-training institutions have incorporated a laboratory component into their program,

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17 B. Othanel Smith et al., A Study of the Logic of Teaching, Urbana, Ill., College of Education, University of Illinois, 1970, p. 8.

18 Robert G. McIntosh, "An Approach to the Analysis of Clinical Settings for Teacher Education," The Third Florence B. Stratemeyer Lecture, address presented to the annual meeting of the Association for Student Teaching, Chicago, Ill., February 15, 1968, p. 2.

19 Henry J. Hermanowicz, "Studies of Teaching and Their Impact on Future Developments in Teacher Education," in Dean Corrigan (ed.), The Study of Teaching, Washington, The Association for Student Teaching, 1967, p. 9.

usually as a preliminary, but quite often as an adjunct, to student teaching.[20] New techniques of recording and analyzing teacher performance, such as videotaping of teaching episodes,[21] microteaching,[22] and interaction procedures[23,24,25,26] provide some means of gathering data about teacher performance which can allow inferences to be made concerning the effects of certain teacher-training procedures during the "vocational state,"[27] the period of basic technical skill learning.

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20 Dwight W. Allen and Kevin Ryan, Microteaching, Don Mills, Ontario, Addison-Wesley Publishing Co., 1969, p. xiii.

21 John H. Meier, "Rationale for and Application of Microteaching to Improve Teaching," in The Journal of Teacher Education, Vol. 19, No. 2, Summer 1968, p. 145-157.

22 James M. Cooper and Dwight W. Allen, Microteaching History and Present Status, Amherst, School of Education, University of Massachusetts, June 3, 1969, 1-34 p.

23 Morton D. Waimon, "Observing the Classroom Action System," in The Journal of Teacher Education, Vol. 12, No. 4, December 1961, p. 466-470.

24 Flanders, op. cit., p. 251-260.

25 Edmund J. Amidon and Evan Powell, "Interaction Analysis as a Feedback System in Teacher Preparation," in James Rath and Robert R. Leeper (eds.), The Supervisor: Agent for Change in Teaching, Washington, Association for Supervision and Curriculum Development, National Education Association, 1966, p. 44-56.

26 Arno A. Bellack et al., The Language of the Classroom, New York, Teachers College Press, Columbia University, 1966, xii-274 p.

27 Judith M. Bloom, "Videotape and the Vitalization of Teaching," in The Journal of Teacher Education, Vol. 20, No. 3, Fall 1969, p. 313-314.

As noted in the aforementioned, the literature emphasizes the importance of developing relevant teaching skills and attitudes as a preliminary step to actual student teaching and/or regular contractual teaching.

Arguing that competence in practice should be gained as an application of theory to the practical problems of instruction, Johnson observed that:

> Traditionally teacher education has been organized to teach the theory (methods courses prerequisite to student teaching) before the practice (student teaching). This procedure violates one of education's own most publicized tenets, that theory and practice are best learned together, thus giving rise to criticisms of inconsistency between doctrine and practice.[28]

An additional ingredient, along with increased stress on curricular changes and organizational innovations, according to Johnson,[29] is a new stress on the quality and nature of instruction. He offered two modifications in procedure toward demonstrating the validity of the proposition that teaching does make a difference; namely:

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28 William D. Johnson, "Teaching Techniques Laboratory," in An Evaluative Report of the Laboratory Portion of the Augmented Professional Semester, Fall 1967, Urbana, University of Illinois, May 1968, p. 19.

29 --------, "Microteaching: A Medium in Which to Study Teaching," in The High School Journal, Vol. 51, No. 2, November 1967, p. 86.

> Teaching techniques. The term [...] refers to specific teacher behaviors designed to influence learners in a predetermined direction. The implementation of the idea requires that both teacher and learner behaviors be operationally defined and that the desired interaction between teacher and learner be derived from a theoretical rationale. [...]
>
> An intermediate step. [...] What has been needed is an intermediate research environment located between the conceptualization of a methodological innovation and the complexities of a field study [...].[30]

This study will limit itself to the pre-service period of teacher education, the preparatory stage preceding employment as a teacher, and will employ clinical training procedures in a laboratory setting. The clinical procedure to be used will be microteaching,

> [...] a training concept that can be applied at various pre-service and in-service stages in the professional development of teachers. Microteaching provides teachers with a practice setting for instruction in which the normal complexities of the classroom are reduced and in which the teacher receives a great deal of feedback on his performance.[31]

The teaching skill to be developed in this inquiry is higher-order questioning and this skill will be discussed later in the chapter.

The idea of breaking down the teaching act into discrete, well-defined components which can be taught, practiced, evaluated, predicted, controlled, and understood

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30 Ibid., p. 88.

31 Allen and Ryan, op. cit., p. 1-2.

is consonant with both Gage's micro-criteria approach and Johnson's teaching techniques procedure. The technical skills protocol, an application of Gage's "micro-effectiveness" concept, is based on the rationale that:

> If skills and behaviors which teachers perform often in the classroom can be identified, different training protocols or established procedures and techniques can be developed in order to produce proficiency in their use. In other words, much of the complex act of teaching can be broken down into simpler, more easily trainable skills or techniques.[32]

Analysis of the teaching process, in clinical settings, with the stress on relatively discrete components which may be used in different combinations by different teachers provides opportunities for satisfactory research on teacher education and on teacher effects. It becomes possible to measure or manipulate pertinent independent variables, perform authentic experiments, and measure relevant dependent variables.

As part of the new emphasis on training, Smith et al.[33] also questioned the assumption that theoretical courses plus student teaching are adequate. Their contention was that

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32 James Cooper, "Developing Specific Teaching Skills through Micro-Teaching," in The High School Journal, Vol. 51, No. 2, November 1967, p. 80.

33 B. Othanel Smith, Saul B. Cohen, and Arthur Pearl, Teachers for the Real World, Washington, The American Association of Colleges for Teacher Education, 1969, p. 71.

the main defect in teacher preparation is the almost total lack of a training component which must include the following elements: (1) establishment of the practice situation; (2) specification of the behavior; (3) performance of the specified behavior; (4) feedback of information about the performance; (5) modification of the performance in the light of the feedback; (6) continuation of the performance-feedback-correction-practice schedule until desirable skillfulness is achieved. In order to train new teachers, it becomes necessary to design a program and sets of training materials which will incorporate each of these essential elements, a procedure employed in this study.

In the reconstruction of teacher education, Goodlad[34] proposed that the theoretical knowledge and the clinical skills needed by the future teacher be brought into juxtaposition by both professors of education and public school personnel.

> At the very time the future teacher needs a truly clinical orientation, he finds himself in a large lecture class with very little opportunity to see and analyze let alone participate in teaching processes employing the principles being studied.[35]

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[34] John I. Goodlad, "The Reconstruction of Teacher Education," in Teachers College Record, Vol. 72, No. 1, September 1970, p. 64.

[35] Ibid.

This portion of the review of the literature explored that area of teacher education focusing on the desirability of clinical experiences as a means of analyzing instruction, particularly in the pre-service stage of teacher education.

The criterion behavior, teacher questioning, is reviewed in its historical context in the next section.

2. Teacher Questioning Behavior.

Reviewed in this section, in chronological fashion, is the research which converges on the desirability of improved questioning. Early attempts to define questioning and to record classroom questioning behavior are outlined to the present day use of more sophisticated data-gathering instruments. Pre-service research studies which investigated questioning practices in clinical settings are examined.

The steady stream of monographs, articles, and books on the "art of questioning" which have appeared over the years attests to the belief that appropriate questioning behavior is an important teaching skill.

As early as 1895, Young,[36] in an attempt to clarify what he labeled "[...] an interrogative ellipsis," deplored the catechetical approach to teaching by which students were

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36 W.T. Young, The Art of Putting Questions, Syracuse, New York, C.W. Bardeen, 1895, p. 10.

expected to commit questions and corresponding answers to memory and advocated questions "[...] so framed, that no answer can be given that is not the result of some reflection."[37]

Two decades later, Stevens[38] blamed haphazard teacher questioning on teacher-training institutions. In one of the first investigations of classroom questioning practices, she observed hundreds of lessons in varying subject areas from the seventh grade through the last year of high school and reported twenty of these lessons stenographically. Her study, a crude analysis, reflected a fast pace of teacher questioning, slavish adherence to the textbook, and a preponderance (over fifty per cent) of memory questions.[39]

These early writers all failed to logically define the term "question." Common was the idea that the question was an expression of the instinct of curiosity although this explanation became unacceptable with the acknowledgment that questioning behavior was probably learned in interaction with environmental conditions. Writers then turned to the

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37 Ibid., p. 14.

38 Romiett Stevens, The Question as a Measure of Efficiency in Instruction, New York, Teachers College, Columbia University, 1912, p. 4-5.

39 Ibid., ii-95 p.

areas of natural language outgrowths, interests, and social contact in their quest for a clearer understanding of the nature of questioning.

An early attempt to clarify the ambiguity and indiscriminate use of the word "question" was Cohen's[40] contention that a question was a logical entity; that questions are variables (as in mathematical logic), the values of which are answers.

In his plan for the improvement of the quality of questions, Houston,[41] in 1938, conducted an experiment with eleven social studies teachers. Stenographic reports focusing on teacher questioning were analyzed and supplied to the teachers for perusal and application. Routine, cognitive-memory questions gradually succumbed to patterns of a higher quality as determined by criteria developed by the experimenter and the teachers. Questioning became increasingly directed towards the teachers' avowed purposes. This was the first recorded attempt to improve teacher questioning ability, albeit it lacked a systematic schema for analytical purposes.

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40 F.S. Cohen, "What Is a Question?", in Monist, Vol. 39, 1929, p. 353-354.

41 V.M. Houston, "Improving the Quality of Classroom Questions and Questioning," in Educational Administration and Supervision, Vol. 24, No. 1, January 1938, p. 17-28.

Fahey[42] defined a question as a "[...] verbal expression of a problematic situation existing in the mind of the questioner." Problematic, in this connotation, was to be interpreted broadly to include realization of lack of specific information, awareness of gaps in relationships, or consciousness of a conflict between present and past experience. The implication was that the question could be used to find a means of supplying the lack of information closing the gap, or resolving the conflict. Attempts to attract attention or to gain time would not have been classified as questions.

Until recently, there have been very few studies done of teacher questioning behavior as it occurs in the classroom. Data gathering handicaps were obvious along with the inability to classify questions. Probably the most widely used system for classifying the questions which children raise was developed by Piaget,[43] but no such categorization system was developed for teachers.

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42 George L. Fahey, "The Questioning Activity of Children," in The Journal of Genetic Psychology, Vol. 60, Second Half, June 1942, p. 339.

43 Jean Piaget, The Language and Thought of the Child (translated by Marjorie Gabain), New York, The World Publishing Company, 1955, 252 p.

Bloom's[44] cognitive classification schema describes factual knowledge acquisition as the most common educational outcome in American education. The Bloom taxonomy was the outcome of a project organized to achieve a more widely accepted set of behavioral objectives that could be more profitably used to facilitate communication and for guiding research in connection with curricula, teaching, and testing in education.

Bloom identified six categories of intellectual performance: (1) knowledge, (2) comprehension, (3) application, (4) analysis, (5) synthesis, and (6) evaluation, and ordered them

> [...] within a hierarchical framework: each category is assumed to include behavior more complex, abstract, or internalized than the previous category. These categories are arranged along a continuum from simple to complex. [...][45]

Bloom claimed that any educational objective could be classified within this outline, and implied that any question could also be classified.

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44 Benjamin S. Bloom (ed.), Taxonomy of Educational Objectives: The Classification of Educational Goals, Handbook I. Cognitive Domain, New York, David McKay Co., 1956, p. 28.

45 Benjamin S. Bloom, J. Thomas Hastings, and George F. Madaus, Handbook on Formative and Summative Evaluation of Student Learning, Toronto, McGraw-Hill, 1971, p. 39.

Although the implication in Bloom's classification system was that it could serve as an analytical instrument in judging questioning in the classroom, it was not until Sanders[46] developed a taxonomy of questions, based on Bloom's domain, that educators seriously considered the appropriateness of taxonomies in improving classroom intellectual performance. With the Sanders taxonomy, certain inadequacies noted in earlier research could be corrected with greater precision.

Based on Bloom's arrangement, the Sanders' Classification System, adapted for use in this experiment, offers a sequential and cumulative hierarchical organization of categories of thinking effected specifically for the appraisal of questions. The headings proposed by Sanders are; namely, (1) memory, (2) translation, (3) interpretation, (4) application, (5) analysis, (6) synthesis, and (7) evaluation. Sanders replaced Bloom's term "knowledge" with the label "memory," asserting that "memory" better described the mental activity and was parallel with the names of the other categories. "Comprehension" was divided into two of its component parts; namely, "translation" and "interpretation" and considered two separate classifications.[47]

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[46] Norris M. Sanders, Classroom Questions: What Kinds?, New York, Harper and Row, 1966, xii-176 p.

[47] Ibid., p. 1-18.

Additional information on the Sanders Question Classification System is listed in Rater's Manual: Sanders Question Classification System (Appendix 1), and Questioning in the Classroom (Appendix 2).

The interim between the appearance of the Bloom and Sanders schemata saw continued efforts to analyze classroom questioning behavior. Aschner's[48] contention was that teachers' questions stimulate four main types of thinking: (1) remembering, (2) reasoning, (3) evaluating or judging, and (4) creative thinking. Since critical reading depends on the ability to ask the proper question at the proper time, Carner[49] felt that children must be taught to ask questions at the concrete, abstract, and creative levels. Gallagher and Aschner,[50] following an attempt to analyze classroom questioning interaction using an adaptation of Guilford's structure of the intellect, called for the construction of a reliable classification system for analyzing verbal interaction of teachers and pupils, particularly in the realm of questioning behavior.

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48 M.J. McCue Aschner, "Asking Questions to Trigger Thinking," in NEA Journal, Vol. 50, No. 6, September 1961, p. 44.

49 Richard L. Carner, "Levels of Questioning," in Education, Vol. 83, No. 9, May 1963, p. 548-550.

50 James J. Gallagher and Mary Jane Aschner, "A Preliminary Report on Analyses of Classroom Interaction," in Merrill-Palmer Quarterly, Vol. 9, No. 3, July 1963, p. 192-193.

Major considerations and basic procedures of effective questioning were listed by Groisser[51] in his publication which labeled questioning as both a technique and method essential for good teaching. A multitude of purposes and functions of questions was suggested, along with ideas for their construction.

> A teacher who asks questions with a specific purpose and in challenging fashion will undoubtedly spark thought and response if his questions are designed carefully.[52]

In another attempt to classify questions according to purpose, Fraenkel[53] offered four categories: (1) factual, (2) descriptive, (3) explanatory, and (4) heuristic. His argument was that lack of purpose on the part of many teachers contributed to the development of uncritical minds which too readily accept all information without query. Too often, according to Eisner,[54] teachers fail to develop instructional strategies which elicit important and relevant questions which might be catalytic to further inquiry.

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51 Philip Groisser, How to Use the Fine Art of Questioning, New York, Atherton Press, 1964, p. 64.

52 Ibid., p. 38.

53 Jack R. Fraenkel, "Ask the Right Questions!", in Clearing House, Vol. 41, No. 4, December 1966, p. 200.

54 Elliot W. Eisner, "Critical Thinking: Some Cognitive Components," in Teachers College Record, Vol. 66, No. 7, April 1965, p. 628.

Critical that the predominant emphasis of teachers' questions seemed to be on knowledge of facts--not thinking--Hunkins[55] advocated judgment of questions according to both their form and their relation to context. "Why" questions are not necessarily better questions unless an individual considers these questions in relation to their context in particular lessons. The types of responses which these questions elicit will also depend to a large extent upon the information students bring to these questions.

The period following Sanders' publication saw an upsurge of literature focusing on the act of asking. Labeling questioning as "[...] the single, most crucial teaching strategy for classroom interaction,"[56] Minor stated that many teachers seemed prone to remain out of resonance with their students because of their inability to question productively.

The move toward empirical studies with more sophisticated analyses was noted in Johns'[57] analysis which

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55 Francis P. Hunkins, "Using Questions to Foster Pupils' Thinking," in Education, Vol. 87, No. 2, October 1966, p. 83, 86.

56 Frances Minor, "In Resonance with Students," in Educational Leadership, Vol. 23, No. 7, April 1966, p. 538.

57 Joseph P. Johns, "The Relationship Between Teacher Behaviors and the Incidence of Thought-Provoking Questions by Students in Secondary Schools," in The Journal of Educational Research, Vol. 62, No. 3, November 1968, p. 122.

explored the relationship between the behavior of teachers and the incidence of thought-provoking questions by students in secondary schools. The implications of this research involving matched high-school English classes representing two groups of teacher behavior (direct and indirect) was that if a teacher wants to increase the incidence of student thought-provoking questions, he should use a greater incidence of indirect behaviors as reflected in Flanders Interaction Analysis and the Minnesota Student Attitude Inventory.

In a study conducted to determine if behavior change in questioning techniques could be effected through programmed materials designed for independent study by the teacher, Crump[58] found that self-instruction resulted in increased numbers of questions drawn from higher cognitive levels as measured by the instrument Self Instruction in the Art of Questioning, which utilized four levels of questions; namely, (1) reproduction, (2) translation, (3) reflection, and (4) valuation. Teachers were involved in responding to examples of social studies questions and excerpts of classroom dialogue and in reacting to guidelines for composing good questions and eliminating poor ones.

Another self-evaluation form that allows the teacher to make an estimate of the cognitive dimension of his

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58 Claudia Crump, "Teachers, Questions, and Cognition," in Educational Leadership, Vol. 27, No. 7, April 1970, p. 659.

questioning demands on students was proposed by Manson and Clegg.[59] The evaluation scale, based on Bloom's taxonomy, is predicated on the conviction that a capable teacher seeks a multitude of objectives and consequently uses questions involving diverse thinking operations. It was suggested that a study of classroom questions should proceed in three stages; namely, (1) collecting the questions, (2) classifying the questions, and (3) interpreting the responses.

Explorations involving the development of questioning ability in the pre-service element of teacher education also started to emerge.

Davis and Hunkins,[60] using the Bloom taxonomy in an examination of social studies textbooks, found that seventy-eight per cent of the questions in these textbooks was concerned with knowledge of specifics as compared to thirteen per cent focusing on the higher thinking processes. As a followup, Davis and Tinsley,[61] in an investigation involving

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59 Gary Manson and Ambrose A. Clegg, Jr., "Classroom Questions: Keys to Children's Thinking," in Peabody Journal of Education, Vol. 47, No. 5, March 1970, p. 302-307.

60 O.L. Davis, Jr. and Francis P. Hunkins, "Textbook Questions: What Thinking Processes Do They Foster?", in Peabody Journal of Education, Vol. 43, No. 5, March 1966, p. 288.

61 O.L. Davis, Jr. and Drew C. Tinsley, "Cognitive Objectives Revealed by Classroom Questions Asked by Social Studies Student Teachers," in Peabody Journal of Education, Vol. 45, No. 1, July 1967, p. 21-26.

forty-four individuals enrolled in secondary teaching of the social studies, discovered from an inventory of student teacher questions recorded during observational visits that both teachers and pupils asked more memory questions than all other questions combined. Their recording instrument was the Teacher-Pupil Question Inventory, based on the Bloom taxonomy and the formulations by Sanders.

Olmo,[62] utilizing an analysis chart adapted from Bloom's taxonomy, provided a social studies methods class with experience in analyzing questions and preparing lessons especially designed to elicit questions in an analytical-discovery sequence with high-school youngsters in a laboratory school. As a result of exposure to this skill in micro-groups and full-class sessions, the student teachers became more perceptive in identifying questions and gradually realized the advantages of asking particular types of questions for particular students. The level of questioning of the ninth graders involved was significantly upgraded.

In a research activity concerned with developing a technical skills approach in a pre-service teacher training program, the area to be investigated in this study,

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62 Barbara M. Olmo, "Questioning: Heart of Social Studies," in Social Education, Vol. 34, No. 9, December 1969, p. 949-952, 989.

Berliner[63] examined training methods designed to promote higher-order questioning behavior in beginning teachers. He employed a procedure involving the use of symbolic and perceptual models designed to sensitize the novice teacher to the effects of questioning of his students and to provide practice, in a microteaching setting, in forming and using questions that elicit complex cognitive activity. The dependent variable measured was the acquisition of the particular teaching skill, higher-order questioning, measured in terms of frequencies of such questions observed under varying conditions. Questions were categorized as either "lower order" or "higher order" on the basis of two substitution rules which were: Can you substitute the verbs "remember" or "describe" in the question? If so, the question is lower order. If not, and such verbs as "infer," "interpret," and "synthesize," can be substituted in the question, the question is higher order. For this sample of interns in secondary teaching, training in the use of higher-order questions was successful. As measured by the percentage of higher-order questions used in a five-minute teaching session, all experimental groups showed significant training

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63 David C. Berliner, "Microteaching and the Technical Skills Approach to Teacher Training," Technical Report No. 8, Stanford, California, School of Education, Stanford University, October 1969, ix-57 p.

effects. For this skill the perceptual model (actual performance of another person on videotape) was no more efficient as a training agent than the written or symbolic model. Berliner concluded that perhaps a verbal skill such as higher-order questioning could be presented as readily through written models and that the video technology used to present the model may be superfluous. There was no control group in this experiment.

A subsequent study of higher-order questioning by Claus[64] investigated the acquisition of this skill with an adaptation of Bloom's taxonomy to form eight categories. All subjects, forty pre-service elementary intern teachers who were randomly assigned to four experimental conditions, were given special training to increase their use of complex or higher-order questions by using combinations of training methods (modeling procedures and feedback) previously demonstrated to be effective. The eight categories in the system developed to rate the dependent variable, use of higher-order questions, were: (1) memory, (2) translation, (3) interpretation, (4) application, (5) analysis, (6) synthesis, (7) lower-order evaluation, and (8) evaluation.

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64 Karen E. Claus, "Effects of Modeling and Feedback Treatments on the Development of Teachers' Questioning Skills," Technical Report No. 6, Stanford, School of Education, Stanford University, June 1969, v-55 p.

A presentation-practice, feedback instructional paradigm was used within a microteaching format. All trainees viewed videotaped models displaying the criterion behavior, practiced emulating the model behaviors in a videotaped microteaching session, then viewed the playback of their own performance.

The effects of verbal cueing procedures (differential reinforcement provided by supervisor during observation of model) in modeling and in feedback (videotape playback) treatments on the acquisition of teacher questioning behavior were investigated in order to determine if providing cues from an experimenter on the questioning behavior during modeling and feedback training treatments would increase the frequency and range of the teacher's use of higher-order questions.

Findings, as a result of analysis of variance, indicated that the treatment with cued model groups ranked higher than that with non-cued model groups. The feedback treatments produced no significant effect. Cueing on the teachers' own use of higher-order questions, as displayed in the videotapes of their own practice sessions, did not prove to be significantly effective. It was concluded that in the acquisition of a complex teaching skill, observational learning with cueing is more effective than feedback, with or without cueing, in producing desired behavior change.

Frequency data from the study indicated that teachers and pupils used mainly factual questions.

It was not possible to use control groups who received neither modeling nor feedback.

The Berliner and Claus studies raised three relevant questions for further investigation.

(1) Would a control group, not exposed to modeling sessions focusing on the criterion behavior, fare as well in the frequency and utilization of higher-order questions?

(2) Is it preferable for a teacher to be exposed to different modeling demonstrations presented between microteaching sessions or could the same modeling demonstrations repeated between microteaching sessions be as effective?

Allen and Ryan,[65] in their discussion of the research possibilities of microteaching, suggested that a high priority in research be given to investigations relating to modeling techniques. Two of their questions are particularly germane: What effect would different verbal reinforcers have in training a particular skill? And, is a trainee's ability to transfer the skill improved by the use of models in different contexts? Bandura, in discussing the generality of modeling influences, stated that:

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65 Allen and Ryan, op. cit., p. 110-122.

> [...] under conditions in which opportunities are provided to observe the behavior of heterogeneous models [...] observers typically display novel patterns of behavior representing diverse combinations of elements from the different models.[66]

A thorough review of the literature failed to reveal any studies wherein teachers, either in pre-service or inservice settings, had viewed two or more different model presentations highlighting the same criterion behavior. This apparent void, along with the Allen and Ryan statement that research in microteaching should build on previous findings, led this researcher to introduce the element of multiple modeling (two different videotapes focusing on the same teaching behavior) in this experimental design.[67]

(3) Is written cueing of the model demonstration effective in eliciting the desired behavior criterion in teachers?

Cueing during the observation of modeling videotapes in this study was provided by the experimenter in the form of written transcripts of the criterion behavior of the models with accompanying classification according to the Sanders Question Classification System. All questions asked by the teacher model were thus presented. These transcripts

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66 Albert Bandura, Principles of Behavior Modification, Toronto, Holt, Rinehart and Winston, 1969, p. 148-149.

67 Allen and Ryan, op. cit., p. 122.

were given to the trainee prior to viewing of model tapes and retrieved following the viewing session. The reason written transcripts were used in lieu of live supervision to cue relevant behavior was to guard against interference from the latter. Verbalizations uttered by a supervisor during the actual presentation of a videotaped model lesson would obviously obscure some of the teacher-pupil dialogue and would make it more difficult for the trainee to attend to the lesson. Claus strongly implied in her study that supervisory cueing may have interfered with the interns' own perception of the type of questions asked in their own lessons.[68] Although no such inference is made relevant to supervisory cueing of model presentations, the same could be implied.

Claus, in citing future research possibilities, suggested investigating whether cueing could be done by a means other than a live supervisor and also advocated adapting cued modeling procedures to a variety of forms.[69] This apparent need to look more closely at the precise nature of effective modeling conditions in order to determine optimal sequencing of instruction led this researcher to apply different cueing procedures in this study. It was felt that written transcripts with accompanying classification

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68 Claus, op. cit., p. 36.

69 Ibid., p. 38.

of teacher questions would provide an optimal cued modeling procedure. There was nothing in the literature disclaiming the soundness of this approach. Bandura, in reviewing conditions required for the occurrence of observational learning from modeled stimuli, called for stimulus contiguity accompanied by discriminative observation. Cueing as a means of encouraging selective attentiveness was mentioned along with other procedures designed to increase discriminability.[70] Findings relative to the superiority of videotape self-viewing over supervisor feedback, reviewed in Chapter II, p. 55-59 of this study, also added weight to the decision to use written cueing.

This experiment will attempt to answer the questions raised above in an effort to further clarify some of the problems related to complex skill presentation (higher-order questioning) in a clinical pre-service setting. The Sanders Question Classification System, because it gives the most detailed description of any question categorization system now available, will be employed in the investigation.

Consonant with Gall's[71] argument that teacher training should involve not only the study of questioning

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70 Bandura, op. cit., p. 136-137.

71 Meredith D. Gall, "The Use of Questions in Teaching," in Review of Educational Research, Vol. 40, No. 5, December 1970, p. 719.

strategies, but also provide directed practice in their use, this study will focus on pre-service training in a micro-teaching setting, an environment deemed effective in providing this practice.

Presented in the next section is the psychological rationale for employing modeling procedures..

3. Observational Learning.

This portion of the chapter defines observational learning and presents research findings which justify the importance of imitation through observation. Application of observational learning principles to teaching behavior is exemplified in selected studies.

A common approach to the transmission or modification of teaching skills has been to provide the teacher (pre-service and/or inservice) with some type of written or oral instruction reinforced by periodic feedback on his attempts to perform these behaviors in the classroom. An alternative to this strategy of teacher training is indicated by recent findings on the role of observational learning in personality development and behavior modification.

> This other method [observational learning] is simply to have the learner observe someone else performing the response that the learner is to acquire. By this means, the learner can often perform the novel responses sometime later without ever having performed them before or having been reinforced for them (since they have never occurred before). It seems obvious that a large portion of human learning is observational and, in one sense, imitative.[72]

This study will approach the training of a complex teaching skill from the framework of social-learning theory of identification or imitation through observation.

Why should such studies of observational learning be considered innovative as recently as the early 1970's?

> The main subject investigated is not a new notion, by any means; since the nineteenth century, psychologists have recognized observation followed by imitation as a principal mode of learning.[73]

The behavioristic revolution and the animal orientation of S-R learning theory placed observational learning in disrepute.

Theoretical work on imitative learning by Bandura and Walters[74] suggested that complex behavior may be acquired almost entirely through imitation. It appeared that the

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72 E.R. Hilgard and G.H. Bower, Theories of Learning, New York, Appleton-Century-Crofts, 1966, p. 534.

73 Ibid., p. 537.

74 A. Bandura and R.H. Walters, Social Learning and Personality Development, New York, Holt, Rinehart and Winston, 1963, p. 52.

utilization of live or symbolic models served to accelerate the learning process and in situations where minimum errors were desired, modeling was regarded as a highly effective method of transmitting behavior patterns. Furthermore, Bandura, Ross, and Ross[75] demonstrated that for some patterns of behavior there is little difference between filmed models and live models in their effects on acquisition.

Modeling, relative to training involving a complex skill, and defined in this study as portrayal of the desired criterion behavior for the learner, appears to be particularly successful in two types of situations; namely, (1) where novel responses are involved, and (2) where the desired responses are too faint or too infrequent to be directly reinforced.[76] Many intricate human skills are learned more readily by observation and imitation than by other methods such as successive approximation.

Two crucial factors underlie imitation; that is, (1) the person must observe the behavior, and (2) the person must be willing and capable of performing the act.

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75 A. Bandura, D. Ross, and S.A. Ross, "Imitation of Film-Mediated Aggressive Models," in Journal of Abnormal and Social Psychology, Vol. 66, No. 1, 1963, p. 9-11.

76 Karen Claus, The Effects of Modeling and Feedback Variables on Higher-Order Questioning Skills, unpublished doctoral dissertation presented to the [School of Education] Stanford University, 1968, p. 15-16.

Grusec and Mischel[77] data suggested that model characteristics not only influence the person's willingness to act, but also the degree to which the individual observes the model's acts.

"Identification," according to Bandura, "refers to a process in which a person patterns his thoughts, feelings, or actions after another person who serves as a model."[78]

In a succession of experiments with nursery school children, Bandura and his associates studied diverse processes by which models transmit behavioral repertoires, change existing response patterns or provide cue responses for later elicitation of specified action strategies. These studies have shown that the observation of models has had important effects on the behavior of observers.[79,80]

Other research has demonstrated that the level of the desired behavior exhibited by the observer can be as great as

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77 J. Grusec and W. Mischel, "Model's Characteristics as Determinants of Social Learning," in Journal of Personality and Social Psychology, Vol. 4, No. 2, August 1966, p. 211-215.

78 A. Bandura, "Social-Learning Theory of Identificatory Processes," in D.A. Goslin (ed.), Handbook of Socialization Theory and Research, Chicago, Rand McNally and Co., 1969, p. 214.

79 N.L. Gage, "Theories of Teaching," in E.R. Hilgard (ed.), Theories of Learning and Instruction, Sixty-Third Yearbook of the National Society for the Study of Education, Chicago, University of Chicago Press, 1964, p. 284.

80 Hilgard and Bower, op. cit., p. 535-536.

that exhibited by the model.[81] The implication of these findings for teacher training is that the provision of live or symbolic models displaying desired teacher behaviors may provide an effective alternative to purely descriptive techniques of training.

According to the theory proposed by Miller and Dollard,[82] the conditions necessary for learning include a motivated subject who is positively reinforced for matching the rewarded responses of a model. This reinforcing stimulus could be administered either to the model or to the observer as he performed a close proximation to the matching response.

The demonstration of response acquisition from models points to a contiguity (observation) theory of vicarious learning, consonant with the theoretical and empirical work of Sheffield and his colleagues.[83,84]

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81 J.F. McBrearty, A.R. Marston, and F.H. Kanfer, "Conditioning a Verbal Operant in a Group Setting: Direct vs. Vicarious Reinforcement," in American Psychologist, Vol. 16, No. 7, July 1961, p. 425.

82 N.E. Miller and J. Dollard, Social Learning and Imitation, New Haven, Yale University Press, 1941, xiv-341 p.

83 F.D. Sheffield, "Theoretical Considerations in the Learning of Complex Sequential Tasks from Demonstration and Practice," in A.A. Lumsdaine (ed.), Student Response in Programmed Instruction: A Symposium, Washington, National Academy of Sciences--National Research Council, Publication No. 943, 1961, p. 13-32.

84 F.D. Sheffield and N. Maccoby, "Summary and Interpretation of Research on Organizational Principles in Constructing Filmed Demonstrations," in Goslin (ed.), op. cit., p. 117-131.

Bandura[85] reported data which support a notion that (1) acquisition of matching responses takes place through contiguity and that (2) performance of the model's behavior depends upon the consequence of the act upon the model.

Thus, upon viewing a model, the observer:

> [...] acquires through the contiguous association of sensory events, perceptual and symbolic responses possessing cue properties that are capable of eliciting at some time after demonstration, overt responses corresponding to those that have been modeled.[86]

Simply stated, if a person observes another perform he can remember the performance and has the potential to match the response.

> Performance of the observed novel responses can be inhibited or disinhibited depending on the consequences to the model. Furthermore, the introduction of a positive incentive to the observer can disinhibit and lead to matching performance.[87]

Reinforcement procedures in training, then, control performance variables, while acquisition is effected primarily by modeling variables.

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85 A. Bandura, "Influence of Model's Reinforcement Contingencies on the Acquisition of Imitative Responses," in Journal of Personality and Social Psychology, Vol. 1, No. 6, 1965, p. 593.

86 Frederick M. McDonald and Dwight W. Allen, Training Effects of Feedback and Modeling Procedures on Teaching Performance, Technical Report No. 3, Stanford, California, School of Education, Stanford University, 1967, p. 10.

87 Francis J. Kelly and John J. Cody, Educational Psychology: A Behavioral Approach, Columbus, Ohio, Charles E. Merrill Publishing Co., 1969, p. 232.

In an experiment designed to test the relative efficacy of social reinforcement and modeling procedures in modifying moral judgmental responses, Bandura and McDonald[88] showed that under certain conditions providing models is significantly more effective in changing behavior than are procedures in which only reinforcement is used. One group of children observed adult models who expressed moral judgments counter to the group's orientation. These children were socially reinforced with approval for adopting the model's evaluative response. A second group observed the models but received no reinforcement. A third group had no exposure to models but were reinforced for moral judgments that ran counter to their dominant evaluative tendencies. Following the treatments, subjects were tested for generalization effects. The treatments produced substantial changes in the children's moral judgment responses. As the authors predicted, conditions utilizing modeling cues proved to be more effective than the operant conditioning procedure. The provision of models alone was effective in altering the children's moral judgments as was the experimental condition combining modeling cues and social reinforcement.

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88 A. Bandura and Frederick J. McDonald, "The Influence of Social Reinforcement and the Behavior of Models in Shaping Children's Moral Judgments," in Journal of Abnormal and Social Psychology, Vol. 67, No. 3, 1963, p. 274-281.

As Bandura and McDonald pointed out:

> The failure of operant conditioning procedures alone in altering moral judgment behavior is not at all surprising considering that the desired responses were much weaker than the competing dominant class of moral judgments. In many cases, particularly in the objective treatment condition, the subordinate responses occurred relatively infrequently; consequently there was little opportunity to influence them through reinforcement.[89]

The authors explained that even though the behaviors to be learned in a training experiment were already in the subject's repertoire, reinforcement alone would not be powerful enough to induce the desired responses without some procedure designed to highlight salient cues that preceded the desired behavior.[90]

Most of the experimental demonstrations of modeling effects, particularly Bandura's, have used young children as subjects and aggressive behavior as the dependent variable.

> While it has been generally speculated that similar effects occur with adults and that, these effects cover a wide range of dependent variables, research literature in this respect is meager. A task for future researchers is to find modeling variables which increase efficiency of learning.[91]

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89 Ibid., p. 281.

90 Ibid.

91 McDonald and Allen, op. cit., p. 9.

McDonald and Allen[92] have applied the research on observational learning to the learning of teaching behavior in three related experiments and obtained data pertaining to the following independent variables: (1) self-feedback and reinforcement; (2) effects of feedback and practice conditions; and (3) film-mediated and written modes of model presentation. It was found that the single most effective variable was a form of self-viewing, accompanied by prompting by an experimenter during the self-viewing. The most powerful treatment in Experiment I was the one in which the trainee viewed his own performance and received reinforcement and cue discrimination training from an experimenter. Similarly, the most effective treatments in Experiment III involved the use of an experimenter in a feedback condition.

The most effective variable for describing a desired behavior appears to be a modeling condition in which the behavior is portrayed, and in which the subject views the model's performance while being cued by an experimenter on the significant aspects of the model's behavior. The results of Experiment III supported this statement in the McDonald-Allen study.

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92 McDonald and Allen, op. cit., iv-220 p.

> Although the experiment has not been performed which effectively separates out the effects of these two kinds of variables, it seems clear that for producing some kinds of behavior change, a modeling and feedback condition with an experimenter present during both phases is a powerful treatment.[93]

In Experiment II, time lapses between the time of the occurrence of the original behavior and the time when the subject actually viewed his performance were uncorrelated with measured changes in behavior, even though these time lapses extended over days and weeks. It would appear that the immediacy of the feedback, where immediacy is measured in terms of time, is not a critical factor. The explanation for this may be that the videotape playback reinstates the trainee's performance for him.[94]

Claus,[95] mentioned earlier in this chapter, tested the McDonald-Allen data and verified the effectiveness of modeling with reinforcement in teacher training involving a complex skill. Her investigation relative to feedback treatments indicated no significant effect. Supervisor feedback concerning videotaped performance did not lead to any greater gains than did perceptual modeling and self-viewing of microteaching videotapes. It should be pointed out that

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93 Ibid., p. 151.

94 Ibid., p. 147-161.

95 Claus, op. cit., p. 73-77.

there were no "pure" control groups in any of the McDonald-Allen, Claus, and Berliner (reviewed earlier in this chapter) research. All groups received relevant training and in no instance was there a "no-treatment" control group.

In summary, this section stressed the importance being placed on observational learning as a methodology worthy of application in teacher education. The framework of this social-learning theory of identification through observation is applied to the problem being investigated in the present study.

4. Statement of the Problem.

The purpose of this research is to investigate the effectiveness of pre-service microteaching experience in the development of questioning ability in teachers' college trainees. The focus is on training utilizing different modeling procedures. Higher-order questioning behavior is chosen as the teaching skill because empirical evidence, as exemplified in this chapter, discloses that teacher questioning practices, in general, are of a low cognitive level, designed to elicit recognition and recall of factual information. The experiment attempts to answer the question: Can the higher-order questioning behavior of selected trainees in the elementary-education at Ottawa Teachers College be

changed as a result of two modeling procedures accompanied by varied reinforcement techniques?

To test the efficacy of perceptual modeling in the pre-service training of elementary teachers, the following predictions are made:

H_1 Trainees exposed to cued modeling procedures (written) will show a significantly higher incidence of higher-order questioning behavior than will trainees who receive noncued modeling procedures.

H_2 Trainees exposed to multiple modeling procedures will show a significantly higher incidence of higher-order questioning behavior than will trainees who receive repeated modeling procedures.

H_3 Trainees receiving the treatment combination in which cued modeling procedures (written) are applied with repeated models will show a significantly higher incidence of higher-order questioning than will trainees who receive no cueing in a repeated modeling procedure.

H_4 Trainees receiving the treatment combination in which cued modeling procedures (written) as applied with multiple models will show a significantly higher incidence of higher-order questioning than will trainees who receive no cueing in a multiple modeling procedure.

H_5 Trainees receiving the treatment combination in which cued modeling procedures (written) as applied with

multiple models will show a significantly higher incidence of higher-order questioning than will trainees who receive repeated cued modeling procedures.

H_6 Trainees exposed to a multiple noncued modeling procedure will show a significantly higher incidence of higher-order questioning behavior than will trainees who receive repeated noncued modeling procedures.

H_7 Trainees exposed to a repeated noncued modeling procedure in which the criterion behavior, higher-order questioning, is absent will show the lowest incidence of higher-order questioning behavior.

A schematic presentation of the experimental hypotheses is shown in Table I.

The experimental design is explained in the following chapter.

Table I.-

Schematic Presentation of Experimental Hypotheses.

Methods of Training for Each Experimental Group			
		Reinforcement	
		Noncued	Cued
Modeling	Repeated	I	II
	Multiple	III	IV

V: Control Group

H_1: II + IV > I + III

H_2: III + IV > I + II

H_3: II > I

H_4: IV > III

H_5: IV > II

H_6: III > I

H_7: Each of Treatment Results > V

CHAPTER II

THE DESIGN OF THE STUDY

This chapter consists of eleven sections. Definition of terms is contained in section one; sections two and three describe the dependent variable and the independent variable, respectively; treatment groups are depicted in section four; the sample description is presented in section five; section six outlines experimental procedures; explication of model tapes follows in section seven; data collection is identified in section eight while a description of rating methodology ensues in section nine. In section ten, the reliability of the ratings is discussed. The last section particularizes the data analysis procedures.

1. Definition of Terms.

In this study, the following meanings are assigned to these terms, alphabetically listed:

(a) Cueing.- Prompting and differential reinforcement techniques provided by the experimenter during the observation of modeling videotapes. In this study, cueing (for Treatments II and IV) will consist of written transcripts of the criterion behavior with accompanying classification according to the Sanders Question Classification System.

(b) Higher-order questioning.- Questioning which can be classified under analysis, synthesis, and evaluation in the Sanders Question Classification System. This questioning calls for finding a rule or principle rather than defining one. Higher-order questions prompt students to use ideas rather than just remember them. These three categories in the Sanders Question Classification System reflect the highest degree of higher-order questioning behavior.

(c) Microteaching.- Scaled-down teaching encounter applying defined teaching skills to brief lessons taught to a small group of students.

(d) Multiple modeling.- Exposing experimental group to the viewing of two different modeling videotapes; in this study, a viewing of each of two different videotapes. Each tape will focus on the same teaching behavior; namely, higher-order questioning.

(e) Placebo.- Exposing control group to a modeling videotape void of the criterion behavior; namely, higher-order questioning.

(f) Perceptual modeling.- Portraying the desired behavior for the learner. Such portrayals may be live or mediated by videotape. In this experimental study, they are videotape presentations.

(g) Repeated modeling.- Exposing experimental group to more than one viewing of the same modeling videotape; in this study, two viewings.

(h) Self-viewing.- Watching a playback of a micro-teaching lesson. In this study, the trainee self-viewed the model videotapes and also self-viewed his videotaped lessons immediately following the actual microteaching.

(i) Trainee.- Student enrolled in the teacher education program at Ottawa Teachers College. The terms "student" and/or "student teacher" will be synonymous with "trainee" in this study.

2. Dependent Variable.

The dependent variable in this study was questioning behavior with the experimenter's attention on the nomenclature "higher-order questions." The latter include all categories of the Sanders Question Classification System beyond Application Category 4.

> To trigger reasoning, a question must call for an answer that is not retrieved but reached. It must be reachable on the basis of the 'given,' but not be itself part of the 'given.'[1]

Questions were classified in accordance with an adaptation of the Sanders categorization system shown in

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1 M.J. McCue Aschner, "Asking Questions to Trigger Thinking," in NEA Journal, Vol. 50, No. 6, September 1961, p. 45.

Appendix 1. A comprehensive commentary on the Sanders Question Classification System appears in Appendices 1, 2, 3 in the materials given to the raters, the trainees, and the models.

Categories one and two, memory and translation, respectively, are termed lower-order in the classification schema; analysis, synthesis, and evaluation, constituting the training variable of the study, are labeled higher-order categories.

The two major groupings utilized in this study are in harmony with Gall's Representative Question-Classification System[2] which organizes eight principal question classification systems into four categories; namely, (1) recall, (2) analytic thinking, (3) creative thinking, and (4) evaluative thinking. This study categorized lower-order questions into the memory and translation sub-categories as identified by Sanders (and comparable to Gall's), and higher-order questions into Gall's three other categories; that is, (1) analytic thinking, (2) creative thinking, and (3) evaluative thinking.

Translation was integrated with memory as a lower-order classification because the former

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2 Meredith D. Gall, "The Use of Questions in Teaching," in Review of Educational Research, Vol. 40, No. 5, December 1970, p. 709.

> [...] does not require students to discover intricate relationships, implications, or subtle meanings. The student identifies one part of the original communication at a time and translates it into the new form.[3]

Ideas in a communication (maps, charts, graphs, pictures, models) are changed into parallel forms. Another reason for classifying translation with memory is that it occupies a transitional position between memory and the other categories. Competence in translation is almost entirely dependent on possession of knowledge (memory). Bloom also stated "[...] when instruction has emphasized the particular points involved, the translation may be more akin to simple recall of knowledge."[4] A student quite often is asked simply to explain something in his own words.

The division line for higher-order questioning was drawn preceding analysis because with this category one arrives at a more sophisticated form of reasoning than that found in the interpretation and application categories which focus primarily on common-sense reasoning.[5] Another distinctive feature of analysis is that it requires solutions of

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3 Norris M. Sanders, Classroom Questions: What Kinds?, New York, Harper and Row, 1966, p. 32.

4 Benjamine S. Bloom (ed.), Taxonomy of Educational Objectives: The Classification of Educational Goals, Handbook I: Cognitive Domain, New York, David McKay Company, Inc., 1956, p. 91.

5 Sanders, op. cit., p. 99.

problems in the light of conscious knowledge of the parts and process of reasoning. The student must be conscious of the intellectual process he is performing and know the rules for reaching a valid and true conclusion.

Interpretation and application questions, because of the shading of boundaries between lower and higher levels of thinking as pointed out by Sanders,[6] were not integrated into either the lower-order questioning category or the higher-order questioning category.

3. Independent Variables.

The independent variables of this study are combinations of training techniques using modeling procedures. Four treatment groups involving exposure to various combinations of perceptual modeling, two with cueing, were used along with a control group.

4. Treatment Groups.

A summary of the modeling procedures for each treatment group appears in Table II.

Group I.- This group was exposed to perceptual modeling, repeated. Following the total-group set induction sessions, also referred to as orientation sessions, and

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6 Ibid., p. 42.

Table II.-

Summary of the Modeling Procedures for Each Treatment Group and Control Group.

I	II	III	IV	V (Control)
Exposure to perceptual modeling (repeated). Trainee views videotape model twice with intervening microteaching session. No cueing.	Exposure to perceptual modeling (repeated, cued). Trainee views videotape model twice with intervening microteaching session. Supervisor cueing questioning behavior through identification of question categories for both viewings (written).	Exposure to perceptual modeling (multiple). Trainee views two different videotape models with intervening microteaching sessions. No cueing.	Exposure to perceptual modeling (multiple, cued) Trainee views two different videotape models with intervening microteaching sessions. Supervisor cueing questioning behavior through identification of question categories for both viewings (written).	Exposure to perceptual modeling--criterion behavior (higher-order questioning) absent.

Teach 1, each Group I subject viewed, with experimenter present, a videotape model of a master teacher using higher-order questions as the basis for instruction. Following this first modeling session, Group I trainees planned a five-minute lesson on the basis of what they had seen in the model tape. History content was used by all trainees in all treatments. Teach 2 followed, after which trainees independently viewed, with experimenter present, the playback of their Teach 2 performance. In the following steps, the subjects independently viewed the same model a second time, with experimenter present, planned a new lesson, taught again, and viewed the playback of their third teach, with experimenter present. Teach 4 (post-test) followed with no viewing. In summary, each subject in Group I viewed the same model twice and although the experimenter was present at all sessions, no cueing occurred.

Group II.- This group received exposure to perceptual modeling, repeated, cued. Following the first two steps, described on the preceding page, trainees in this group independently viewed, with experimenter present, the model videotape with cueing provided by printed transcripts of model's questions and their classification according to the Sanders Question Classification System. These sheets provided training in discrimination as well as reinforcement for the criterion behavior. Following the viewing, Group II

subjects independently repeated the steps taken by Group I. In summary, each subject in Group II viewed the same model twice, with experimenter present, and each time received written cues and reinforcement on higher-order questioning behavior.

Group III.- This group was exposed to perceptual modeling, multiple. Following the first two steps, listed for Groups I and II, Group III subjects independently viewed the videotape model, with experimenter present. Procedures in this treatment were identical to Group I with the exception of the presentation of multiple modeling. In this treatment, the trainee independently viewed two different videotape models with intervening microteaching sessions. Both models stressed the criterion behavior.

Group IV.- Subjects in this group were independently exposed to perceptual modeling, multiple, cued. Procedures were identical to Group III with the exception of cueing during modeling viewings provided by printed transcripts of model's questions and their classification according to the Sanders Question Classification System. These sheets provided training in discrimination as well as reinforcement for the criterion behavior. Again, the experimenter was present at all sessions.

Group V (Control).- Following the large-group set induction sessions and Teach 1, each control group subject

independently viewed, with experimenter present, a videotape model of a master teacher presenting a lesson in which the criterion behavior, higher-order questioning, is not stressed. This videotape has a low incidence of questions (one) as compared to forty-four and thirty-seven, respectively, in each of the tapes utilized with the experimental groups. The subjects in this group independently repeated all steps undertaken by the treatment groups and observed the model videotape independently a second time. No cueing was provided. This neutral model lesson was shown for placebo effect.

The decision to rely primarily on self-viewing of videotape playback following each microteaching session was based on a review of investigations dealing with the effect of feedback on skill-learning.

Borg et al. drew the following conclusion as a result of their review of the literature and used it in the development of their minicourses: "Videotape feedback contributes to skill development and can be effectively substituted for supervisor feedback."[7]

In the minicourse which is basically a short course designed to teach specific teacher behavior patterns using

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7 Walter R. Borg et al., The Minicourse: A Microteaching Approach to Teacher Education, Toronto, Collier-Macmillan Canada Limited, 1970, p. 52.

the microteaching technique and the use of the videotape recorder, the primary form of feedback is self-evaluation through the videotape playback of each microteach and reteach session. The Stanford model of microteaching is similar, except that supervisor feedback is also provided.

Acheson, in a study comparing the relative effectiveness of videotape feedback and different forms of supervisor feedback, found that videotape feedback was conducive to learning-teaching skills, but supervisor feedback was not. Teachers, in his study, who received only supervisor feedback did not make significant gains over teachers who received no feedback. This finding suggests that videotape self-viewing is superior to supervisor feedback in bringing about changes in teaching skills.[8]

Orme, in his study, varied perceptual and symbolic modeling over six experimental conditions which also included the following variations in feedback:

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8 K.A. Acheson, The Effects of Feedback from Television Recording and Three Types of Supervisory Treatment on Selected Teacher Behavior, unpublished doctoral dissertation presented to the [School of Education] Stanford University, 1964, and referred to by Borg et al., op. cit., p. 43.

> [...] all participating teachers received supervisor reinforcement and/or supervisor discrimination training. No significant differences were found between the group that received perceptual modeling only and the groups that received perceptual and/or symbolic modeling and some form of supervisor feedback. Supervisor feedback led to differential gains only when compared with the group that received symbolic modeling. Thus the critical variables in Orme's study were perceptual modeling and videotape feedback; apparently, if these are present, supervisor feedback is unnecessary.[9]

The Claus study which investigated the effect of several training variables on teacher skill in asking higher-order questions showed that supervisor feedback concerning videotaped performance did not lead to any greater learning gains than did perceptual modeling and self-viewing of videotapes.[10]

Tuckman and Oliver, in their study, found that supervisor feedback had a negative effect on perceived teacher change.[11]

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9 M.E. Orme, The Effects of Modeling and Feedback Variables on the Acquisition of a Complex Teaching Strategy, unpublished doctoral dissertation presented to the [School of Education] Stanford University, 1966, and referred to in Borg et al., op.cit., p. 38-40, 45-46.

10 Karen E. Claus, The Effects of Modeling and Feedback Variables on Higher-Order Questioning Skills, unpublished doctoral dissertation presented to the [School of Education] Stanford University, 1968, p. 47-77.

11 B.W. Tuckman and W.F. Oliver, "Effectiveness of Feedback to Teachers as a Function of Source," in Journal of Educational Psychology, Vol. 59, No. 4, 1968, p. 297-301.

In an earlier experiment designed to increase teacher-intern use of verbal reinforcers following pupil responses, McDonald and Allen assigned interns to one of four experimental situations. The control group viewed videotape playbacks of their teaching without specific instruction regarding their use of verbal reinforcers. The second group was identical, except that interns received a written evaluation form to help them increase their use of verbal reinforcers. The third group differed from the second in that the experimenter viewed the videotape playbacks and provided differential reinforcement. The fourth condition enlarged upon the third with the addition of discrimination training on the part of the experimenter. Interns in the first three groups did not differ significantly from one another in their use of verbal reinforcers at the end of the training period. Teachers in the fourth group, however, showed a higher incidence of verbal reinforcers than did any other group. This study was definitely more favorable to supervisor feedback. McDonald and Allen, in discussing the relative ineffectiveness of the self-feedback conditions in their research, advocated combining perceptual modeling with self-feedback, a practice used by Orme and Claus and the one applied in this research.[12]

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12 Frederick J. McDonald and Dwight W. Allen, Training Effects of Feedback and Modeling Procedures on Teaching Performance, Technical Report No. 3, Stanford, California, School of Education, Stanford University, 1967, p. 145-161.

With the exception of the McDonald-Allen investigation, most research findings pointed to the minimal importance of supervisor feedback in skill learning. Based on this supportive data, this research employed self-viewing as the primary form of feedback.

5. The Sample.

The subjects were sixty female student teachers attending Ottawa Teachers College, an institution operated by the Ontario Provincial Department of Education for the preparation of elementary teachers. This group was randomly chosen from the entire population of 211 female students who had completed grade thirteen in an Ontario secondary school in June of 1970. All met the requirements for acceptance into pre-service elementary training in Ontario.

Subjects were randomly assigned to the four treatmen groups and the control group.

The elementary pupils who participated in the micro-teaching lessons were fifth and sixth graders, St. Theresa's School, Ottawa Separate School Board. From the same classroom, these pupils were in groups of four; namely, two from grade five and two from grade six. The entire class, in cooperation with the teacher, proceeded on a rotating schedule with all pupils participating. The experimenter

explained microteaching to these elementary-school pupils and provided familiarization with the videotaping equipment. They were told that they would be taught history lessons by trainees from Ottawa Teachers College. No mention was made of the criterion behavior, higher-order questioning.

6. Experimental Procedures.

The training employed in this study is based on a conceptual model of instruction described by a pedagogical paradigm combining adaptations of two models proposed by Glaser[13] and Strasser.[14] Figure 1 shows the framework of the conceptual model of instruction employed in this investigation.

Glaser's process of instruction paradigm reflects five basic components.[15] Its development begins with the specification of the goals of instruction. Strasser[16] refers to this aspect as teacher planning which involves decision-making on the part of the teacher relative to goals, structures and planned tactics.

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13 Robert Glaser, "Psychology and Instructional Technology," in Robert Glaser (ed.), Training Research and Education, New York, John Wiley and Sons, 1962, p. 1-30.

14 Ben Strasser, "A Conceptual Model of Instruction," in The Journal of Teacher Education, Vol. 18, No. 1, Spring 1967, p. 63-74.

15 Glaser, op. cit., p. 5-30.

16 Strasser, op. cit., p. 66-67.

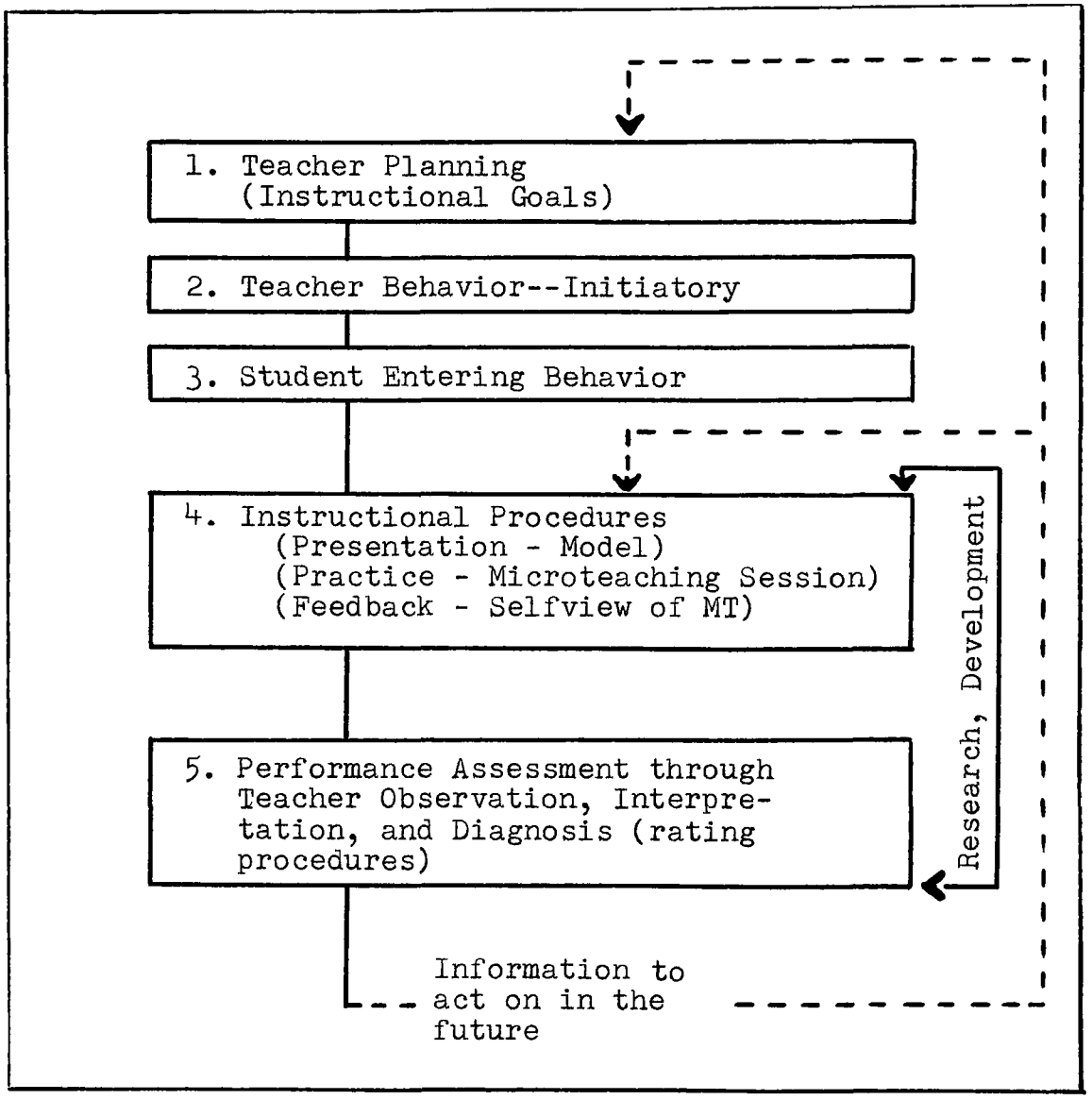

Figure 1.- A Conceptual Model of Instruction Adapted from Glaser and Strasser.

Tactic is defined as:

> Goal-linked influenced/influencing behavior of the teacher--the way a teacher behaves in the instructional situation in working toward the development of the strategy; units of teacher behavior through which the teacher fulfills his various instructional roles with the students of his class from moment to moment; the components of teacher behavior through which the teacher, the students, and the subject matter interact.[17]

In this study, the teacher planning component, the first step, will center on a specific skill; namely, higher-order questioning.

In this adaptation, Strasser's[18] tactic labeled "teacher behavior, initiatory" follows. During this stage, the teacher creates the focus for the lesson and establishes the appropriate structure. Pupils should be made aware of the goals which will direct their activity as well as their evolving responsibilities in the specific instructional situation. Tactics are initiated into action. In this study, the experimenter, in the role of "teacher," employed two set induction sessions prior to exposure to treatment sequences. Written and oral information was provided relative to microteaching, its application, lesson planning, and questioning. Two booklets; namely, Microteaching: An Added

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17 Ibid., p. 65.

18 Ibid., p. 67.

Dimension (Appendix 4) and Questioning in the Classroom (Appendix 2) were distributed. All trainees, in the role of "students," were presented lecture-discussion-demonstration periods in large-group settings (Appendix 5).

Thirdly, according to the paradigm, there is the entering behavior of the student which consists of the initial skill repertoire, prior knowledge, and aptitudes. As part of Teach 1, all subjects were videotaped as they taught a five-minute history lesson to fifth and sixth graders (two pupils from each grade). Subjects were asked by the experimenter to "please prepare a five-minute history lesson in which you will focus on effective questioning."

The next phase, as illustrated in the conceptual model, constitutes the actual instructional procedures and experiences which are employed to guide and modify behavior. This study delineated this component into three parts; namely, presentation, practice, and feedback. Practice and presentation of the skill of higher-order questioning was modified experimentally while feedback was held constant. The point of convergence in this study was the utilization of perceptual modeling (videotape presentations of live performances) as the means of presentation of the criterion behavior to all trainees.

The practice phase involved the participants in microteaching lessons in which they practiced the modeling

behaviors seen during the presentations. During the feedback stage, the students self-viewed their own performance via videotape.

The following steps constituted the instructional sequence and are summarized in Table III, Numbers 3 - 12.

(a) Each subject viewed a model tape; some trainees received cueing from written transcripts of the criterion behavior, others viewed the model presentation without external cues.

(b) Following the modeling session, each trainee was given a week to plan his lesson, incorporating ideas gained from viewing the model.

(c) Each subject then taught the lesson before a new group of four pupils. Subjects taught five-minute lessons throughout the entire training sequence and were asked to utilize new history content each time. Time between viewing of model and teaching was kept constant.

(d) A videotape of the lesson was then replayed for the subject. In accordance with the experimental design, trainees received no cueing from the experimenter during the playback although the latter was present. This self-view lesson provided immediate feedback to the subject concerning his own behavior.

Table III.-

Summary of Steps in Treatments by All Groups.

Steps	Experimental Groups I	II	III	IV	Control Group V	Minutes in Treatment
1. Orientation sessions[a]	X	X	X	X	X	120
2. Teach-1[b]	X	X	X	X	X	5
3. Model[c]	X	X[d]	X	X[d]	X[e]	10
4. Planning session	X	X	X	X	X	
5. Teach-2	X	X	X	X	X	5
6. Self-confrontation of Teach-2	X	X	X	X	X	10
7. Model	X	X	X	X	X	10
8. Planning session	X	X	X	X	X	
9. Teach-3	X	X	X	X	X	5
10. Self-confrontation of Teach-3	X	X	X	X	X	10
11. Planning session	X	X	X	X	X	
12. Teach-4 (post-test)	X	X	X	X	X	5

a Lecture-discussion periods as preliminary to treatment sequence. These two set induction or orientation sessions enabled the experimenter to provide information relative to the task and the general lesson planning including microteaching format. For all trainees there was a week between this session and their actual skill training.

b Directions for all groups for all microteaching sessions: "Please prepare a five-minute history lesson in which you will focus on effective questioning."

c Treatment groups were not told that model tapes had a high incidence of higher-order questions.

d Treatment Groups II and IV received reinforcement provided through written transcripts of all model questions and their classification according to Sanders.

e Control group was shown a videotape in which a model presented a lesson focusing on no particular skill--placebo effect.

(e) The final step for all trainees was to teach a lesson for the fourth time. Teach 4, which was not viewed, provided a post-test to the experiment.

In summary, all subjects participated in two set induction sessions at which time they received written and oral instructions relative to microteaching and its application, lesson planning and questioning. Following these two large-group encounters, all subjects participated in Teach 1. The basic training sequence for all subjects involved a model presentation, a planning period, a teaching session, and a self-view provision. Experimental variables were introduced during this training sequence. Following a repeat of this basic training procedure, all trainees planned and taught a fourth time (post-test). The experiment ran every day, from 8:30 a.m. to 3:00 p.m., over a ten-week period and was done during the trainees' free time. Each subject spent approximately three hours in total treatment at the same microteaching station (St. Theresa's School).

The next phase of the Glaser model adapted into this study is that of performance assessment which Strasser[19] labels "teacher observation, interpretation, and diagnosis of learner behavior." This can occur during and/or following the instructional procedures. Videotaping of the lesson in this study allowed post-instructional assessment of

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19 Ibid., p. 67.

performance through rating procedures explained in section nine of this chapter.

The final step in this adapted model is research and development logistics which Glaser[20] superimposed upon the functioning of his instructional system. This research and development component contributes to each of the sequential segments in Glaser's paradigm. The present study, an experimental attempt to influence teaching behavior, represents an element in Glaser's research and development component. The latter component is confined to Instructional Procedures and Performance Assessment through Teacher Observation, Interpretation, and Diagnosis for this particular study. See Figure 1.

7. Model Tapes.

Two experienced male master teachers from Peterborough Teachers College were selected to model higher-order questioning behavior. They were directed to demonstrate the use of the criterion behavior in accordance with the Model's Manual (Appendix 3) and the textbook, Classroom Questions: What Kinds?, by N.M. Sanders.[21] Teaching conditions for

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20 Glaser, op. cit., p. 20.

21 Sanders, op. cit., xii-176 p.

models were similar to those utilized by trainees. Geography content was used in their ten-minute lessons which were taught to four sixth graders. A high incidence of higher-order questions was sought on these model tapes. Transcripts of these questions and their categorization according to the Sanders Question Classification System can be found in Appendices 6 and 7.

An experienced male master teacher from Ottawa Teachers College was selected to model the placebo lesson which was a ten-minute geography lesson with a minimal incidence of any type of questioning behavior. Transcript of the question asked in that lesson along with question categorization is shown in Appendix 8. This lesson was also taught to four sixth graders.

These three model lessons were independently rated on question categories in the same manner as the trainee lessons. Certain characteristics of the model tapes are reflected in Tables IV, V, VI.

Even though questions were not asked in the "evaluation" category, the model videotapes were judged satisfactory because all other categories were represented. There was no requirement in the experiment that all categories had to be learned and used.

Table IV.-

Frequencies of Question Categories on Model Tape I.

Categories	Teacher Responses f	%
1. Memory	13	29
2. Translation	3	7
3. Interpretation	7	16
4. Application	7	16
5. Analysis	11	25
6. Synthesis	3	7
7. Evaluation	0	0

Table V.-

Frequencies of Question Categories on Model Tape II.

Categories	Teacher Responses f	%
1. Memory	16	43
2. Translation	1	3
3. Interpretation	7	19
4. Application	3	8
5. Analysis	9	24
6. Synthesis	1	3
7. Evaluation	0	0

Table VI.-

Frequencies of Question Categories on Model Tape III.

Categories	Teacher Responses f	%
1. Memory	1	100
2. Translation	0	0
3. Interpretation	0	0
4. Application	0	0
5. Analysis	0	0
6. Synthesis	0	0
7. Evaluation	0	0

8. Data Collection.

All trainee lessons were recorded on videotape. All Teach-1 and Teach-4 questions were recorded stenographically, numbered, and typed for later circulation among four trained raters. These ratings of teacher questions were placed on special rating sheets which facilitated data analysis. One of these rating sheets is included in the Rater's Manual: Sanders Question Classification System (Appendix 1).

9. Rating Methodology.

Four male raters were selected from the 1970-71 graduate students in the Faculty of Education, University of Ottawa. All had teaching experience at the secondary level and were outstanding students in their respective graduate programs. These four were given the Rater's Manual: Sanders Question Classification System, Appendix 1, and asked to read it carefully the week before the first orientation session. Raters were also asked to commit to writing any questions which might arise while they studied the manual.

The raters met collectively in five orientation sessions prior to any independent rating. The purpose of these meetings was to ascertain an understanding of the category system and to review, modify, and adopt decision

rules for rating. During these sessions, raters viewed five videotapes of five-minute teaching sessions prepared especially for orientation. Written transcripts of all teacher questions (prenumbered) on each videotape were distributed to the raters. Discussion sessions followed each evaluative session. These briefing periods also familiarized the raters with the microteaching format. Prenumbering of questions on printed transcripts relieved the raters of the task of isolating and identifying questions on videotape and also permitted the investigation of the decisions made by each rater on a given question. Total number of questions on a given transcript was fixed and all questions had to be rated. All transcripts had to be rated by four raters.

The rating format agreed upon by the raters and experimenter was: (1) rating of written transcripts, (2) viewing of videotape while transcripts were being completed, and (3) completion and double-check of transcripts. All rating, beyond the orientation sessions, was done independently at five predetermined videotaping stations. The four raters, first alphabetically listed, then assigned random numbers, were each presented with a different videotape sequence, determined by a table of random numbers, for rating purposes. All transcripts and videotapes were coded to disguise the trainees and the actual teaching sequence.

A fifth male rater, selected from the same population, received orientation which was identical to that given the aforementioned four raters. Whenever a tie occurred among the four raters, this fifth person was asked to break the tie.

Consensus scores were recorded for each question on each written transcript. A consensus score was a single category rating given to a question based on at least two agreements.

10. Reliability of the Ratings.

An appropriate method of assessing the amount of agreement achieved by the group of four independently working judges had to be determined. The one-factor analysis of variance for repeated measures was used. Based on the resultant mean squares, Winer's[22] interrater reliability coefficients were calculated. The analysis of variance and reliability coefficients appear in Table VII.

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22 B.J. Winer, Statistical Principles in Experimental Design, New York, McGraw-Hill, 1962, p. 127-130.

Table VII.-

Analysis of Variance and Reliability Coefficients of Ratings on Five Orientation Lessons by Four Raters.

Source	df	SS	MS	Reliability Coefficient
Orientation I				
Between Questions	43	323.790	7.530	.83
Within Questions	3	11.108	1.32008	
	129	163.142		
Orientation II				
Between Questions	38	207.897	5.471	.78
Within Questions	3	12.667	1.17949	
	114	125.333		
Orientation III				
Between Questions	21	138.466	6.594	.85
Within Questions	3	7.671	1.00379	
	63	58.580		
Orientation IV				
Between Questions	23	162.625	7.071	
Within Questions	3	6.125	.65278	.91
	69	40.875		
Orientation V				
Between Questions	28	408.810	14.600	.95
Within Questions	3	5.612	.76149	
	84	60.638		

$p < 0.05$.

11. Data Analysis Procedures.

The plan of the analysis was:

To test for significant differences among proportions of post-test higher-order question frequencies.. The normal approximation to the Fisher exact test was used for this purpose. The mathematical model for testing for significant difference between two independent proportions can be stated thus:[23]

$$H_o : p_1 = p_2 \qquad H_1 : p_1 \neq p_2$$

$$z = \frac{p_1 - p_2}{\sqrt{p(1-p)\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

z is a normal deviate

n_1 = number in Sample 1

n_2 = number in Sample 2

p_1 = proportion in Sample 1

p_2 = proportion in Sample 2

$$p = \frac{n_1 p_1 + n_2 p_2}{n_1 + n_2}$$

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23 George A. Ferguson, Statistical Analysis in Psychology and Education, Toronto, McGraw-Hill, 1971, p. 160-162.

CHAPTER III

THE RESULTS OF DATA ANALYSIS

The primary objectives of this study were: (1) to assess the relative effects of different modes of model presentation (multiple and repeated); (2) to assess the relative effects of different modes of reinforcement (noncued and cued).

The collected data were analyzed statistically according to the procedures already described. The results are reported in this chapter which is arranged in three sections. The first part presents the results of testing the seven hypotheses previously stated; the second section sets forth the findings of a nonparametric test for interaction between modes of model presentation (multiple and repeated) and modes of reinforcement (noncued and cued). Lastly, the main findings are outlined. Appendix 9 shows the post-test question frequencies and their classification for experimental groups I, II, III, IV, and the control group (V). The post-test data reflected in Appendix 9 are summarized in Appendix 10 which depicts the total number of frequencies and percentages of all questions for the post-test by group. Appendix 11 provides a breakdown of question type frequencies over all groups for the post-test.

1. Results of Testing the Hypotheses.

A. Hypothesis One

The first hypothesis stated that trainees exposed to cued modeling procedures (written) would show a significantly higher incidence of higher-order questioning behavior than would trainees who received noncued modeling procedures. The null form of the hypothesis was tested by using a test for significant differences between two proportions on post-test frequencies of higher-order questions.[1] On the basis of the results obtained from the analysis of the data, the statistical null hypothesis was rejected. It was found that cued modeling was significantly ($p < .05$) more effective than noncued modeling in producing a change in the criterion behavior. Table VIII gives the summary of results of significant differences between two proportions on post-test differences for this hypothesis and the seven which follow.

B. Hypothesis Two

The second hypothesis stated that trainees exposed to multiple modeling procedures would show a significantly higher incidence of higher-order questioning behavior than would trainees who received repeated modeling procedures.

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1 See p. 76.

Table VIII.-

Summary of Results of Test for Significant Differences Between Two Proportions on Post-Test Frequencies for Seven Hypotheses.

Hypotheses		Experimental Groups		z
H_1		II and IV	I and III	
	p[a]	.1923	.1324	
	n[b]	551	551	2.70*
H_2		III and IV	I and II	
	p	.1545	.1699	
	n	537	565	0.69 n.s.
H_3		II	I	
	p	.1992	.1408	
	n	281	284	1.85 n.s.
H_4		IV	III	
	p	.1851	.1235	
	n	270	267	1.98*
H_5		IV	II	
	p	.1851	.1992	
	n	270	281	0.42 n.s.
H_6		III	I	
	p	.1235	.1408	
	n	267	284	0.60 n.s.
H_7		I	V	
	p	.1408	.1209	
	n	284	273	0.70 n.s.
		II	V	
	p	.1992	.1209	
	n	281	273	2.51*
		III	V	
	p	.1235	.1209	
	n	267	273	0.09 n.s.
		IV	V	
	p	.1851	.1209	
	n	270	273	2.08*

a p = proportion of higher-order questions.
b n = total number of questions.
* $p < .05$

On the basis of the results obtained by applying a test for significant differences between two proportion on post-test higher-order question frequencies, the statistical null hypothesis could not be rejected. Multiple modeling procedures did not yield significant differences at the .95 level of confidence when compared with repeated modeling practices.

Hypotheses three, four, five, and six were all tested using a test for significant differences between two proportions on post-test frequencies of higher-order questions. The results were as follows.

C. Hypothesis Three

The third hypothesis stated that the treatment combination in which cued modeling procedures (written) were applied with repeated models would show a significantly higher incidence of higher-order questioning than would trainees who received no cueing in a repeated modeling procedure. On the basis of the results obtained from the analysis of the data, the null hypothesis was not rejected. Cueing procedures applied with repeated models were not significantly more effective than noncued repeated modeling procedures in producing a change of behavior in questioning.

D. Hypothesis Four

The fourth hypothesis stated that the treatment combinations in which cued modeling procedures (written), as applied with multiple models, would show a significantly higher incidence of higher-order questioning than would trainees who received no cueing in a multiple modeling procedure. The results led to rejection of the null form of the hypothesis. Cued multiple modeling produced a significantly ($p < .05$) higher incidence of the criterion behavior than noncued multiple modeling.

E. Hypothesis Five

The fifth hypothesis stated that trainees who received the treatment combination in which cued modeling procedures (written) as applied with multiple models would show a significantly higher incidence of higher-order questioning than would trainees who received repeated cued modeling procedures. On the basis of the results obtained from the analysis of the data, the null form of this hypothesis was not rejected. It was found that cued modeling procedures as applied with multiple models did not yield significant differences when compared with repeated cued modeling procedures.

F. Hypothesis Six

The sixth hypothesis stated that trainees exposed to a multiple noncued modeling procedure would show a significantly higher incidence of higher-order questioning behavior than would trainees who received repeated noncued modeling procedures. The null form of this hypothesis was rejected. Multiple noncued modeling did not yield significant differences when compared with repeated noncued modeling procedures.

G. Hypothesis Seven

The seventh hypothesis stated that trainees exposed to a repeated noncued modeling procedure in which the criterion behavior, higher-order questioning, was absent would show the lowest incidence of higher-order questioning behavior. A test for significant differences between two proportions on post-test higher-order question frequencies was applied in testing the null form of this hypothesis. The proportion of each treatment group was tested against the proportion of group five (control group).

On the basis of the results obtained from the analysis of the data, it was found that there was no significant difference between group one (repeated-noncued) and the control group. Again, there was no significant difference between group three (multiple-noncued) and the control

group. Group two (repeated-cued) when compared with the control group reflected a significantly higher incidence of higher-order questioning. Group four (multiple-cued) also showed a significantly higher incidence of higher-order questioning.

2. Interaction Effects.

Although the proportions of higher-order questions for noncued modeling, both repeated and multiple, were approximately the same (Table IX), differences between the proportions of higher-order questions in cued (repeated and multiple) modeling led the researcher to examine the data for the possibility of interaction between modeling and the order of questioning in the two situations of noncued and cued reinforcement. A nonparametric test for the analysis of multiple 2 x 2 tables[2] was performed to check for the existence of a significant interaction between these variables. No significant interaction was found. An inspection of the data revealed that Group IV, multiple cued modeling, and Group II, repeated cued modeling, differed in higher-order questioning while repeated noncued modeling and multiple noncued modeling did not. However,

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2 L.A. Marascuilo, Notes, Pre-session on Nonparametric Statistics, American Educational Research Association Conference, Chicago, Illinois, 1968.

Table IX.-

Frequency of Higher-Order Questions for Four Treatment Groups on Post-Test.

Question Frequency	Noncued		Cued	
	Repeated	Multiple	Repeated	Multiple
Lower Order	164 I[a]	139 III	177 II	159 IV
Higher Order	40 .19[b]	33 .19	56 .24	50 .28
Total	204	172	233	209

a Treatment group.
b Proportions of higher-order questions.

the difference was not significant. This situation is reflected in Table IX.

3. Major Findings.

This study investigated the use of written cueing procedures and variations in modeling presentations in the acquisition of higher-order questioning behavior.

The main findings of the analyses of the data obtained in this study are as follows:

1. Treatments involving cued modeling (written) were clearly more effective in training teachers to use the criterion behavior than noncued modeling treatments.

2. Treatments incorporating multiple modeling procedures did not differ significantly from the treatments with repeated modeling practices.

3. Trainees exposed to cueing procedures applied with repeated models did not differ significantly in their utilization of higher-order questions from trainees exposed to noncued repeated models.

4. Trainees subjected to cued multiple modeling practices differed significantly from trainees exposed to noncued multiple modeling in their use of higher-order questions.

5. The treatment involving cued modeling procedures as applied with multiple modeling did not differ

significantly from the treatment employing cued repeated modeling.

6. The treatment including multiple noncued modeling did not differ significantly from repeated noncued modeling procedures in training teachers to use higher-order questioning.

7. The repeated cued treatment and the multiple cued treatment were both clearly more effective in training teachers to use higher-order questions than the treatment utilizing a repeated noncued modeling procedure in which the criterion behavior was absent (control). No significant difference was noted between the repeated noncued treatment and the treatment with repeated noncued modeling minus the criterion behavior; multiple noncued treatment and the repeated noncued treatment, when compared with the control group, did not differ significantly.

Written cueing was effective. This fact was twice shown; first, in the results of hypotheses one and four, and secondly, in the results of hypothesis seven.

The most effective variable for describing a desired behavior was a modeling condition in which the behavior is shown, and in which the trainee views the model's performance while exposed to written cues on the significant aspects of the model's behavior.

While the type of modeling, repeated or multiple, does not of itself cause a difference, it is noted that cueing, when combined with repeated modeling, causes no difference; therefore, multiple modeling may have helped to improve the cueing effect. Further research might well center on the training combination of cueing with multiple modeling.

CHAPTER IV

DISCUSSION OF RESULTS, IMPLICATIONS FOR EDUCATIONAL PRACTICE AND FUTURE RESEARCH

This chapter is divided into four parts. Section one presents a discussion of the results of the investigation. Implications for educational practice are offered in section two; section three centers on future research possibilities. Section four is the conclusion.

1. Discussion of Results.

The acquisition of appropriate teaching skills is one of the aims of pre-service teacher education. Too frequently, in the past, the professional education sequence for students has included courses which were <u>about</u> something; for example, courses <u>about</u> methodology. Future teachers were largely passive recipients who did not get involved in the basic skills of teaching itself until student teaching. Now, teacher-education programs are becoming both academic and clinical with provisions for direct involvement in teaching prior to supervised practice teaching. In the more neutral environment of the clinic, students may directly apply their learnings in teaching situations where they may test these principles and receive constructive feedback. Among the teaching skills which the

teacher should possess is the ability to develop the cognitive potential of children. In this study, a technique conducive to the development of intellectual skills in children; namely, higher-order questioning, was applied in a clinical setting with a group of sixty trainees. The training employed in the study was based on a conceptual model of instruction which reflects a presentation-practice-feedback instructional component. The purpose of this investigation was to examine the effectiveness of various types of modeling and reinforcement procedures in the development of the desired criterion behavior, higher-order questioning.

Results of this study generally supported the hypothesis that cued modeling procedures (written) were more effective than noncued modeling procedures in the development of a specific teaching behavior. Trainees were taught to augment their use of higher-order questions through a procedure which included the presentation of a video-tape model of a teacher using questioning skills. Written cues on the different types of higher-order questions occurring during the demonstration lesson were provided. Some of the subjects were also subjected to a repeated modeling procedure which meant two exposures to the same model; others were exposed to a multiple-model sequence, two videotapes, each featuring a different teacher using questioning skills. The

use of multiple modeling procedures did not prove to be significantly more effective than repeated modeling.

More specifically, although cued procedures applied with repeated models were not significantly more effective than noncued repeated modeling in producing a change in questioning behavior, cued multiple modeling produced a significantly higher incidence of the criterion behavior than noncued multiple modeling.

Cued multiple modeling, when compared with cued repeated modeling, did not prove to be significantly more effective; noncued multiple modeling, when compared with noncued repeated modeling, was not significantly more effective.

Noncued repeated modeling and noncued multiple modeling, when compared with noncued placebo modeling (minus higher-order questioning), were not significantly more effective; cued repeated modeling and cued multiple modeling, however, when compared with the placebo group, proved to be significantly more effective.

These findings, relative to cueing practices, are consistent with the McDonald-Allen experimental results which pointed to the effectiveness of a model condition in which the behavior is portrayed and in which the subject views the model's performance while being cued verbally by an experimenter on the significant aspects of the model's

behavior.[1] A departure in the present study was the utilization of written cues. Claus,[2] in a similar study, also found that the provision of verbal cues from an experimenter on the questioning behavior during modeling did increase the frequency and range of the teacher's use of higher-order questions. Based on the Claus finding that cueing on the teacher's own use of higher-order questions, as displayed in the videotapes of his own practice sessions, did not prove to be significantly effective, it was decided to exclude that cueing component from this experiment. Self-viewing of the teacher's own performance was the feedback procedure employed in this study.

A distinction made by Bandura[3] was that modeling, in the learning of complex cognitive skills, is an acquisition variable. This distinction is supported in the present research to the extent that cued versus noncued modeling produced differential effects. An assumption made in this study was that the criterion behavior, higher-order

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1 Frederick J. McDonald and Dwight W. Allen, Training Effects of Feedback and Modeling Procedures on Teaching Performance, Technical Report No. 3, Stanford, California, School of Education, Stanford University, 1967, p. 159.

2 Karen E. Claus, The Effects of Modeling and Feedback Variables on Higher-Order Questioning Skills, unpublished doctoral dissertation presented to the [School of Education] Stanford University, 1968, p. 79.

3 Albert Bandura, Principles of Behavior Modification, Toronto, Holt, Rinehart and Winston, Inc., 1969, p. 128.

questioning, would not be effectively used by trainees at the onset of the experiment. Since modeling is an acquisition variable, then it is not surprising to find that cued modeling procedures are more effective than noncued modeling as a learning treatment.

Multiple modeling, when compared with repeated modeling, did not prove to be significantly effective. A basic assumption was that trainees exposed to the behavior of heterogeneous models (multiple modeling) would show a higher frequency and a wider range of the criterion behavior.

Bandura and Menlove,[4] in an experiment with children in which they exposed their subjects to a single-model treatment and a multiple-model treatment, found that a broader sampling of models was superior to the single-model approach. This application, employed in a psychotherapeutic setting involving children who displayed dog-avoidance behavior, may have little bearing on the use of models in a situation where learning is of a high cognitive nature.

The ineffectiveness of the multiple-modeling procedure may also be attributed, in part, to one of the model tapes which displayed a high frequency (forty-six per cent) of lower-order questions. It is possible that this incidence rate may have been too high to influence

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4 Ibid., p. 179-180.

higher-order questioning behavior in trainees. The minimum criterion required of each model was that each lesson have at least twelve higher-order questions. It was suggested that they try to include as many instances of high-level questions as possible. It is also possible that exposure to multiple models, each focusing on questioning, may have been beyond the trainee's discriminatory powers. Perhaps the stress should have been on increasing appropriate occurrence of the skill instead of simply increasing occurrence. Perhaps positive instances of the skill (all higher-order questions) alone should have been displayed on the videotapes as opposed to both positive and negative instances. It is also possible, as suggested by Taba and Elzey[5] in their research on teaching strategies, that a premature leap into a higher level of thought may immobilize mental activity and cause trainees to revert to a lower level of thought. These researchers advocated a corresponding reshaping of conceptual schemes with which to organize facts as they are assimilated.

Every study has limitations; perhaps the aforementioned issues should have been foreseen and integrated into the experiment. Unfortunately, some of these problems did not evolve until findings were being scrutinized.

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5 Hilda Taba and Freeman F. Elzey, "Teaching Strategies and Thought Processes," in Ronald T. Hyman (ed.), Teaching: Vantage Points for Study, New York, J.B. Lippincott Co., 1968, p. 446.

Another factor which could have had considerable bearing on the results is the time variable. A five-minute microteaching session, even though the focus is on a specific skill, may not be adequate for the development of questioning strategy. The fact that seventy-six per cent of all trainee lessons featured lower-order questioning as a preliminary to higher-order questioning would seem to indicate that the factual, recall-type question is an important tool in introducing a lesson. Both experimental models also began their lessons with lower-order questions. Perhaps the five-minute period does not allow adequate time for a change in question type considering the fact that other variables are present which could also influence a teacher.

2. Implications for Educational Practice.

Smith et al.,[6] in their plan of action for the reformation of teacher preparation, stressed that a training component was a necessity. The training complex they envisioned was a neutral ground which would provide a setting for the training component of teacher preparation to take place. It would be a controlled setting with provisions for the development of professional skills. Also

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6 B. Othanel Smith, Saul B. Cohen, and Arthur Pearl, Teachers for the Real World, Washington, The American Association of Colleges for Teacher Education, 1969, p. 71.

advocated were the use of protocol training materials--tapes, records, films, and slides--which could capture teacher and pupil behavior and permit a later analysis of that behavior. This study was an attempt to incorporate the ideas recommended by Smith et al., along with an emphasis on the individualization of teacher training. Also considered were logistical factors bearing on cost and efficiency implications. It has been shown in this study that trainees, through observation accompanied by cueing, can acquire principles exemplified in a model's behavior.

The pedagogical paradigm employed in this study[7] appears to be flexible enough to provide a framework for a conceptual model of instruction which could be incorporated into teacher-education training programs.

Through the utilization of written cueing practices, as discriminatory reinforcement to accompany the model's lesson, trainees could, without the assistance of a supervisor, practice specific skills whenever the need arose. Perhaps an audio-recorder (synchronized to the videotape) could also be used to provide a standard commentary on salient characteristics exemplified in the model lesson. Another possibility might be to use subtitles in instructional and model films to cue trainees regarding the

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7 See p. 61.

particular behavior to be modeled. This would also relieve the supervisor from direct involvement whenever a trainee viewed a model presentation. Supervisory personnel might be better employed in assisting trainees to improve their own teaching behavior following feedback on their micro-teaching encounters.

More research is needed to determine what effects multiple modeling behaviors have on trainees. Perhaps models (both in single-model treatments and multiple-model treatments) could control the lesson material on which the teacher bases his questions. The use of a constant lesson topic might make it possible to attribute variance in questioning to the teachers rather than to differences in the lesson.

3. Implications for Future Research.

On the basis of data gathered and analyzed in this study, a number of hypotheses were generated. These hypotheses are testable, and should serve to direct further research efforts which emanate from the findings of this study.

H_1 Trainees exposed to a cued modeling session will show a significantly higher incidence of the specified behavior than will trainees who receive noncued modeling if the time variable for the trainees' practice lesson is increased from five minutes to ten minutes.

H_2 Trainees exposed to multiple modeling procedures will show a significantly higher incidence of the specified behavior than will trainees who receive repeated modeling procedures if a constant lesson topic is used in the model lessons.

H_3 Trainees exposed to cued modeling procedures focusing on appropriate occurrence of a specified skill will improve in their ability to use the behavior appropriately. (This would be a departure from investigations focusing on the frequency of the skill.)

H_4 Trainees exposed to cued modeling procedures in which the model is of the same sex will show a significantly higher incidence of the specified behavior than will trainees who receive cued modeling procedures from a model of a different gender.

H_5 Trainees exposed to cued modeling procedures will show a significantly higher incidence of the specified behavior if they practice that skill within the twenty-four hour period following the modeling session.

H_6 Trainees exposed to modeling procedures accompanied by synchronized audio-tape focusing on lesson characteristics will show a significantly higher incidence of the specified behavior than will trainees who are exposed to written cues as reinforcement.

H_7 Trainees exposed to modeling procedures with film subtitles cueing the particular behavior being modeled will show a significantly higher incidence of the specified behavior than will trainees who are exposed to written cues as reinforcement.

H_8 Trainees exposed to a cued modeling session will show a significantly higher incidence of the specified behavior if pre- and post-modeling sessions focusing on the criterion behavior are planned.

H_9 Trainees exposed to cued modeling procedures in which only positive instances of the specified behavior are displayed will show a significantly higher incidence of the behavior than will trainees who receive cued modeling procedures in which both positive and negative instances of the specified behavior are shown.

Other research questions are suggested by the results of this study.

Since the Sanders Question Classification System is a cognitive-process approach to question classification and largely dependent on inference, it may be advisable to investigate other approaches to the analysis of questions.

Existing question classification systems focus primarily on questions which pertain to recall of information and the development of critical thinking processes.

Other types of questions, perhaps as vital, are neglected; for example, cueing questions, questions which create a discussion atmosphere, questions which stimulate inquiry, questions which guide the learning of an affective skill. Additional research is required to develop more adequate classification systems.

Another limitation of most existing classification systems, including the one employed in this study, is that they were designed to investigate the types of questions actually used by teachers in the classroom. Perhaps attempts should now be made to identify effective types of questions. These question types might vary according to different areas of the curriculum.

Effective question sequencing could also be investigated. Should all lessons move from low-cognitive-level questioning to higher-level questioning? Additional research on follow-up questions seems advisable as well. Follow-up questions test the pupil's ability to think about a problem and to stimulate the development of his thinking processes.

4. Conclusion.

This study, an attempt to marry theory and practice in pre-service teacher education, scrutinized the criterion behavior, higher-order questioning, in a clinical setting

utilizing principles of observational learning. The independent variables of this study were combinations of training techniques using written cueing procedures and variations in modeling presentations.

More specifically, the effectiveness of written cueing during modeling presentations and the advisability of using multiple versus repeated models were investigated.

Results of the study indicated that written cueing procedures when applied to modeling were clearly more effective in nurturing higher-order questioning than non-cued modeling treatments.

The use of multiple modeling as opposed to repeated modeling did not measurably change the use of the criterion behavior.

ANNOTATED BIBLIOGRAPHY

Allen, Dwight W., and Richard Clark, Jr., "Microteaching: Its Rationale," in The High School Journal, Vol. 51, No. 2, issue of November 1967, p. 75-79.

This brief article by one of the original implementors of microteaching clarifies what the technique is and provides a partial analysis of the theoretical and practical reasons behind both its original and subsequent applications.

Allen, Dwight, and Kevin Ryan, Microteaching, Don Mills, Ontario, Addison-Wesley Publishing Co., Inc., 1969, xv-151 p.

The first book devoted entirely to a definitive treatment of microteaching, a new training technique for beginning and experienced teachers. Microteaching, a constructed teaching encounter which allows for realistic practice and feedback, is explained along with suggestions on how it can be used and how it has been used. A multitude of research suggestions are offered by the authors. Very good source.

Bandura, Albert, Principles of Behavior Modification, Toronto, Holt, Rinehart and Winston, Inc., 1969, ix-677 p.

Recent theoretical and experimental advances in the field of social learning are reviewed in this text following a presentation of basic psychological principles governing human behavior within the conceptual framework of social learning. Especially germane to this study was the chapter devoted to modeling and vicarious processes.

Berliner, David C., Microteaching and the Technical Skills Approach to Teacher Training, Technical Report No. 8, Stanford, California, School of Education, Stanford University, 1969, ix-57 p.

This review summarizes research focusing on the development of a technical skills approach to teaching. Specifically discussed are the skills of higher-order questioning, reinforcement, probing, stimulus variation, silence and nonverbal communication, and control of small groups. The section on questioning was particularly relevant to this thesis.

Bloom, Benjamin S. (ed.), Taxonomy of Educational Objectives: The Classification of Educational Goals, Handbook I, Cognitive Domain, New York, David McKay Co., 1956, 207 p.

Handbook I, which classifies objectives involving intellectual tasks, is a result of the work of a group of

college examiners who developed the classification system for educational objectives to facilitate communication among themselves and with colleagues about objectives, test items, and test procedures. This taxonomy places the behavioral aspect of the objective within a hierarchical framework: each category is assumed to include behavior more complex, abstract, or internalized than the previous category. This publication served as the model for Sanders' question classification system which in turn served as the categorization scheme for this research.

Borg, Walter R. et al., The Minicourse: A Microteaching Approach to Teacher Education, Toronto, Collier-Macmillan Canada Ltd., 1970, 256 p.

A comprehensive treatise on the rationale and development of minicourses at the Far West Laboratory for Educational Research and Development is given in this publication. Development and testing of instructional models which can bring about major changes in specific skills related to classroom teaching is explained in depth along with suggestions for implementing these models in teacher education. Chapter II provided extensive research findings relative to microteaching which were fundamental to this study.

Claus, Karen E.S., The Effects of Modeling and Feedback Variables on High-Order Questioning Skills, unpublished doctoral thesis presented to the [School of Education] Stanford University, 1968, xiii-143 p.

This study investigates the acquisition of the skill of higher-order questioning with a classification system adapted from Bloom's Taxonomy to form eight categories. The author manipulated as the independent variable the presence or absence of cueing by the experimenter during the presentation of the model tape or the presentation of the trainee's own videotaped microteaching performance. This thesis provided the most recent investigation of the skill of higher-order questions and was directly related to this research.

Conant, James B., The Education of American Teachers, New York, McGraw-Hill Co., Inc., 1963, ix-275 p.

The product of a two-year study of certification policies in sixteen state capitals and of teacher-training programs in seventy-seven institutions, this book reviews teacher education policies and offers recommendations that appeared radical at the time of publication. Diversity of American education is taken into account and suggestions are offered for raising standards without sacrificing diversification.

Cooper, James M., "Developing Specific Teaching Skills through Micro-Teaching," in The High School Journal, Vol. 51, No. 2, issue of November 1967, p. 80-85.

In this article, the author suggests that the analysis of teaching be approached in terms of pupil and teacher behaviors and concludes that breaking down the complex teaching act (as exemplified by microteaching) into simpler, more easily trainable skills offers much promise for teacher education. Article helped clarify the micro-teaching process.

Corrigan, Dean (ed.), The Study of Teaching, Washington, D.C., The Association for Student Teaching, 1967, viii-91 p.

The ideas contained in this publication exemplify newer approaches to the systematic study of teaching. With the premise that teaching, because it depends on one or more human beings functioning in an interaction process, requires the continuous adjustment of behavior, the authors emphasize action programs which concentrate on the analytical study of teaching. The Hermanowicz article, a review of the research on teaching with accompanying comments on the application of the conceptual tools of the researcher to the study of teaching by prospective teachers, provided valuable background for the evolvement of the rationale for this study.

Dewey, John, The Relation of Theory to Practice in Education, Bulletin No. 17, Cedar Falls, Iowa, The Association for Student Teaching, 1962, iv-24 p.

A reprint of Dewey's analysis of the principles underlying direct experience in teacher education. Published originally in 1904, the analysis is a classic, providing a rationale for professional laboratory experiences in current teacher education programs.

Gage, N.L., "An Analytical Approach to Research on Instructional Methods," in Phi Delta Kappan, Vol. 49, No. 10, June 1968, p. 601-606.

The meager research on teaching from the early 1900's to the present is reviewed with the pendulum swinging from the criterion-of-teacher-effectiveness paradigm to the current micro-criteria-of-effectiveness approach coined by the author. The rationale for the technical skills program at Stanford University with utilization of microteaching is given. The idea of breaking down the teaching act into manageable parts conducive to analysis as presented by Gage has provided the impetus for the scientific study of teaching in clinical and classroom settings.

Glaser, Robert, "Psychology and Instructional Technology," Chapter I, in Robert Glaser (ed.), Training Research and Education, New York, John Wiley and Sons, 1967, p. 1-30.

This introductory first chapter presents a conception of an instructional system with the following components: (a) instructional goals, (b) entering behavior, (c) instructional procedures, (d) performance assessment, and (e) research and development logistics. This conceptual system, reinforced by Strasser's model of instruction, provides the framework of the conceptual model of instruction employed in this investigation. The Glaser components, in the opinion of this researcher, helped complete the model and made it more conducive to research and development in a pre-service setting.

McDonald, Frederick J., and Dwight W. Allen, Training Effects of Feedback and Modeling Procedures on Teaching Performance, Stanford, California, School of Education, Stanford University, 1967, iv-220 p.

This report presents one of the few attempts to modify teaching behavior by using the paradigm of psychological experimentation in a series of three experiments conducted at Stanford University. The conclusions reached in this comprehensive study helped in the formulation of the problem and rationale for this thesis.

Meier, John H., "Rationale for and Application of Microteaching to Improve Teaching," in The Journal of Teacher Education, Vol. 19, No. 2, issue of Summer 1968, p. 145-157.

Comprehensive description of a rationale for and application of microtraining to improve teaching. Learning theory commonalities to the microteaching process of subjecting samples of human behavior to videotape recording, reviewing, responding, refining, and redoing are listed along with examples of the practical application of the microtraining process. Very helpful.

Sanders, Norris M., Classroom Questions--What Kinds?, New York, Harper and Row, 1966, xii-176 p.

In this publication, the author classifies questions following a system based on Benjamin Bloom's Cognitive Taxonomy of Educational Objectives. Following the introductory chapters, Sanders devotes one chapter to each of the seven question levels; namely, memory, translation, interpretation, application, analysis, synthesis, and evaluation. These hierarchical categories were adapted for utilization as the categorization system for this thesis. A textbook essential to the development of this study.

Smith, B. Othanel, Saul B. Cohen, and Arthur Pearl, Teachers for the Real World, Washington, The American Association of Colleges for Teacher Education, 1969, xiii-185 p.

Outlines a plan for the education of teachers in the United States--a plan based largely on what is known about training, about the uses of theory, about teaching, and about social realities. This researcher was particularly interested in Chapter 6, "An Approach to Systematic Training," with its expression of a training concept integrating both the theoretical and training components.

Smith, Elmer R. (ed.), Teacher Education: A Reappraisal, New York, Harper and Row, 1962, vii-213 p.

Reports the conclusions and recommendations of a group of persons actively involved in teacher-education projects supported by the Fund for the Advancement of Education, to the following questions: "Is there anything of essential importance to a teacher in the way of teaching beyond knowledge of the subject he teaches? If so, what are these essentials? How best can these essentials be acquired? How can you tell when a teacher possesses these essentials?" This critical appraisal of teacher education is documented by supporting chapters written by individual participants.

Strasser, Ben, "A Conceptual Model of Instruction," in The Journal of Teacher Education, Vol. 18, No. 1, issue of Spring 1967, p. 63-74.

Author presents a conceptual model of instruction which provides a basis for looking at and thinking about instruction. The implication of the model is that teaching is inquiring and invites a teacher's thinking and behaving in terms of certain goals or enduring purposes. The training employed in this thesis is based on an adaptation of this pedagogical paradigm combined with certain aspects of the Glaser process-of-instruction model.

APPENDIX 1

RATER'S MANUAL: SANDERS QUESTION CLASSIFICATION SYSTEM

RATER'S MANUAL

SANDERS
QUESTION
CLASSIFICATION
SYSTEM

A question is a statement which elicits a verbal response. The question may take any grammatical form--declarative, interrogative, or imperative.

Your task will be to examine the questions asked by teachers in transcripts of teaching sessions and to sort these questions according to the categories identified in "Summary of the Sanders Question Classification System, Definitions of Each Category, Key Concepts, and Related Examples of Behavior." You will also have an opportunity to observe the teaching episode on videotape while examining the transcript.

All teacher questions will be identified on these transcripts with a numeration system.

Each question is to be placed in any <u>one</u> of the categories.

Your familiarization with all categories in this classification system is essential if questions are to be properly identified. Please study it and continually refer to it.

The classification system presented to you in this manual is based on the book, <u>Classroom Questions: What Kinds?</u>, by Norris M. Sanders who in turn based his research on Benjamin Bloom's <u>Taxonomy of Educational Objectives--The Classification of Educational Goals--Handbook I: Cognitive Domain</u>.

Sanders' "taxonomy of questions" defines the type of questions which would be used in each of Bloom's categories of thinking and gives examples of each. These questions require students to engage in specific kinds of thinking from low-level

recall of knowledge to the more sophisticated evaluation-type queries.

By using a classification system, a teacher can guide his questioning in the classroom. He can determine the kinds of intellectual activity he is requiring of his students. Prior to the development of these evaluative devices such as the one presented here, it was more difficult for teachers to examine the quality of thinking practiced in their classroom.

Now questions can be described in terms of purpose. We can ask questions to accomplish something. We can deliberately frame questions which will be appropriate to the pupils and the lesson.

On the following pages is the "Summary of the Sanders Question Classification System, Definitions of Each Category, Key Concepts, and Related Examples of Behavior."

Summary of the Sanders Question Classification System,
Definitions of Each Category, Key Concepts, and Related Examples
of Behavior

Category	Operation Performed (Definition)	Key Concepts	Examples of Behavior
Memory 1	Recall or recognition of factual or conceptual information; if student remembers information presented to him, he will know it applies to question. a. fact questions b. definition questions c. generalization questions d. skill questions e. can be True or False questions	memory knowledge repetition description remembering definition distinquishing identification recall recognition acquisition	Who was Sir John A. MacDonald? What is the capital of Canada? What is the color of this rock? Define government. List ten verbs. Who first settled Hull, Quebec? What happens to people in our society who do not pay their debts? Add 10 and 10.
Translation 2	Translating ideas from one communication to another (perhaps from textbook to student's own language). Words to pictures; vice versa. An <u>impersonal</u> verbal description of pictorial or diagrammatic material is given or a direct verbal translation from one language to another is given. It could include paraphrasing on the part of the teacher with students asked to find passages in text that say the same thing. <u>Ideas must be identified</u>.	translation transformation to give in own words illustration rephrasing restating	Can you state in your own words what Mr. Trudeau said? What idea that we studied in this lesson is close to the focal point of this cartoon? Can you illustrate in cartoon form the author's ideas on pollution? I just explained nationalism to you. Can you find sentences or paragraphs in your textbook that say the same thing? What is this? (showing picture of a triangle). Summarize this chapter.

Category	Operations Performed (Definition)	Key Concepts	Examples of Behavior
Interpretation **3**	Relating facts, generalizations, definitions, values, skills, To relate means to discover or use a relationship between two or more ideas. One explains himself or the thoughts and/or ideas of others. One colors his translation with his own values, beliefs, feelings, etc. Student is asked to discover or use relationships on a common-sense level. Questions should be explicit about what student should do. Interpretation questions ask for a pattern of thinking that can be predicted in advance. Question is objective in the sense that there is one or possibly a few correct answers which can be justified beyond a reasonable doubt. A student interprets if the answers have not been revealed in previous instruction. Not usually short-answer format. a. comparative relationship: comparing ideas to determine whether they are identical, similar, different, unrelated, or contradictory. b. relationship of implication: an idea that follows inevitably from specific evidence.	interpreting rearranging differentiating distinguishing explaining comparing contrasting interpolating understanding	Is the government of Canada different or the same as that of England and why? How is Toronto similar to Montreal? Compare the dictionary definition of "taxonomy" with the one given on page 6. From your text, cite evidence that there was no freedom in the ancient world. The engineer is to the locomotive as the _____ is to the airplane.

Category	Operations Performed (Definition)	Key Concepts	Examples of Behavior
Application 	Presenting problems that approximate the form and context in which they would be encountered in life. Mastery of skills is not complete until pupil uses them successfully in the application category; student selects, transfers, and uses data and principles to complete a problem task with a minimum of directions. Skills, principles, concepts, formulae, etc., are used in a problem-solving situation similar to the learning situation wherein the skills, principles, concepts, formulae, etc., were learned. Questions designed to give students practice in the transfer of training. "How" questions often fall in this category. Also "what would happen if". NOT as explicit about directions as an interpretation question. These questions ask students to be able to use an idea without explicitly telling them to do so. They deal with the whole of ideas and skills rather than their parts.	application organizing transferring generalizing	What would happen if Quebec became an independent country? How would you go about solving the air pollution problem in Canada? Can you think of another reason which might explain why people in warm climates wear white? How could we help a teacher improve herself by teaching her these microteaching principles? Can you think of another example that fits this definition?

Category	Operations Performed (Definition)	Key Concepts	Examples of Behavior
Analysis **5**	Solution of a problem in the light of conscious knowledge of the parts and processes of reasoning. Must always be preceded by instruction in the form of reasoning required by the question. Student distinguishes, classifies, and relates the assumptions, hypotheses, evidence, conclusions, and structure of a statement or a question with an awareness of the thought processes he is using. One applies a set of one or more criteria to a group of examples in order to classify some or all into one or more categories. Cue word=why.	detecting classifying discriminating categorizing deduction contrasting induction formal reasoning logic	What was the author's purpose? Which are facts and which are opinions and why? Why are Toronto winters milder than Ottawa's? Why does a rabbit change color in the winter?
Synthesis **6**	Engaging in imaginative, original thinking. Diverse solutions (divergent thinking) elicited. Students allowed great freedom in seeking solutions. Questions have many possible approaches. Solution requires a product, plan, proposal, or communication new to student. No specific detailed directions. One combines learned skills, principles, concepts, formulae in ways novel to himself in problem-solving and/or creative situations. Synthesis differs from application in that application deals with a horizontal transfer of learning whereas a vertical transfer is involved in the synthesis category.	producing constituting transmitting originating modifying documenting proposing planning specifying formulating creativity divergence productive thinking imagination novelty	Suppose that you decide to manufacture a cassette tape recorder that will sell better than any other. List the problems. Can you tell me all the possible ways we might use this cube? What are some of the methods we can employ to solve inflation? Can you develop a new way...? Give the pros and cons of legalized abortion.

Category	Operations Performed (Definition)	Key Concepts	Examples of Behavior
Evaluation 	The process of making a judgment about the value of an idea, a solution, a method, using criteria developed by the individual himself. Two major steps are involved: (1) setting up appropriate standards or values; (2) determining how closely the idea or object meets these standards or values. Question must require the student to perform both steps in evaluation. Evaluation questions deal with values and NOT facts or opinions; student appraises, assesses, or criticizes on basis of specific standards or criteria; NOT opinion unless standards are made explicit. Value judgments are made based on predetermined standards, values, etc., held by the respondent. Evaluation differs from interpretation in that evaluation includes a conscious judgment.	judgment appraisal deciding assessment validation arguing selection	Which policy will result in the greatest good for the greatest number? For what reasons would you favor...? Evaluate the ideas in terms of cost and community acceptance. Does bilingualism make sense? Are wars necessary? Is the car well constructed from a safety standpoint? Which of the two books do you believe contributed most toward an understanding of the Victorian era and why?

Specific Procedures:

1. Complete the special rating sheet as follows:

   a. Your name on line next to rater.

   b. Indicate intern code number on the line marked trainee.

   c. Leave teaching session blank.

2. Number on the rating sheet must match the number preceding each question on the printed transcript. This is essential.

3. Please record all questions on one transcript on a single rating sheet. This will give a complete record of that teacher's lesson.

4. Each transcript is a record of teacher-questions asked in a five-minute lesson. These are all teacher questions. Do not categorize pupil questions.

5. Examine each teacher question and decide in which category it belongs. If it is a memory question, you will place a 1 next to it; if it is a synthesis question, you will place a 6 next to it. The categories are listed below with their number designations:

   1. Memory

   2. Translation

   3. Interpretation

   4. Application

   5. Analysis

   6. Synthesis

   7. Evaluation

6. A question cannot be placed in two categories; choose one only.

7. If you strongly feel that a question belongs in two or more categories and find it very difficult to discriminate, please place it in the highest category in which you think it might fit.

8. Please consider the categories to be rank-ordered according to the numeration system.

9. Focus on the teacher's actual verbalisms and refrain as much as possible from looking for the "real" meaning or intent.

10. A distinction between memory questions and the others in the classification system is that of whether the pupil is repeating previously acquired information, or whether he is applying the operations analogous to the other categories. Bear in mind that these lessons are being taught in a student-teaching setting and quite independent of what is being taught in the regular classroom by the homeroom teacher. Some content may have been previously studied in a different context. Please use your best judgment.

11. Always keep in mind the informational content of the lesson but categorize according to the specific intent of the question.

12. Rhetorical questions (those which are self-answered) are to be categorized. These are questions which the teacher does not expect to be answered.

13. If the teacher repeats a pupil's response (which may be a question), do not score it as a question.

14. Completion-type statements are to be considered questions.

15. An incomplete question (resulting from a pupil interruption or other distraction), if answered, is to be scored as a question.

16. If a teacher interrupts her question and clarity is lacking, do not score as a question.

17. If a question is extremely vague or elliptical, please disregard it. Examples: "What about the heart?" "What about Canada?" These questions are unsatisfactory because they fail to suggest where the pupil is to dig in in order to reply.

18. Generally speaking, a "yes" or "no" question will be classified in the memory category. Be on your guard, however, for a followup question such as "why?" Since the "yes" or "no" response is almost invariably followed up by a question calling for explanation, it is better to combine both questions.

19. A repeated question on the part of the teacher will only be counted once--if one follows the other immediately. If the question is repeated because it was inaudible, count it once only.

RATING SHEET - SANDERS QUESTION CLASSIFICATION SYSTEM - - - - - - - - - -

Trainee Code Number _____ _____ Rater

Teaching Session _____

Teacher Questions	Teacher Questions	Teacher Questions
1.	24.	47.
2.	25.	48.
3.	26.	49.
4.	27.	50.
5.	28.	51.
6.	29.	52.
7.	30.	53.
8.	31.	54.
9.	32.	55.
10.	33.	56.
11.	34.	57.
12.	35.	58.
13.	36.	59.
14.	37.	60.
15.	38.	61.
16.	39.	62.
17.	40.	63.
18.	41.	64.
19.	42.	65.
20.	43.	66.
21.	44.	67.
22.	45.	68.
23.	46.	69.

APPENDIX 2

QUESTIONING IN THE CLASSROOM

QUESTIONING IN THE CLASSROOM

Questioning:

In any method of teaching where discussion occurs, questioning is a central, critical element. The teacher poses questions to the learner because questions set the mind working.

It has been said with good reason that "To question well is to teach well". Indeed, from the time of Socrates, history's greatest teachers have generally been penetrating questioners. [1]

Plato named the question well when he called it the "torpedo's touch". [2]

The teacher who is skillful in the art of questioning knows how strategic the rightly worded question can be in helping pupils to acquire and classify knowledge.

Dewey,[3] in 1933, stated that "thinking itself is questioning". The good classroom question will prompt the student to use ideas rather than just remember them.

In the majority of classrooms, far too many teachers overemphasize questions requiring recall of specific knowledge. In other words, "memory" type questions are stressed.

If a question is to trigger reasoning, it must call for a response that is not retrieved but reached. "It must be reachable on the basis of the 'given', but not be itself part of the 'given'." [4]

How can you move beyond the cognitive-memory questions which elicit responses requiring cognitive-memory operations?

How can you move away from answers which focus on the simple reproduction of facts--remembered content, recognition, rote memory and selective recall?

Perhaps it might help you to move to a higher level of questioning if you knew of at least one classification system utilized in categorizing questions according to cognitive level (intellectual level).

The classification system presented to you in this publication is based on the book, Classroom Questions: What Kinds?, by Norris M. Sanders [5] who in turn based his research on Benjamin Bloom's Taxonomy of Educational Objectives--The Classification of Educational Goals--Handbook I: Cognitive Domain.[6] (A taxonomy is a special system of classification in which the classes are sequential rather than arbitrary).

Sanders' "taxonomy of questions" defines the type of questions which would be used in each of Bloom's categories of thinking and gives examples of each. These questions require students to engage in specific kinds of thinking from low-level recall of knowledge to the more sophisticated evaluation-type queries.

By using a classification system you can guide your questioning in the classroom. You can determine the kinds of intellectual activity you are requiring of your students. Prior to the development of these evaluative devices, such as the one to be presented here, teachers were not able to examine the quality of thinking practiced in their classroom.

Now you can describe questions in terms of purpose. You can ask questions to accomplish something. You can deliberately frame questions which will be appropriate to your pupils and your lesson.

Practice will be essential if you are to become an effective questioner. Certain types of questions will be more difficult to formulate. You will not necessarily be able to incorporate every type of question in every lesson.

To provide the needed variety in your lessons, you should formulate key questions in advance and set them down in your lesson plan.

Do not try to plan every question for that might eliminate the spontaneity and flexibility essential to effective classroom dialogue. Key, pivotal questions, however, worded according to a classification system, should be formulated in advance.

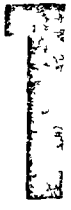
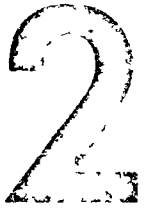
You should guard against asking questions which are confusing. Keep your questions as uncomplicated as possible. Ask one question at a time.

When you ask a question that demands complex thinking operations on the part of your pupils, give them time to think. Remain silent for a while.

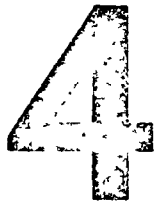
"Yes" and "no" questions require very little effort on the part of pupils. Always make sure they give you the reason for their answer... otherwise they may be guessing.

On the next four pages you will find a Summary of the Sanders Question Classification System, Definitions of each Category, Key Concepts, and Related Examples of Behavior. This classification system is followed by a practice planning sheet for your assistance in preparing your lesson utilizing the different types of questions.

Summary of the Sanders Question Classification System,
Definitions of Each Category, Key Concepts, and Related Examples
of Behavior

Category	Operation Performed (Definition)	Key Concepts	Examples of Behavior
emory 	Recall or recognition of factual or conceptual information; if student remembers information presented to him, he will know it applies to question. a. fact questions b. definition questions c. generalization questions d. skill questions e. can be True or False questions	memory knowledge repetition description remembering definition distinguishing identification recall recognition acquisition	Who was Sir John A. MacDonald? What is the capital of Canada? What is the color of this rock? Define government. List ten verbs. Who first settled Hull, Quebec? What happens to people in our society who do not pay their debts? Add 10 and 10.
Translation 	Translating ideas from one communication to another (perhaps from textbook to student's own language). Words to pictures; vice versa. An original verbal description of pictorial or diagrammatic material is given or a direct verbal translation from one language to another is given. It could include paraphrasing on the part of the teacher with students asked to find passages in text that say the same thing. Ideas must be identified.	translation transformation to give in own words illustration rephrasing restating	Can you state in your own words what Mr. Trudeau said? What idea that we studied in this lesson is close to the focal point of this cartoon? Can you illustrate in cartoon form the author's ideas on pollution? I just explained nationalism to you. Can you find sentences or paragraphs in your textbook that say the same thing? What is this? (showing picture of a triangle). Summerize this chapter.

Category	Operations Performed (Definition)	Key Concepts	Examples of Behavior
Interpretation 3	Relating facts, generalizations, definitions, values, skills, To relate means to discover or use a relationship between two or more ideas. One explains himself or the thoughts and/or ideas of others. One colors his translation with his own values, beliefs, feelings, etc. Student is asked to discover or use relationships on a common-sense level. Questions should be explicit about what student should do. Interpretation questions ask for a pattern of thinking that can be predicted in advance. Question is objective in the sense that there is one or possibly a few correct answers which can be justified beyond a reasonable doubt. A student interprets if the answers have not been revealed in previous instruction. Not usually short-answer format. a. comparative relationship: comparing ideas to determine whether they are identical, similar, different, unrelated, or contradictory. b. relationship of implication: an idea that follows inevitably from specific evidence.	interpreting rearranging differentiating distinguishing explaining comparing contrasting interpolating understanding	Is the government of Canada different or the same as that of England and why? How is Toronto similar to Montreal? Compare the dictionary definition of "taxonomy" with the one given on page 6. From your text, cite evidence that there was no freedom in the ancient world. The engineer is to the locomotive as the _____ is to the airplane.

Category	Operations Performed (Definition)	Key Concepts	Examples of Behavior
Application 	Presenting problems that approximate the form and context in which they would be encountered in life. Mastery of skills is not complete until pupil uses them successfully in the application category; student selects, transfers, and uses data and principles to complete a problem task with a minimum of directions. Skills, principles, concepts, formulae, etc., are used in a problem-solving situation similar to the learning situation wherein the skills, principles, concepts, formulae, etc., were learned. Questions designed to give students practice in the transfer of training. "How" questions often fall in this category. Also "what would happen if". NOT as explicit about directions as an interpretation question. These questions ask students to be able to use an idea without explicitly telling them to do so. They deal with the whole of ideas and skills rather than their parts.	application organizing transferring generalizing	What would happen if Quebec become an independent country? How would you go about solving the air pollution problem in Canada? Can you think of another reason which might explain why people in warm climates wear white? How could we help a teacher improve herself by teaching her these microteaching principles? Can you think of another example that fits this definition?

Category	Operations Performed (Definition)	Key Concepts	Examples of Behavior
Analysis 	Solution of a problem in the light of conscious knowledge of the parts and processes of reasoning. Must always be preceded by instruction in the form of reasoning required by the question. Student distinguishes, clascifies, and relates the assumptions, hypotheses, evidence, conclusions, and structure of a statement or a question with an awareness of the thought processes he is using. One applies a set of one or more criteria to a group of examples in order to classify some or all into one or more categories. Cue word=why.	detecting classifying discriminating categorizing deduction contrasting induction formal reasoning logic	What was the author's purpose? Which are facts and which are opinions and why? Why are Toronto winters milder than Ottawa's? Why does a rabbit change color in the winter?
Synthesis 	Engaging in imaginative, original thinking. Diverse solutions (divergent thinking) elicited. Students allowed great freedom in seeking solutions. Questions have many possible approaches. Solution requires a product, plan, proposal, or communication new to student. No specific detailed directions. One combines learned skills, principles, concepts, formulae in ways novel to himself in problem-solving and/or creative situations. Synthesis differs from application in that application deals with a horizontal transfer of learning whereas a vertical transfer is involved in the synthesis category.	producing constituting transmitting originating modifying documenting proposing planning specifying formulating creativity divergence productive thinking imagination novelty	Suppose that you decide to manufacture a cassette tape recorder that will sell better than any other. List the problems. Can you tell me all the possible ways we might use this cube? What are some of the methods we can employ to solve inflation? Can you develop a new way...? Give the pros and cons of legalized abortion.

Category	Operations Performed (Definition)	Key Concepts	Examples of Behavior
Evaluation 	The process of making a judgment about the value of an idea, a solution, a method, using criteria developed by the individual himself. Two major steps are involved: (1) setting up appropriate standards or values; (2) determining how closely the idea or object meets these standards or values. Question must require the student to perform both steps in evaluation. Evaluation questions deal with values and NOT facts or opinions; student appraises, assesses, or criticizes on basis of specific standards or criteria; NOT opinion unless standards are made explicit. Value judgments are made based on predetermined standards, values, etc., held by the respondent. Evaluation differs from interpretation in that evaluation includes a conscious judgment.	judgment appraisal deciding assessment validation arguing selection	Which policy will result in the greatest good for the greatest number? For what reasons would you favor...? Evaluate the ideas in terms of cost and community acceptance. Does bilingualism make sense? Are wars necessary? Is the car well constructed from a safety standpoint? Which of the two books do you believe contributed most toward an understanding of the Victorian era and why?

PRACTICE PLANNING SHEET

This tally sheet will help you to rate the questions you plan to ask.

Match the question with the category you think is appropriate. Check your Sanders Question Classification System often while preparing your lesson.

	Questions in Your Lesson
1. Memory Pupil is asked to recognize or recall	
2. Translation Pupil is asked to relate in his own words or to pictorialize	
3. Interpretation Pupil is asked to discover or use relationships between ideas	
4. Application Pupil is asked to solve real-life problems reflecting on his mastery of skills	
5. Analysis Pupil is asked to solve a problem in the light of knowledge of parts and processes of reasoning	
6. Synthesis Pupil is asked to solve a problem using imaginative and original thinking	
7. Evaluation Pupil is asked to make a value decision--not to respond "yes" or "no" to a fact or an opinion	

References:

1. Groisser, Philip, How to Use the Fine Art of Questioning, New York, Teachers Practical Press, Inc., Atherton Press, 1964, p. 5.

2. Stevens, Romiett, The Question as a Measure of Efficiency in Instruction, New York, Teachers College, Columbia University, 1912, p. 6.

3. Berliner, David C., Microteaching and the Technical Skills Approach to Teacher Training, Stanford, California, School of Education, Stanford University, 1969, p.8.

4. Aschner, M.J. McCue, "Asking Questions to Trigger Thinking," NEA Journal, Vol. 50, No. 6, September 1961, p. 45.

5. Sanders, Norris M., Classroom Questions: What Kinds?, New York, Harper and Row, 1966, Pp. xii-176.

6. Bloom, Benjamin, et al., Taxonomy of Educational Objectives: The Classification of Educational Goals--Handbook I: Cognitive Domain, New York, David McKay Co., Inc., 1956, Pp. 207.

7. Based on:

   a. Bloom, Benjamin, et al., Taxonomy of Educational Objectives: The Classification of Educational Goals: Handbook I: Cognitive Domain, New York, David McKay Co., Inc., 1956, Pp. 207.

   b. Claus, Karen E. S., The Effects of Modeling and Feedback Variables on Higher-Order Questioning Skills, Unpublished Doctoral thesis presented to the School of Education of Stanford University, Stanford, California, 1969, Pp. xiii-143.

   c. Manson, Gary and Ambrose A. Clegg, Jr., "Classroom Questions: Keys to Children's Thinking," Peabody Journal of Education, Vol. 47, No. 5, March 1970, Pp. 302-307.

   d. Sanders, Norris M., Classroom Questions: What Kinds? New York, Harper and Row, 1966, Pp. xii-176.

APPENDIX 3

MODEL'S MANUAL

MODEL'S MANUAL

CONFIDENTIAL

Note: A week prior to the actual taping, models received the following directions. They were asked to be ready to teach a ten-minute geography lesson incorporating Sanders' Question Classification System.

APPENDIX 3

MANUAL FOR MODELS

The primary objective of this research is to help the student teacher extend the range and quality of his questioning techniques in such a way that his pupils' thought processes will range beyond memorization of factual information.

The author proposes to do this by means of models. He would like you to teach a ten-minute lesson in the area of geography to a group of four sixth graders. In each lesson your purpose will be to demonstrate higher-order questioning (according to Sanders) to the best of your ability. Try to include as many instances of high-level questions (from each of Sanders' seven categories) as possible. These relationship questions should require your pupils to go beyond recall or recognition answers and beyond shallow statements of opinions. Although content objectives are important, your prime concern at this time is the skill: higher-order questioning. The more frequently you are able to demonstrate the desired behavior, the better it will be in terms of training the student teachers. Concentrate on the question as your mode of instruction.

Your familiarization with the following text is essential before you actually teach your lesson:

Sanders, N.M., Classroom Questions: What Kinds?, New York, Harper and Row, pp. xii-176.

Also included in this manual, for your information, is a detailed description of the question categories and a practice planning sheet for use in preparing your lesson.

You may choose any geography topic you wish and partake of any instructional materials deemed necessary to your topic.

Do not try to cover too much information--you will have only ten minutes.

The minimum criterion for each lesson will be twelve higher-order questions.

Your lesson will be independently rated on question categories in the same manner as the student teacher lessons.

Although you are encouraged to use questions from as many Sanders' categories as possible, it is not essential that all categories be included. This will depend on your lesson. Too high a frequency of the desired behaviors might endanger the educational quality of the lesson.

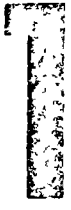
Please familiarize yourself with the names and background of your sixth graders before the actual lesson is presented.

The student teachers, in preparing their lessons, will be presented with similar background material relative to the Sanders Question Classification System which you have in this manual.

Remember: The skill of higher-order questioning is the objective of your lesson rather than transmitting content.

Your teaching attire should be typical of that expected of student teachers in the teachers' college setting.

Summary of the Sanders Question Classification System,
Definitions of Each Category, Key Concepts, and Related Examples
of Behavior

Category	Operation Performed (Definition)	Key Concepts	Examples of Behavior
lemory 	Recall or recognition of factual or conceptual information; if student remembers information presented to him, he will know it applies to question. a. fact questions b. definition questions c. generalization questions d. skill questions e. can be True or False questions	memory knowledge repetition description remembering definition distinguishing identification recall recognition acquisition	Who was Sir John A. MacDonald? What is the capital of Canada? What is the color of this rock? Define government. List ten verbs. Who first settled Hull, Quebec? What happens to people in our society who do not pay their debts? Add 10 and 10.
Translation 	Translating ideas from one communication to another (perhaps from textbook to student's own language). Words to pictures; vice versa. An interpersonal verbal description of pictorial or diagrammatic material is given or a direct verbal translation from one language to another is given. It could include paraphrasing on the part of the teacher with students asked to find passages in text that say the same thing. Ideas must be identified.	translation transformation to give in own words illustration rephrasing restating	Can you state in your own words what Mr. Trudeau said? What idea that we studied in this lesson is close to the focal point of this cartoon? Can you illustrate in cartoon form the author's ideas on pollution? I just explained nationalism to you. Can you find sentences or paragraphs in your textbook that say the same thing? What is this? (showing picture of a triangle). Summarize this chapter.

Category	Operations Performed (Definition)	Key Concepts	Examples of Behavior
Interpretation 3	Relating facts, generalizations, definitions, values, skills, To relate means to discover or use a relationship between two or more ideas. One explains himself or the thoughts and/or ideas of others. One colors his translation with his own values, beliefs, feelings, etc. Student is asked to discover or use relationships on a common-sense level. Questions should be explicit about what student should do. Interpretation questions ask for a pattern of thinking that can be predicted in advance. Question is objective in the sense that there is one or possibly a few correct answers which can be justified beyond a reasonable doubt. A student interprets if the answers have not been revealed in previous instruction. Not usually short-answer format. a. comparative relationship: comparing ideas to determine whether they are identical, similar, different, unrelated, or contradictory. b. relationship of implication: an idea that follows inevitably from specific evidence.	interpreting rearranging differentiating distinguishing explaining comparing contrasting interpolating understanding	Is the government of Canada different or the same as that of England and why? How is Toronto similar to Montreal? Compare the dictionary definition of "taxonomy" with the one given on page 6. From your text, cite evidence that there was no freedom in the ancient world. The engineer is to the locomotive as the _____ is to the airplane.

Category	Operations Performed (Definition)	Key Concepts	Examples of Behavior
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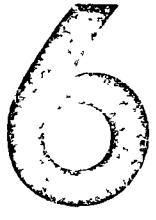
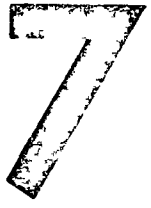
Category	Operations Performed (Definition)	Key Concepts	Examples of Behavior
Analysis 	Solution of a problem in the light of conscious knowledge of the parts and processes of reasoning. Must always be preceded by instruction in the form of reasoning required by the question. Student distinguishes, classifies, and relates the assumptions, hypotheses, evidence, conclusions, and structure of a statement or a question with an awareness of the thought processes he is using. One applies a set of one or more criteria to a group of examples in order to classify some or all into one or more categories. Cue word=why.	detecting classifying discriminating categorizing deduction contrasting induction formal reasoning logic	What was the author's purpose? Which are facts and which are opinions and why? Why are Toronto winters milder than Ottawa's? Why does a rabbit change color in the winter?
Synthesis 	Engaging in imaginative, original thinking. Diverse solutions (divergent thinking) elicited. Students allowed great freedom in seeking solutions. Questions have many possible approaches. Solution requires a product, plan, proposal, or communication new to student. No specific detailed directions. One combines learned skills, principles, concepts, formulae in ways novel to himself in problem-solving and/or creative situations. Synthesis differs from application in that application deals with a horizontal transfer of learning whereas a vertical transfer is involved in the synthesis category.	producing constituting transmitting originating modifying documenting proposing planning specifying formulating creativity divergence productive thinking imagination novelty	Suppose that you decide to manufacture a cassette tape recorder that will sell better than any other. List the problems. Can you tell me all the possible ways we might use this cube? What are some of the methods we can employ to solve inflation? Can you develop a new way...? Give the pros and cons of legalized abortion.

Category	Operations Performed (Definition)	Key Concepts	Examples of Behavior
Evaluation 	The process of making a judgment about the value of an idea, a solution, a method, using criteria developed by the individual himself. Two major steps are involved: (1) setting up appropriate standards or values; (2) determining how closely the idea or object meets those standards or values. Question must require the student to perform both steps in evaluation. Evaluation questions deal with values and NOT facts or opinions; student appraises, assesses, or criticizes on basis of specific standards or criteria; NOT opinion unless standards are made explicit. Value judgments are made based on predetermined standards, values, etc., held by the respondent. Evaluation differs from interpretation in that evaluation includes a conscious judgment.	judgment appraisal deciding assessment validation arguing selection	Which policy will result in the greatest good for the greatest number? For what reasons would you favor...? Evaluate the ideas in terms of cost and community acceptance. Does bilingualism make sense? Are wars necessary? Is the car well constructed from a safety standpoint? Which of the two books do you believe contributed most toward an understanding of the Victorian era and why?

APPENDIX 4

MICROTEACHING: AN ADDED DIMENSION

MICROTEACHING: an added dimension

The Faculty of Education
University of Ottawa
GRADUATE STUDIES

P. BABIN

1970-71

an intermediate step between THEORY and practice

DEFINITIONS:

MICROLESSON: A short five-minute lesson, used primarily to train for single teaching skills.

MICROCLASS: A small group of pupils (elementary or secondary) taught in a microteaching clinic. Basic to operation of microteaching.

VIDEOTAPING: Recording of microlesson which allows an immediate feedback source for the teacher.

COMPONENTS: Microphone, camera, videocorder, monitor, videotape. The tapes are erasable and reusable.

cosmetic effect

COSMETIC EFFECT REFERS TO INITIAL REACTIONS TO VIDEOTAPING -- PERHAPS AN OVERLY SELF-CONSCIOUS REACTION.

CONCERN ABOUT COIFFURE, PERSONAL MANNERISMS, AND ANATOMICAL ANOMALIES.

MICROTEACHING IS

SIMPLIFIED
CONTROLLED
PRACTICE.

BRIEF: 5-10 minutes.

SMALL SESSIONS: 1-4 students.

REAL: Genuine learners, real lesson.

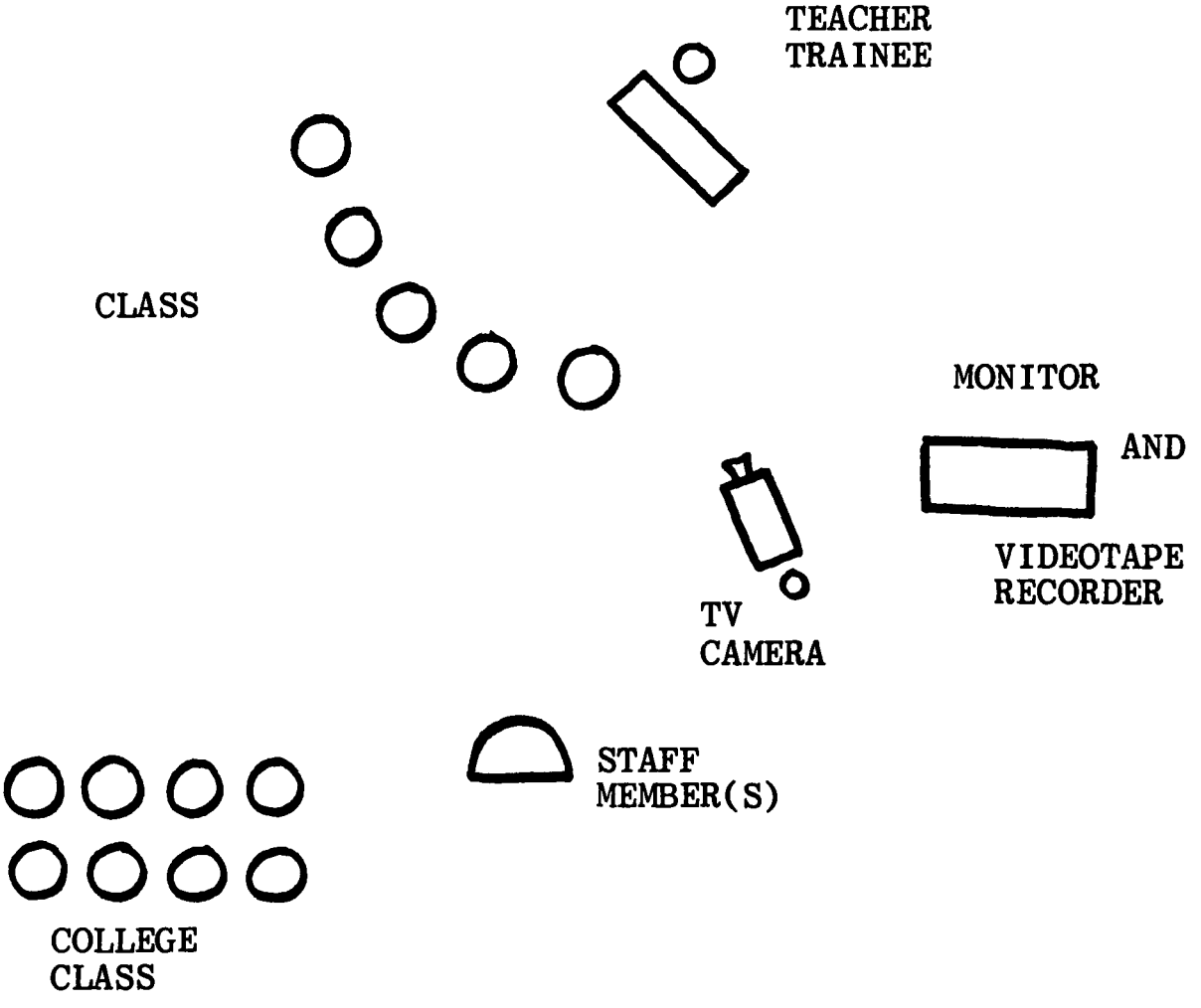
CONSTRUCTED: Certain characteristics ordered as desired.

CRITIQUE: FOCUS process in supervision. Not diffused. Limited to 1-3 points.

PROGRAMMED: Decide in advance what skill(s) will be practiced.

PRACTICE: Subsequent reteaching.

TYPICAL SETTING:



specific skills

ONE OR, AT THE MOST, TWO SPECIFIC SKILLS ARE TAUGHT AND ANALYZED AT ANY ONE TIME.

SOME OF THESE SKILLS (AS IDENTIFIED BY GENERAL LEARNING CORPORATION) ARE:

1. Response Repertoire
    a. Verbal responses
    b. Nonverbal responses

2. Questioning Skills
    a. Fluency in asking questions
    b. Probing questions
    c. Higher order questions
    d. Divergent questions

3. Creating Student Involvement
    a. Set induction
    b. Stimulus variation
    c. Closure

4. Increasing Student Participation
    a. Reinforcement
    b. Recognizing attending behavior
    c. Silence and nonverbal cues
    d. Cueing

5. Presentation Skills
    a. Completeness of communication
    b. Lecturing
    c. Use of examples
    d. Planned repetition

TRAINEE

HAS
AN
OPPORTUNITY
TO
MAKE
MISTAKES.

HE
DOES
NOT
HAVE
TO
WORRY
ABOUT
THE
EFFECT
ON
PUPILS.

MICROTEACHING PROVIDES AN
OPPORTUNITY TO GO THROUGH
THE INITIAL ANXIETY EXPERIENCED
WHEN STANDING BEFORE A CLASS.

initial anxiety

pupil

THE MORE
TECHNIQUES A
TEACHER HAS AT HIS

DISPOSAL FOR REINFORCING
STUDENTS THE BETTER HIS

CHANCES FOR GETTING GOOD
PUPIL PARTICIPATION.

participation

FEEDBACK

NOW, FOR THE FIRST TIME, WE CAN SEE IMMEDIATELY HOW WE HAVE PERFORMED IN TEACHING.

WE CANNOT ONLY SEE RESULTS AT ONCE BUT CAN PRACTICE A GIVEN SKILL OVER AND OVER IN THE MICROTEACHING CLINIC UNTIL WE ARE READY TO TRY IT IN THE CLASSROOM.

VIDEOTAPES MAY BE ERASED AT ANY TIME.

MICROTEACHING PROVIDES FOR INDIVIDUALIZED INSTRUCTION OF TEACHER TRAINEES. THE MICROTEACHING DOSAGE CAN BE VARIED AND THE TRAINEE'S INITIAL ENCOUNTER CAN FOCUS ON AREAS OF STRENGTH. SPECIAL ATTENTION CAN BE GIVEN TO THE TEACHER'S SELF-CONCEPT AND HIS RESULTING ABILITY TO BE AN EFFECTIVE CLASSROOM PERSON.

individualized instruction

neutral area

SINCE THE TRAINEE IS WORKING WITH A SHORT LESSON AND FEWER PUPILS, HE MAY TRY OUT NEW METHODS AND IDEAS IN A LESS DIFFICULT SITUATION THAN THAT FOUND IN A REGULAR CLASSROOM.

MICROTEACHING IS CONDUCTED IN A NEUTRAL AREA -- THE CLINIC.

TRAINEE CAN PRACTICE SPECIFIC SKILLS--AND NOT BE AFRAID THAT PUPILS ARE DEPRIVED IN ANY WAY.

A TRAINEE NEED NOT BE AFRAID TO MAKE MISTAKES.

LESSON planning

Choose a topic which can be adequately developed within your time limit. Keep your particular teaching skill(s) in mind.

Although some people doubt that anything can be taught in a five-minute period, experience with microteaching has shown that this affords adequate time for discussion of a small amount of content.

More importantly, five minutes is ample time to practice a specific teaching skill. At the beginning, perhaps a trainee can time his lesson to make sure he completes IT in the allotted time. Microteaching is designed to be a highly focused, highly concentrated experience. The short teaching episode allows for a greater possibility of recall of specific instances of the skill performance.

TRAINING SEQUENCE

Teacher instructs a brief lesson to a small group of students and tries to highlight a relevant teaching skill. Teacher, with some kind of supervision, views the videotape of his performance, and then receives feedback on how successfully he performed the teaching skill. The teacher has a block of time to plan his next lesson, incorporate the feedback from his previous teaching lesson, or receive training. He then teaches the lesson over again to another group of students in an attempt to improve on his previous use of the skill. Again he receives feedback by watching the videotape of his second teaching performance, again with some kind of supervision.

The sequence of teaching, critique, and training can be repeated as many times as necessary to bring the teacher up to a pre-set standard of performance of the skill being trained.

YOUR SUPERVISOR WILL MEET YOU AT YOUR ASSIGNED MICROTEACHING STATION. TAKE THE TIME TO CLARIFY WITH HIM ANY LAST-MINUTE QUESTIONS YOU MAY HAVE. TEACHING AIDS SHOULD BE READY. YOUR STUDENTS WILL BE REQUESTED TO WEAR NAME TAGS. WHEN THE CAMERA OPERATOR SIGNALS YOU TO BEGIN, START YOUR LESSON IMMEDIATELY.

SPEAK CLEARLY AND LOUDLY ENOUGH.

WHEN SIGNAL IS GIVEN, STOP YOUR LESSON (EVEN THOUGH YOU MAY NOT HAVE REACHED A CONCLUSION).

getting started

VIDEO

Although it is possible to utilize the microteaching technique without a videotape recorder, the process is facilitated by the use of the equipment. Its value lies in the vivid or subjective record it provides for analysis purposes. These recordings help the trainee to supervise himself, i.e., to analyze his own performance in terms of its strengths and weaknesses.

TAPING

critique:

FOLLOWING THE MICROTEACHING EPISODE, FEEDBACK MAY BE FIVEFOLD; NAMELY,

1. Self.
2. Pupils being taught.
3. Trainee's peers.
4. Staff member(s).
5. Videotape replay.

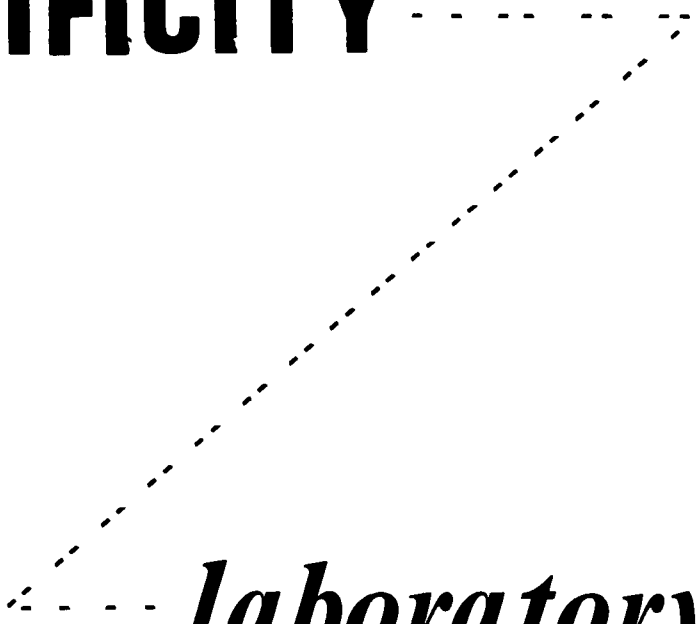
TRAINEE AND SUPERVISOR, DURING THE CRITIQUE, CENTER DISCUSSION ON THE PERFORMANCE OF THE SKILL. INTENTION IS TO HELP TRAINEE THINK OF WAYS OF IMPROVING HIS PERFORMANCE FOR THE NEXT TEACHING SESSION. CONSTRUCTIVE SUGGESTIONS ARE IN ORDER.

LOW RISK

MICROTEACHING
HOLDS A
LOW RISK
FOR BOTH TEACHERS
AND PUPILS.

TOO OFTEN, NEOPHYTE
TEACHERS HAVE BEEN
EXPOSED TO UNREASONABLE
THREATS
AND
HURDLES
WHICH
SOURED
THEIR
BEGINNING
DAYS.

- **ACTIVITY**
- **REALISM**
- **SPECIFICITY**



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APPENDIX 5

INTRODUCTORY ORIENTATION SESSION FOR FEMALE STUDENTS (1970 GRADE THIRTEEN GRADUATES) ENROLLED AT OTTAWA TEACHERS COLLEGE

APPENDIX 5

INTRODUCTORY ORIENTATION SESSION FOR FEMALE STUDENTS (1970 GRADE THIRTEEN GRADUATES) ENROLLED AT OTTAWA TEACHERS COLLEGE

We have asked you to meet here today to present you with a challenge.

You are all attending Ottawa Teachers College, presumably because you are interested in teaching . . . elementary teaching. You are also interested, presumably, in becoming topnotch teachers--because you realize that school directors and school superintendents are seeking quality teachers. Only the best qualified make the grade--you are part of a very competitive profession.

What I want to propose to you is an activity which will contribute to your development as a teacher. This activity, if pursued by you, will reinforce you all the more in your teacher preparation program.

First of all, this is a research project being conducted in cooperation with Ottawa Teachers College, the Ottawa Separate School Board and the University of Ottawa. Participants will receive a printed statement indicating their involvement in this endeavor.

This research project will focus on you and some of the teaching skills which will contribute to your development as teachers.

Through your participation in this activity, you will be better prepared to face pupils in the elementary classrooms of Ontario and other parts of the country. You should, at the end of these few weeks, have acquired certain skills which will enable you to provide more exciting lessons for your youngsters.

How will these skills be presented to you? Basically, in a microteaching context.

What is microteaching? Perhaps you've heard about it.

In a nutshell, it is a technique designed to strengthen your teacher preparation program.

The teaching act, complicated beyond recognition, has been broken down into specific skills. Not all skills have been identified--some of the major ones.

What are some of these skills?

One of them is fluency in asking questions . . . and the right kind of questions.

Another is set induction. How do you prepare pupils for learning? How do you get them interested in the lesson?

Another is stimulus variation. How do you keep your pupils interested in what you teach them? How do you add variety to your teaching? How do you hold their attention?

What happens in microteaching? Well, these skills are presented to you either in live demonstration lessons, on film, or on videotape. Printed matter usually reinforces this presentation.

Then, before you do your student teaching or go into a regular classroom at the end of your teachers college year, you get a change to practice these skills in a microteaching clinic.

At the clinic, you teach a brief lesson, usually five minutes in length, to a group of 4-5 pupils. You do not have to worry about making mistakes since you are in a neutral situation, the laboratory. Your teaching encounter is minimized and narrowed down to enable you to zero-in on certain skills.

Following your presentation, you are given the opportunity to watch yourself on television. At that time you decide what changes you want to make in your teaching. Perhaps your lesson is A-1 and no alteration is necessary. On the other hand, it could be that your lesson was a complete flop. Then you can prepare another lesson in which you make the necessary improvements.

Once you have mastered a specific teaching skill, you move on to another. Eventually, you build up a rich background of many skills which hopefully becomes a part of your teaching.

Any questions up to this point?

Because of inavailability of time, personnel, and the necessary facilities, only a portion of you will be able to take part . . . 60, in fact.

Later on during your scholastic year, it is hoped that you others will get some type of exposure.

What I would like to have you do today is complete this brief personal data sheet. Later this week or during the first part of next week, another brief meeting will be called at which time the names of participants will be announced. At that time additional material will be distributed including a pictorial book explaining microteaching and a pamphlet on teaching skills.

Your participation in this activity is on a voluntary basis. I can only encourage you to participate.

As previously mentioned, those of you who participate will be kept informed as to your progress and will be given a written statement indicating your participation.

Many of your master teachers here at the College took part in a microteaching clinic this past summer at the University of Ottawa and will be interested in your involvement.

APPENDIX 6

WRITTEN TRANSCRIPT OF MODEL ONE QUESTIONS AND THEIR CLASSIFICATION ACCORDING TO THE SANDERS QUESTION CLASSIFICATION SYSTEM

Written Transcript of Model One Questions and their Classification According to the Sanders Question Classification System

QUESTIONS

1.	What often happens to these patches during the following winter?	Memory
2.	What causes them to disappear?	Interpretation
3.	What causes the water to expand?	Memory
4.	Could you elaborate a little further?	Interpretation
5.	What has happened in the picture here?	Interpretation
6.	Are you suggesting then that the same principle that Chris mentioned applies here as well?	Interpretation
7.	What name was given to this era in the earth's history?	Memory
8.	What name is given to the large sheets of ice?	Memory
9.	Can you name one place where we find glaciers today?	Memory
10.	And another place?	Memory
11.	What do you suppose would happen to the earth's surface due to the weight and pressure of these large expanding sheets of ice?	Application
12.	Anything else that might happen?	Application
13.	How thick do you think these glaciers were during the ice age?	Memory
14.	What shape do you think this land form would be?	Analysis
15.	What would be the ingredients of this pile?	Memory
16.	What does the term glacial rubble mean to you, Cathy?	Interpretation
17.	What does it mean to you, Cathy? (another pupil)	Interpretation
18.	Why is it suggested we carry a long pole with us when crossing a frozen river or lake?	Analysis
19.	What if you test the ice and find it a foot thick--why carry the pole?	Analysis
20.	What causes it to be thinner in some places?	Analysis

21.	What are the chances of finding an air pocket or an air bubble in the glacier?	Analysis
22.	What shape of land form would be left behind as a result of a bubble being pushed across the surface of the earth?	Application
23.	Why do rivers not freeze right to the bottom?	Analysis
24.	Why is the water in the bottom part or the water below the ice able to retain its warmer temperature?	Analysis
25.	What seals it off from the cold air?	Memory
26.	What is it that--what material or what name do we give to material that keeps the cold out and the warm in?	Memory
27.	Is it possible that ice could act as an insulator even though it is below freezing in temperature?	Application
28.	What then would be the chances of us finding a stream or a river flowing beneath a glacier if ice can act as an insulator?	Analysis
29.	What would happen to the stream bed as this glacier moved across the face of the land and the water flowed through the tunnel there for the stream or river?	Application
30.	What shape of land form would we have behind?	Interpretation
31.	What would we find inside that hill?	Application
32.	Pebbles and sand together and larger stones we call--what?	Memory
33.	Where do you think many of our gravel pits are located?	Application

(I would like you to name the land form you see in each slide from the evidence that we have examined here.)

First slide:

34.	What land form?	Translation
35.	Why do you say it is a moraine?	Analysis

Second slide:

36.	What name do we give this?	Memory
37.	And why do you say it is a drumlin?	Analysis
38.	What shape did we say it would be?	Memory

39.	Does it look like a bubble?	Translation
	Third slide:	
40.	And here's the last one. . . ?	Translation
41.	Why do you say it is an esker?	Analysis
42.	What value would you see in a farmer knowing about these land forms?	Synthesis
43.	What value would you see in a road construction engineer knowing about these land forms?	Synthesis
44.	And another reason?	Synthesis

APPENDIX 7

WRITTEN TRANSCRIPT OF MODEL TWO QUESTIONS AND THEIR CLASSIFICATION ACCORDING TO THE SANDERS QUESTION CLASSIFICATION SYSTEM

Written Transcript of Model Two Questions and their Classification According to the Sanders Question Classification System

QUESTIONS

1.	What does manufacturing mean to you?	Translation
2.	What are--things--man-made things made from?	Interpretation
3.	What would be an example of another raw material from which we make man-made things?	Memory
4.	What would be another thing?	Memory
5.	What finished products would be manufacture from logs?	Memory
6.	O.K., anything else?	Memory
7.	What finished products would we make from iron ore?	Memory
8.	What manufactured things could we make from crops grown in the fields?	Memory
9.	What proportion of all Canadian manufacturing is done in Ontario and Quebec?	Memory
10.	What proportion of all manufacturing done in Canada--the whole of Canada--is done in Ontario and Quebec?	Memory
11.	Approximately?	Memory
12.	What proportion would that be all together?	Memory
13.	What conditions in the Great Lakes-St. Lawrence Lowlands favor each of these factors?	Application
14.	What conditions, for example, in the lowlands favor this factor that's required in manufacturing--skilled workers?	Application
15.	What is there about southern Ontario that influences this factor of raw materials?	Interpretation
16.	For example, what would be a nearby place to . . .?	Memory
17.	What condition is there in the Great Lakes St. Lawrence Lowlands that favor this factor--a market for products?	Interpretation
18.	A place where we can sell the things that are manufactured in southern Ontario and the Great Lakes?	Memory

19.	Would you say that there was a good market for products in that area itself?	Analysis
20.	Can you expand that a little bit?	Analysis
21.	Do we need a lot of people in order to make a good market for products?	Analysis
22.	What condition in the Great Lakes-St. Lawrence Lowlands is good for transportation?	Interpretation
23.	Can you explain a little bit more . . . ?	Interpretation
24.	Is there anything else (using Toronto again as a base)?	Interpretation
25.	Anything else that you notice, Steve, that would be good for transportation in southern Ontario?	Interpretation
26.	What can you tell me from your experience about power in Ontario?	Memory
27.	Which two cities would be the most favorably located with respect to all these factors that we've talked about?	Analysis
28.	Which cities would have skilled workers, raw materials, market, transportation, and access to cheap power? Which two cities would have the best?	Analysis
29.	What would you say?	Analysis
30.	Why did you say Niagara Falls?	Analysis
31.	What factors affect the price of a manufactured article?	Synthesis
32.	If you were buying something that was manufactured, what factors would influence what it would cost you?	Analysis
33.	What about some of these other factors-would they influence cost?	Application
34.	Can you give me a reason why Kingston would not be the best place to locate a new industry?	Analysis
35.	What would it cost to ship goods from Kingston to Toronto and from Kingston to Montreal?	Memory
36.	Which is how much?	Memory
37.	How much does it cost you to ship from Toronto to Montreal?	Memory

APPENDIX 8

WRITTEN TRANSCRIPT OF MODEL THREE (CONTROL GROUP) QUESTIONS AND THEIR CLASSIFICATION ACCORDING TO THE SANDERS QUESTION CLASSIFICATION SYSTEM

APPENDIX 8

WRITTEN TRANSCRIPT OF MODEL THREE (CONTROL GROUP) QUESTIONS AND THEIR CLASSIFICATION ACCORDING TO THE SANDERS QUESTION CLASSIFICATION SYSTEM

Questions

1. What were the three factors that led then to the growth of Greece during the time of Pericles? Memory

APPENDIX 9

POST-TEST QUESTION FREQUENCIES AND THEIR CLASSIFICATION FOR EXPERIMENTAL GROUPS I, II, III, IV, AND CONTROL GROUP (V)

Table X.-

Post-Test Question Frequencies and Their Classification for Experimental Group I.

Trainees	Post-Test Question Categories 1	2	3	4	5	6	7	Total
48CB	25	0	0	0	0	0	0	25
8CB	15	0	1	5	1	4	0	26
19EB	19	3	1	5	0	0	0	28
41HB	19	2	0	1	6	0	1	29
33KB	18	1	5	0	9	0	0	33
56McB	10	0	2	18	1	0	0	31
49MB	6	0	9	0	0	0	0	15
1MB	9	2	5	0	1	0	0	17
6MB	5	1	5	5	1	4	0	21
9MB	6	1	3	6	2	1	0	19
20MB	15	2	1	0	3	0	0	21
55PB	5	0	4	4	6	0	0	19
Total	152	12	36	44	30	9	1	284

Table XI.-

Post-Test Question Frequencies and Their Classification for Experimental Group II.

Trainees	Post-Test Question Categories 1	2	3	4	5	6	7	Total
44AB	22	0	0	5	5	0	0	32
58BB	31	2	1	0	3	0	0	37
50BB	12	1	0	2	4	0	0	19
20KB	17	0	1	6	3	0	0	27
28LB	18	0	0	1	4	2	0	25
39McB	7	0	1	5	4	2	0	19
32MB	12	0	1	0	2	0	0	15
10MB	13	2	2	0	3	0	0	20
21NB	11	0	3	2	2	0	0	18
17OB	8	0	3	6	2	3	0	22
34PB	5	0	1	0	10	1	0	17
51RB	16	0	7	1	5	0	1	30
Total	172	5	20	28	47	8	1	281

Table XII.-

Post-Test Question Frequencies and Their Classification for Experimental Group III.

Trainees	Post-Test Question Categories 1	2	3	4	5	6	7	Total
29CB	19	0	4	1	0	4	0	28
40EB	19	1	0	9	4	0	0	33
11LB	22	3	2	0	1	0	0	28
7MB	0	0	5	0	2	0	0	7
160B	10	2	6	3	1	0	0	22
220B	14	0	3	0	0	0	0	17
570B	6	0	6	0	6	1	2	21
23SB	5	0	0	16	3	0	0	24
2SB	3	2	8	5	0	1	0	19
46VB	5	0	0	14	0	0	0	19
12VB	2	3	3	3	8	0	0	19
24WB	23	0	0	7	0	0	0	30
Total	128	11	37	58	25	6	2	267

Table XIII.-

Post-Test Question Frequencies and Their Classification for Experimental Group IV.

Trainees	Post-Test Question Categories 1	2	3	4	5	6	7	Total
36BB	9	0	6	4	2	0	0	21
52DB	5	0	2	11	3	0	5	26
3FB	25	0	2	2	1	0	2	32
13HB	15	0	2	1	8	0	0	26
25JB	9	0	0	0	12	2	0	23
35JB	13	0	1	2	4	0	1	21
53KB	11	0	1	1	1	0	0	14
5MB	11	0	5	3	1	0	0	20
38MB	14	16	1	1	1	0	0	33
14SB	2	0	3	12	2	1	0	20
26SB	13	0	0	0	0	0	0	13
47WB	16	0	1	0	4	0	0	21
Total	143	16	24	37	39	3	8	270

Table XIV.-

Post-Test Question Frequencies and Their Classification for (Control) Group V.

Trainees	Post-Test Question Categories 1	2	3	4	5	6	7	Total
45BB	15	1	3	0	0	0	0	19
30CB	9	0	4	0	3	0	0	16
42DB	12	0	2	1	1	0	0	16
37FB	11	7	1	0	0	0	0	19
54GB	18	0	3	6	0	0	0	27
4MB	2	0	2	6	2	2	4	18
15MB	18	0	1	15	0	0	0	34
59MB	4	0	0	12	2	0	0	18
18SB	8	13	9	4	3	0	0	37
31SB	26	0	4	0	0	0	0	30
43VB	5	2	6	1	2	0	0	16
27WB	9	0	0	0	11	0	3	23
Total	137	23	35	45	24	2	7	273

APPENDIX 10

TOTAL NUMBER OF FREQUENCIES AND PERCENTAGES OF ALL QUESTIONS FOR POST-TEST BY GROUP

Table XV.-

Total Number of Frequencies and Percentages of All Questions for Post-Test by Group.

Group	Post-Test Questions						
	Lower-Order		Others		Higher-Order		Total
	f	%	f	%	f	%	f
I	164	58	80	28	40	14	284
II	177	63	48	17	56	20	281
III	139	52	95	36	33	12	267
IV	159	59	61	22	50	19	270
V	160	59	80	29	33	12	273
Total	799	58	364	26	212	16	1375

APPENDIX 11

NUMBER OF TRAINEE QUESTIONS IN EACH CATEGORY OVER ALL GROUPS FOR POST-TEST

Table XVI.-

Number of Trainee Questions in Each Category Over All Groups in Post-Test.

	Group	Question Category: Memory	Translation	Interpretation	Application	Analysis	Synthesis	Evaluation	Total
No. of Questions	I	152	12	36	44	30	9	1	284
	II	172	5	20	28	47	8	1	281
	III	128	11	37	58	25	6	2	267
	IV	143	16	24	37	39	3	8	270
	V	137	23	35	45	24	2	7	273
Total No. of Questions		732	67	152	212	165	28	19	1375
		799				212			
% of Total Questions		53	5	11	15	12	2	2	100

APPENDIX 12

ABSTRACT OF

Adaptations of Modeling Procedures and Their Effect on the Development of Higher-Order Questioning Behavior in an Elementary Teacher-Education Program

APPENDIX 12

ABSTRACT OF

Adaptations of Modeling Procedures and Their Effect on the Development of Higher-Order Questioning Behavior in an Elementary Teacher-Education Program[1]

The purpose of this study was to investigate the effectiveness of pre-service clinical experience in the development of questioning ability in teachers' college trainees. More specifically, the experiment attempted to answer the question: Can the higher-order questioning behavior of selected trainees in the elementary-education program at Ottawa Teachers College be changed as a result of exposure to varying modeling procedures employed in a microteaching program?

Principles of observational learning guided the utilization of combinations of teaching techniques using written cueing procedures and variations in modeling presentations. Higher-order questioning behavior was chosen as the teaching skill because empirical evidence disclosed that teacher questioning practices, in general, were of a low cognitive level, designed to elicit recognition and recall of factual information.

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1 Patrick Babin, doctoral thesis presented to the Faculty of Education of the University of Ottawa, Ontario, July 1971, x-131 p.

The hypotheses were:

H_1 Trainees exposed to cued modeling procedures (written) will show a significantly higher incidence of higher-order questioning behavior than will trainees who receive noncued modeling procedures.

H_2 Trainees exposed to multiple modeling procedures will show a significantly higher incidence of higher-order questioning behavior than will trainees who receive repeated modeling procedures.

H_3 Trainees receiving the treatment combination in which cued modeling procedures (written) are applied with repeated models will show a significantly higher incidence of higher-order questioning than will trainees who receive no cueing in a repeated modeling procedure.

H_4 Trainees receiving the treatment combination in which cued modeling procedures (written) as applied with multiple models will show a significantly higher incidence of higher-order questioning than will trainees who receive no cueing in a multiple modeling procedure.

H_5 Trainees receiving the treatment combination in which cued modeling procedures (written) as applied with multiple models will show a significantly higher incidence of higher-order questioning than will trainees who receive repeated noncued modeling procedures.

H_6 Trainees exposed to a multiple noncued modeling procedure will show a significantly higher incidence of higher-order questioning behavior than will trainees who receive repeated noncued modeling procedures.

H_7 Trainees exposed to a repeated noncued modeling procedure in which the criterion behavior, higher-order questioning, is absent will show the lowest incidence of higher-order questioning behavior.

The sixty subjects, randomly chosen from the student body at Ottawa Teachers College, were randomly assigned to four treatment groups and a control group. The instrument used to evaluate trainee questions was the Sanders' Question Classification System.

One-factor analysis of variance for repeated measures was used to assess the amount of agreement achieved by the group of four independently working judges who evaluated trainee questioning. Data were analyzed using a test for significant differences between proportions.

The following conclusions were drawn from the results:

1. Written cueing procedures when applied to modeling were clearly more effective in producing higher-order questioning than noncued modeling treatments.

2. The use of multiple modeling as opposed to repeated modeling did not significantly change the use of the criterion behavior but multiple modeling appeared to improve the cueing effect.

Recommendations for further research included:

1. Replicative studies in which certain variables would be modified; namely, (a) time, (b) constant lesson topic, (c) appropriate occurrence of the teaching skill as opposed to frequency of skill, (d) sex differences between models and trainees, (e) positive modeling as opposed to negative modeling, and (f) further examination of types of modeling.

2. Development of more adequate question classification systems. Effective types of questions should be investigated along with question sequencing.