R E P O R T R E S U M E S

ED 013 228 SP 000 874

CLINICAL RESEARCH--A TWO-WAY STREET BETWEEN RESEARCH AND PRACTICE.

BY- COOKINGHAM, FRANK WARD, TED W.
MICHIGAN ST. UNIV., EAST LANSING,COLL. OF EDUC.

REPORT NUMBER 52 PUB DATE 28 JUN 67
EDRS PRICE MF-$0.25 HC-$0.68 17P.

DESCRIPTORS- BIBLIOGRAPHIES, CLASSROOM ENVIRONMENT, *EDUCATIONAL RESEARCH, *FIELD STUDIES, OBSERVATION, *RESEARCH, *RESEARCHERS, RESEARCH TOOLS, *TEACHERS, TEACHING MODELS, FOCUSED OBSERVATION FORM,

A CASE IS MADE FOR CLINICAL RESEARCH AS A 2-WAY STREET BETWEEN EDUCATIONAL RESEARCH AND PRACTICE. EDUCATIONAL RESEARCH IS DEFINED AS "THE DEVELOPMENT OF APPROPRIATE TECHNIQUES FOR THE MANAGEMENT OF THE LEARNING PROCESS IN AN EDUCATIONAL SETTING," THUS QUESTIONING THE RELEVANCY OF "BASIC" VS. "APPLIED" THEORIES. CLINICAL RESEARCH STUDIES CONSIST OF 3 STAGES--(1) EXPLORATORY OBSERVATION (A FOCUSED OBSERVATION FORM IS USED BY PRACTITIONER A TO SUMMARIZE SITUATION, TEACHER ACT, AND CONSEQUENCES OF PRACTITIONER B, WITH A ASKING B TO VERIFY THE SUMMARY); (2) REFLECTIVE OBSERVATION (A ASKS B WHY HE PERFORMED THE TEACHER ACT AND IF IT ILLUSTRATES HIS TEACHING BELIEF, STAGE 1 RESULTS ARE REVIEWED BY PEOPLE FAMILIAR WITH TEACHING ENVIRONMENT AND RESEARCH LITERATURE AND HYPOTHESES ARE MADE), (3) VERIFICATION (BRINGING TOGETHER OF EXPLORATORY AND REFLECTIVE VERIFICATIONS). COMPARISON OF CLINICAL RESEARCH TECHNIQUES WITH THOSE USED IN OTHER TYPES OF RESEARCH SHOW THE FOLLOWING CLINICAL RESEARCH OUTCOMES--(1) PRACTITIONERS ARE TRAINED TO SYSTEMATICALLY OBSERVE THEIR EVERYDAY ENVIRONMENT AND TO ACT IN ACCORDANCE, (2) RELATIONS BETWEEN PARTICULAR PRACTITIONER BEHAVIORS AND RELEVANT RESEARCH FINDINGS ARE MADE EXPLICIT TO SERVE AS FOCAL POINTS FOR MORE RELEVANT RESEARCH AND EFFECTIVE PRACTICE, (3) AN EASILY REVISABLE MODEL OF TEACHING IN A PARTICULAR SCHOOL SYSTEM IS PRODUCED FOR USE IN PRE- AND IN-SERVICE TRAINING. (AF)

Learning Systems Institute

CLINICAL RESEARCH: A TWO-WAY STREET BETWEEN RESEARCH AND PRACTICE*

Frank Cookingham
Ted W. Ward

Papers of the Institute #52

COLLEGE OF EDUCATION / MICHIGAN STATE UNIVERSITY / EAST LANSING, MICHIGAN

Frank Cookingham
Ted W. Ward
LEARNING SYSTEMS INSTITUTE
College of Education
Michigan State University

June 28, 1967

CLINICAL RESEARCH: A TWO-WAY STREET BETWEEN RESEARCH AND PRACTICE*

Frank Cookingham
Ted W. Ward

Papers of the Institute #52

*The main points of this paper were included in a paper presented at the Annual Meeting of the American Educational Research Association in New York City, February 16-18, 1967.

In another paper, a two-dimensional classification scheme for educational research activities was proposed to clarify relationships among researcher and practitioner activities. (Cookingham, 1967) The scheme is based on the premise that statements representing all outcomes of research activities can be placed into three categories: exploratory observation statements, which accurately represent some phenomena of interest; reflective observation statements, which are inferences (hypotheses) drawn from exploratory observation statements; and verification observation statements, which are produced to test the utility of reflective observation statements. The second dimension of the scheme reclassifies these statements according to who produces them: participating or nonparticipating researchers, and participating or nonparticipating practitioners. A specific type of educational research is represented by a subset of the twelve possible statement classifications. (See Figure 1.)

FIGURE 1. A Classification Scheme for Types of Educational Research

PRODUCER OF STATEMENTS	TYPE OF OBSERVATION STATEMENTS		
	exploratory	reflective	verification
participating researcher	x_1	y_1	z_1
nonparticipating researcher	x_2	y_2	z_2
participating practitioner	x_3	y_3	z_3
nonparticipating practitioner	x_4	y_4	z_4

The purpose of this paper is to discuss the so-called gap between educational research and practice in terms of this classification scheme. It is suggested that while two-way routes between research and practice are what is needed in education, most proposals for "bridging the gap" focus on one-way routes from research to practice. A series of activities called "clinical research" is discussed as an example of a two-way street between educational research and practice.

THE MISLEADING DISTINCTION BETWEEN BASIC AND APPLIED EDUCATIONAL RESEARCH

Within discussions of educational research, the distinction is often made between "basic" or "pure" or "fundamental" research and "applied" or "field" research. One common criterion used for making this distinction is the overall purpose of the research activity. The purpose of basic research is said to be the discovery of basic truths or principles which can be added to some organized body of scientific knowledge, regardless of whether those truths or principles can be used to solve an immediate practical problem. Applied research, on the other hand, is undertaken for the purpose of establishing relationships which can be used to solve an immediate practical problem, regardless of whether any new scientific information is produced. (Borg, 1963, pp. 16-20; Travers, 1964, pp. 4-5; Vallance and Crawford, 1962, pp. 497-499) Similarly, it has been said by Lazarsfeld and Sieber (1964, p. 23) that the goal of basic research is to <u>understand</u> educational processes, while the goal of applied research is to <u>improve</u> educational processes.

One major disadvantage in using this criterion of overall purpose to differentiate types of educational research is that emphasis placed on a diversity of research purposes tends to obscure the common goal of understanding educational phenomena so that desirable ends can be defined and achieved. One of the most serious criticisms of education as a discipline which is raised by those within and outside the field is that there is no comprehensive, integrated educational theory. It is doubtful that such theory will be constructed and become influential in practice as long as those within the field divide themselves according to the overall purpose of their professional activities.

The particular distinction made between the purposes of basic and applied research is also disadvantageous on semantic grounds. Certainly, an aim of applied research is to add information to some organized body of knowledge which can be used to make decisions leading to desirable actions in a particular environment. Likewise, an aim of basic research is to solve some immediate problem for the investigator, since the information he obtains will be used to make some decision about how to behave in a certain environment (e.g., what experiment to conduct next in his laboratory). Since both applied

and basic researchers seek to add useful information to some body of knowledge, and since both are concerned with solving immediate problems in some specific environment, it is difficult to justify using these criteria to distinguish between the two.

It is also difficult to maintain this distinction from a psychological point of view. Applied researchers view their work as "basic" in the sense that they believe it is important both for advancing knowledge and for improving practice. Basic researchers view their work as "applicable," since further development of their findings by themselves or others often leads to more advanced knowledge and improved practice. (Gilbert, 1962, p. 568)

Borg (1963, pp. 16-21) has suggested that the two types of research can be differentiated according to the precision of results obtained and the amount of control exerted by the researcher over the environment. In basic research great emphasis is placed upon the researcher-controlled environment, which is usually a laboratory containing selected subjects about whom much is known concerning heredity and behavioral history. It is often pointed out, however, that since there is very little similarity between the research situation in a laboratory setting and the related situation in a public school setting, serious questions must be raised concerning the degree to which the laboratory findings will be applicable in the school setting. As Page (1962) aptly said, often the bridge between the two settings consists of nothing more than "verbal magic," by which a verbal expression used to denote part of the laboratory situation is used to denote part of the field situation. The validity of this mode of inference is logically questionable, and experience in educational settings suggests that it is also empirically questionable.

Sometimes basic research is described as research which takes place in an artificial environment, while applied research is described as research which takes place in the "real" world. Of course, the laboratory setting is just as much a part of the "real" world as the field setting, since in both settings it is presumed that natural laws are operating and that phenomena are experienced. Neither of the two settings is more <u>real</u> than the other, but since more people spend more time in the field than in the laboratory, the field setting is more <u>realistic</u> than the laboratory setting. From a political point of view this point becomes a crucial one, for it is not known how the

"simple" or "elemental" laws of behavior discovered in the controlled laboratory environment will interact or combine in the relatively uncontrolled field environment. Indeed, the assumption that the laws of behavior operating in the field environment are combinations of the elemental laws operating in the laboratory environment is often challenged on the grounds that the field environment contains potent variables not found in the laboratory environment. Thus, the most rational decisions (i.e., those decisions based on the greatest amount of known information) can only be made when they affect very few people for very short spans of time in very few settings (i.e., selected subjects in controlled experiments).

Educational researchers often talk about the two-horned dilemma of having to give up precision of results to achieve applicability of results, or to give up applicability of results to achieve precision of results. Since it hardly seems reasonable to use precise nonapplicable findings in educational decision-making, the dilemma is at best a short-horned one. Of course, shearing off one of the horns of the dilemma in no way mitigates the problem of producing precise applicable findings.

Such considerations raise the question as to whether there can be any "basic" educational research, where basic research is defined as controlled environment research. After all, most educators and behavioral scientists do not foresee American education moving towards controlled environments such as described by Skinner in Walden Two. Strictly speaking, educational research must be "applied research," since educational phenomena are field phenomena rather than laboratory phenomena. Melton (1959) has pointed out that psychologists interested in laws of learning are building a science of learning while educators must be concerned with developing a technology of education. Educators must know how to manage the learning process in a social and politica system to achieve specified modifications of cognitive behaviors (and certain noncognitive behaviors), while learning theorists seek to explain and predict all forms of relatively permanent modifications of behavior resulting from experience. Educational research does not involve the direct application of the science of learning; it is the development of appropriate techniques for the management of the learning process in an educational setting.

Another way of distinguishing between applied and basic research is to say that basic research is concerned with theory testing while applied research is concerned with getting things done. However, all actions performed in the field are based on some implicit theory of behavior, and in a general sense, constitute non-explicit theory testing. ("If I perform antecedent action A, then consequence C should follow. I just performed A, and C did or did not follow.") The basic researcher works to make his theories explicit so that they can be modified when necessary. The applied researcher should strive towards the same end, since the primary objective in educational research is to produce a body of knowledge which allows prediction of behavior in educational situations.

All of these considerations suggest that there are no apparent professional advantages of making the "basic-applied" distinction. Perhaps it relieves some obscure anxiety in those who feel a professional responsibility to be interested in all aspects of the field, but who have some vested interest in a narrower set of goals associated with one or the other of the two types of activity. ("Even though I'm not tackling any given immediate problem within existing practice, I'm tackling a problem which is very important for the advancement of knowledge in this field of study." Or, "I don't have time to try and understand academic theories; I'm too busy tackling an immediate practical problem that must be solved.") Perhaps it establishes an order of professional prestige within the field which permits some educational researchers to remain on speaking terms with colleagues outside the field. Perhaps it is intended to help establish a schedule of priorities for financial support. (Such a schedule, however, presupposes that some sort of risk function and loss function can be specified, and it is not at all clear how this is to be done in terms of the basic-applied distinction.)

Whatever the supporting reasons, the distinction is a misleading one to make for those attempting to understand educational research activities. It does not describe useful differences among research activities, and perhaps it even solidifies irrelevant and confusing sociological differences among educational researchers. (Gilbert, 1962, pp. 560-562; Lazarsfeld and Sieber, 1964)

CLINICAL RESEARCH

Several attempts have been made to portray the developmental and implementation activities required for the improvement of educational practice. For example, Campbell (1962) suggested that there are four stages in the process of implementing research findings in the classroom: basic studies, field testing and demonstrations, information dissemination and promotion, and application to practice. Hilgard (1964) suggested a slightly more elaborate but similar model for the implementation of principles of learning theory in the classroom. Campbell's stage of basic studies is subdivided by Hilgard into three parts: research on learning with no regard for its educational relevance, research on learning which is not concerned with educational practices but which deals with human subjects and processes which have an analog in classroom learning, and research on learning using school materials and school-age children but which does not attempt to adapt the learning to school practices.* Campbell's stage of field testing and demonstration is subdivided into two parts by Hilgard: exploratory or "feasibility" research conducted in a special educational setting, and tryout in a "normal" classroom. Campbell's two stages of promotion and application are treated as a single category by Hilgard.

Gilbert (1962) has proposed a five-stage model based on research structures in industry which is very similar to Hilgard's model. The stages described by Gilbert include: exploratory (theoretical) research, where scientific methodologies and concepts are explored and reexamined primarily to provide experience with certain phenomena for the investigator; fundamental development, where many variables potentially relevant to principles and procedures discovered in exploratory research are deliberately and systematically investigated in the laboratory; specific development, where a "mock-up" of a specific product is developed and intensely investigated; design of a consumable product, and demonstration of that product's effectiveness under exacting field conditions; and training and follow-through.

---

*Hilgard's three categories of "pure" research are discussed in terms of research on learning, while Campbell's stage of "basic" studies includes other types of research which may have educational relevance. For purposes of this paper, Hilgard's model can be extended to these other types of research.

These models have one major characteristic in common--they all define at least one intermediate stage between the stages of research and application. A discussion of such intermediary stages appeared in the Sixth Symposium on Educational Research sponsored by Phi Delta Kappa (1965, pp. 185-189). In this discussion there was a need expressed for a person who might be called a "creative engineer," who is familiar both with educational settings and with research technology and findings. Such a person must be capable of comfortably and competently traveling back and forth between educational practice and educational research, drawing productive implications for each from the other. The important point to note is that this person travels in round trips between practice and research, not just the usually discussed one-way route from research to practice. A similar concern for the round trip between research and practice in education led to the development of a set of research activities which have come to be known as "clinical research" in the School of Teacher Education at Michigan State University.

The clinical research studies arose from a curiosity about whether teacher behaviors were influenced more by rational decision-making based on hunches or by present environmental reinforcement contingencies and past conditioning. It was assumed that teacher educators should know whatever rational processes and data were being used in the course of making the moment-by-moment decisions required of practitioner behavior. A feasibility study was begun in 1964 to develop a procedure capable of documenting teachers' hunches and their relation to actual teacher behaviors by the MSU Learning Systems Institute. (Cf. Henderson and Ward, 1966; Ward and Henderson, 1966)

An observation form was developed to be used by practitioner Smith for recording a brief summary statement that describes a specific teacher act performed by practitioner Jones, the situation which culminated in that act, and the immediate consequences of that act. Soon after the incident has been recorded, Smith asks Jones to verify the description. Jones may add statements to the description which he believes are important for understanding his action. A series of these practitioner-produced records of observed practitioner behaviors, accumulated on the basis of some appropriate sampling scheme, represent the exploratory observation stage of a clinical study.

In the reflective observation stage of a clinical study two sets of statements are obtained. First, during the post-incident interview the observer practitioner Smith asks the observed practitioner Jones why he performed the particular teacher act described, and whether the record of the episode illustrates something specific Jones believes about teaching. These practitioner-produced statements are presumed to be the outcome of reflective observation by Jones in the situation (since this can only be determined in retrospect, it's actually reflection upon reflection) or of retrospective reflection on the situation (which occurs during the interview). These statements constitute a set of practitioner-produced hypotheses.

Second, the exploratory observation statements are reviewed by persons familiar with the teaching environment and who have knowledge and understanding of the relevant research literature (i.e. "creative engineers"). These researchers produce hypothesis statements based on their teaching and research experience or based on hypothesis statements produced by other reseachers.

In the verification stage of clinical study two sets of statements are obtained. First, observer recorded statements of the consequences of the instructional act constitute a set of practitioner-produced verification observation statements. These statements are verified during the post-incident interview when observer Smith asks observer Jones to state independently the consequences of his act. Second, the research-produced verification observation statements associated with the researcher-produced hypotheses provide a second set of relevant verification observation statements.

In terms of the classification relation R, clinical research as described here can be represented by the ordered triple $[(x_3), (y_1, y_2, y_3), (z_2, z_3)]$. (See Figure 1.) Comparison of this ordered triple with several ordered triples representing other types of research suggests several important points.

(a) In clinical research the practitioner produces exploratory observation statements, while in experimental research the researcher produces the exploratory observation statements.* Those who have addressed themselves to the

---

*Experimental and correlational research are both represented by the ordere triple $[(x_1, x_2), (y_1, y_2), (z_1, z_2)]$. See Figure 1 above and the paper by Cookingham (1967) for clarification.

problem of research implementation in educational practice have noted that practitioners are quite suspicious of research findings because they feel they are not relevant to the practical setting. In the practitioner's opinion the exploratory observation statements produced by researchers describe artificial phenomena rather than natural phenomena.

One solution to this problem would be to begin with exploratory observation statements produced by pratitioners. Of course, researchers object to such a proposal, contending that practitioners don't know what to look for in their setting. The distinguishing feature of scientific observation is that it proceeds according to specified sets of rules and in general practitioners are unaware of the rules.

Clinical research is a setting in which the dilemma between relevant exploratory observation statements and scientifically fruitful exploratory observation statements can be resolved. The statements are relevant since they describe the practitioner's view of his own setting, and they become more fruitful as the practitioner becomes a more sensitive observer.

A major objective of clinical research is to help practitioners develop systematic procedures for observing their everyday environment more objectively. Through use of the Focused Observation Form practitioners can be trained to carefully diagnose a particular instructional situation to determine the essential components of that situation, to prescribe what should be done to achieve optimal learning in that situation, to carry out the prescribed treatment, and to evaluate the consequences of that particular treatment in that particular situation. Specific recorded observations become the focal point for discussions among observed and observing pratitioners, with emphasis placed on re-diagnosis,re-prescription of treatment, and re-evaluation in light of observed consequences.

Researcher-produced hypothesis and verification statements for particular recorded observations provide another opportunity for re-diagnosis, re-prescription of treatment, and re-evaluation. It should be noted that although the characterization of the Corey model of action research includes the subset

(x_3), the exploratory observation statements typically produced by practitioners participating in action research differ from those produced by practitioners participating in clinical research.* In action research the exploratory observation statements are produced in relation to some global research problem in comparison to the specific instructional acts emphasized in clinical research. Moreover, the statements are rarely explicitly recorded in terms of situation, act, and consequence, and even more rarely recorded on the basis of an appropriate sampling scheme. Many of the shortcomings of the Corey model of action research can be avoided in clinical research by placing emphasis on training practitioners to be more objective observers of their environment.

Although clinical research as defined here does not include direct exploratory observation of the practitioner's behavior in his environment by a researcher, there is no reason why such observation cannot occur. If researcher-produced exploratory observation statements were added to clinical research, the resulting research paradigm would closely resemble the Lewin model of action research.

(b) Correlational and experimental research (and the Lewin model of action research) differ from clinical research in that they lack practitioner produced hypotheses. In a field where researchers and practitioners are disarticulate there is difficulty in generating researchable hypotheses. As educational researchers establish closer linkage with practitioners a most significant value will be interaction concerning the generation of more relevant and potentially fruitful hypotheses. It is recognized that since

---

*The Corey model of action research is being distinguished from the Lewin model of action research. The basis for this distinction are discussed in another paper by Cookingham (1966a).

The Corey model of action research is represented by the ordered triple $[(x_3), (y_2, y_3), (z_3)]$, while the Lewin model of action research is represented by the ordered triple $[(x_1, x_3), (y_1, y_2), (z_1, z_3)]$.

See Figure 1 above and the paper by Cookingham (1967) for clarification.

scientific understanding is furthered by the use of formal theoretical systems which cannot be expressed in everyday language, educational theories must ultimately be expressed in some language other than the everyday language of the practitioner. On the other hand, since formal systems begin and end with everyday events it seems that more scientific understanding of educational phenomena would result if researchers attempted to build researchable hypotheses in theoretical terms from practitioner-produced hypotheses in everyday terms. It also seems that practical understanding would be facilitated if practitioners learned more aobut the difficulties involved in basing practice on their hypotheses expressed in everyday language terms.

Clinical research provides a setting in which interaction between researchers and practitioners can occur. Practitioner explanations of educational phenomena are made explicit and compared with researcher explanations, with the comparisons being made readily available to both researchers and practitioners. Thus it is possible to travel from practice to research as well as from research to practice.

In general this does not appear to be the case for most past or present experimental or correlational research activities.

At best the paradigm for the Corey model of action research includes hypotheses produced by nonparticipating researchers, but there is no opportunity for interaction between researchers and practitioners. If any route between research explanations and practical explanations exists at all in this paradigm, it is a one-way route from research to practice. Confromtation of explicit researcher-produced and practitioner-produced hypotheses is essential for suggesting more relevant research and more effective practice.

(c) Experimental and correlational research differ from clinical research also in that they lack practitioner-produced verification observation statements. This lack is believed by many to be a major factor inducing practitioner suspicion of research findings, and was a major influence in the development of the Corey model of action research. However, since practitioners often produce verification observation statements according to ill-defined sets of rules, their statements are not comparable with those produced by researchers. Moreover, in the Corey model of action research emphasis was placed on the usefulness of practitioner-produced statements, not on the comparison of those statements with researcher-produced statements.

A major aim of clinical research is to help practitioners produce better verification observation statements by providing a setting in which explicit pracititioner-produced and researcher-produced statements can be compared. (In this respect clinical research is similar to the Lewin model of action research.) These comparisons, along with the relevant exploratory observation statements and hypotheses, can be placed into a loose-leaf manual that can be rapidly revised and updated. A manual which includes a sampling of instructional acts from one school system is in essence a model of ongoing teaching practices that have been related to relevant research which can be used for pre-service and in-service practitioner training.

In summary, clinical studies have three primary outcomes. First, practitioners are trained to systematically observe their everyday environment and act in accord with their observations. Second, relations between particular practitioner behaviors and relevant research findings are made explicit to serve

as focal points for more relevant research and more effective practice. Third, an easily revisable model of teaching in a particular school system is produced for use in pre-service and in-service training. Comparison of clinical research and other types of educational research within a classification scheme based on types of observation statements and who produces them revealed some promising resolutions for some long-standing dilemmas.

REFERENCES

Bereiter, Carl. "Issues and Dilemmas in Developing Training Programs for Educational Researchers" Guba, Egon; Elam, Stanley (eds.). The Training and Nurture of Educational Researchers. Sixth Annual Phi Delta Kappa Symposium on Educational Research. Bloomington, Indiana: Phi Delta Kappa. 1965.

Borg, Walter R. Educational Research: An Introduction. New York: David McKay Company, Inc. 1963.

Campbell, Ronald F. "The Role of School Study Councils and Local School Districts in the Dissemination and Implementation of Educational Research" Dissemination and Implementation. Third Annual Phi Delta Kappa Symposium on Educational Research. Bloomington, Indiana: Phi Delta Kappa. 1962.

Cookingham, Frank. "Action Research Models of Practitioner Change." Papers of the Institute No. 19. Learning Systems Institute, Michigan State University. 1966. (a)

Cookingham, Frank. "Clinical Studies as a Part of Educational Practice." Papers of the Institute No. 38. Learning Systems Institute, Michigan State University. 1966. (b)

Cookingham, Frank. "A Classification Scheme for Research Activities in Education." Papers of the Institute No. 51. Learning Systems Institute, Michigan State University. 1967.

Findley, Warren G. "The Impact of Applied Problems on Educational Research." Banghart, Frank W. (ed.), First Annual Phi Delta Kappan Symposium on Educational Research. Bloomington, Indiana: Phi Delta Kappa, Inc. 1960.

Gilbert, Thomas F. "A Structure for a Coordinated Research and Development Laboratory." Glaser, Robert(ed), Training Research and Education. John Wiley and Sons, Inc. 1962.

Henderson, Judith E., and Ward, Ted W. "Teaching in the Inner City: Identification of Educational Practices of Competent Elementary Teachers of Culturally Disadvantaged Youth." Michigan State University. 1966.

Hilgard, Ernest R. "A Perspective on the Relationship Between Learning Theory and Educational Practices." Hilgard, Ernest R. (ed). Theories of Learning and Instruction. The Sixty-third Yearbook of the National Society for the Study of Education. Chicago: University of Chicago Press. 1964.

Lazarsfeld, Paul F. and Sieber, Sam D. Organizing Educational Research: An Exploration. Englewood Cliffs, New Jersey: Prentice-Hall, Inc. 1964.

Melton, Arthur W. "The Science of Learning and the Technology of Educational Methods." Harvard Educational Review. 29:96-106. 1959.

Page, Ellis Batten. "Behavioral Theory, Verbal Magic, and Education." Educational Theory. 12:73-78. 1962.

Skinner, B.F. Walden Two. New York: The Macmillan Company. 1948.

Travers, Robert M.W. An Introduction to Educational Research (Second Edition). New York: The Macmillan Company. 1964.

Vallance, Theodore R. and Crawford, Meredith P. "Identifying Training Needs and Translating Them into Research Requirements." Glaser, Robert (ed). Training Research and Education. New York: John Wiley and Sons, Inc. 1962.

Ward, Ted W. and Henderson, Judith E. "Guidelines for Building Teacher-Behavioral Research Instruments." Papers of the Institue No. 25. Learning Systems Institute, Michigan State University. 1966.

Webb, Wilse B. "Applied Research: Variations on a Theme." American Psychologist. 12:225-226. 1957.