

Research Series No. 27

CHARACTERISTICS
OF THE CLINICAL PROBLEM-SOLVING MODEL
AND ITS RELEVANCE TO EDUCATION

Arthur Elstein,
Lee Shulman, John Vinsonhaler,
Christian Wagner, and Lois Bader

Published By

The Institute for Research on Teaching
252 Erickson Hall
Michigan State University
East Lansing, Michigan 48824

October 1978

The work reported herein is sponsored by the Institute for Research on Teaching, College of Education, Michigan State University. The Institute for Research on Teaching is funded primarily by the Teaching Division of the National Institute of Education, United States Department of Health, Education, and Welfare. The opinions expressed in this publication do not necessarily reflect the position, policy, or endorsement of the National Institute of Education. (Contract No. 400-76-0073)

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Abstract

The clinical model is discussed and defined. It is problem-initiated and problem-directed. Therefore, it is well-suited to the study of reading clinicians. One purpose of IRT's research on reading as a clinical activity is to identify the extent to which the clinical model can be appropriately used to understand educational activities. The authors do not claim the model to be universal for all educational activity, but they believe it fits and helps them understand those educational programs directed at identifying and remedying learning deficiencies.

CHARACTERISTICS OF THE CLINICAL PROBLEM SOLVING MODEL
AND ITS RELEVANCE TO EDUCATIONAL RESEARCH¹

Arthur Elstein, Lee Shulman, John Vinsonhaler,
Christian Wagner, and Lois Bader²

Much of our knowledge of the properties of the clinical problem-solving model comes from studies of physicians and clinical psychologists. This may suggest that the clinical model is essentially a medical model, and reading clinicians might well wonder whether the model is appropriate for the study of their work with reading problems. Certainly questions about the appropriateness of the medical model have been the source of much debate and controversy in psychology, clinical psychology, and related fields. It may be useful, then, to begin by pointing out that we distinguish the clinical model from the medical model. To employ a medical model usually means either:

1. The work being described or at issue is done by physicians, or that it is appropriate that physicians closely supervise this work, or
2. The problem can be located within a single person.

¹This paper was presented at the annual meeting of the American Educational Research Association, New York, April 1977. It was formerly available as an IRT Collateral Paper.

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"Clinical," as we use it, has neither of these connotations. We are not suggesting that education in general, or that the field of reading in particular, be subordinated to medicine, although it may turn out that some reading problems have a neuropsychological basis. Nor are we suggesting that the problems of teaching and learning can be exclusively located inside a single learner or teacher, though again this may be the case at times.

As we hope will become clear, not all clinical tasks are done by persons usually identified as clinicians--physicians, dentists, nurses, and other health professionals. Clinical tasks instead partake of a common set of goals and processes, regardless of who is doing them. (To go back to the Latin root of our English word, a doctor is a teacher, not necessarily a physician.) The aim of this paper is to elucidate these features and to suggest that they apply also to reading diagnosis and remediation.

Nature of the Clinical Task

First of all, clinical practice is concerned with action directed toward a particular problem or set of problems. It is concerned with doing something, not with establishing norms or gaining theoretical knowledge of fundamental scientific principles. Clinicians are concerned with alleviating problems, not simply studying them. They recognize that norms and principles will be employed to understand important features of a problem, but the aim of clinical work is not to establish these norms or principles.

Second, clinicians are generally concerned with the problems of a particular individual, who may be identified as a patient, a client, or a student in difficulty. They are not ordinarily concerned with large-scale interventions directed at populations. While there is clearly a connection between large-scale interventions directed at major social problems (such as a possible epidemic of influenza or a high national rate of illiteracy) and work with troubled individuals or social units, the clinical phase begins at the point where a particular individual (or organization) seeking help comes into direct contact with a helping professional.

Third, because the clinical model is a practical one, we speak of people who do clinical work as "practicing." Clinical skills are learned by practicing under supervision, and a clinical internship or "practicum" takes the form of supervised contacts with patients, clients, or individuals with problems.

Finally, clinical problems are solved by collecting information and then combining this information into a conclusion. The method for combining information into a conclusion preferred by most clinicians is informal, intuitive, or qualitative. It is not formally stated or quantitative. Clinical practitioners describe clinical judgment as an artistic, intuitive, or qualitative process that is not easily or appropriately quantified. However, what the practitioner describes as intuitive or qualitative can often be represented by a more formal, rigorous approach. Much of the research on clinical judgment has been concerned with this question (Elstein, 1976).

Types of Clinical Model

Two major types of clinical model can be distinguished: diagnostic and therapeutic.

In the diagnostic mode, the state of the system or person is first determined. The nature of the problem or malfunction and its causes are identified. Then, insofar as is possible, a remedy suited to the problem is chosen. The remedy or therapy must take account of or build upon the capabilities within the troubled person or organization. In this mode, the clinical problem solver generally conceives of the selection of action as flowing as a logical necessity from the identification of the problem. Hence, major emphasis is on the proper characterization of the problem.

A model of medical inquiry that has been developed elsewhere (Elstein, Shulman, & Sprafka, 1978) describes the diagnostic mode. The inquiry model points out that diagnostic problems are solved by an iterative process of:

1. Cue acquisition -- the process of gathering and collecting data.
2. Hypothesis generation -- the process of generating alternative formulations of the problem.
3. Cue interpretation -- the process of interpreting the evidence collected in the light of these hypotheses.
4. Hypothesis evaluation or judgment -- the process of combining information to reach a diagnostic decision.
5. Treatment selection, easily flowing from stage four.

In the therapeutic mode, the state of the system is identified only to the point where an action can be taken. Confirmation of a suspected

problem follows from the treatment. For example, exploratory surgery is often necessary to determine whether abdominal pain is due to appendicitis or to some other cause. Diagnosis in these cases is made either by the action taken or by the response to treatment. The task of the clinician is to determine what action should be taken, not what the underlying state of the system is. In the language of decision analysis (Raiffa, 1968; Betaque & Gorry, 1971; Parker, 1976) the basic elements of this model are:

1. States of nature -- the different possible states that the system could be in.
2. Actions that are available to the decision maker -- controlled by his/her own choices.
3. Outcomes -- chance or non-controlled results of taking particular actions.
4. Probabilities -- estimates, either subjective or objective, of the likelihood that each listed state of nature does in fact exist, or that each outcome will occur, or of observing a particular sign or symptom in a particular state of nature.
5. Utilities -- assessments of the value of each possible outcome, carefully distinguished from the probability of its occurrence.

Two other clinical activities may be related to these modes. Briefly, screening is a diagnostic process directed at detecting a particular problem; it is carried out with a relatively small amount of data collection assembled in a focused routine. The contact with the client is brief unless the problem searched for is suspected, in which case a more extensive diagnostic routine is implemented. Follow-up is the process of observing whether anticipated outcomes have in fact occurred, assessing what changes in the state of nature are brought about by these new outcomes, and recycling the process of deciding about action based on this update.

Data collection in the diagnostic model is partly discretionary and partly routine. This flexibility is one of its strengths. With respect to cue acquisition, the clinician may choose to employ a standardized set of methods to collect information (e.g., administer a complete Stanford-Binet and a test of reading comprehension to all children referred) or to adjust data collection so as to illuminate particular problems that are either presented in the referral statement or are disclosed as the worker proceeds. In studies of medical diagnostic reasoning, it was found that physicians employ some combination of these two alternatives. A great deal of flexibility in collecting data is thus possible, varying from brief routine screening to intensive evaluation of a particular problem to searching exploration of an entire domain of function to a routine but thorough workup performed on all clients or patients.

Another feature of the clinical model's diagnostic version is the flexibility of solutions available. Diagnostic problems are solved by a process of generating and testing hypotheses. Some hypotheses are generated very early in the clinical encounter, using a very limited amount of data compared to what will eventually be collected. Often the referral statement or the first three minutes of conversation with a client are sufficient to establish a small set of working hypotheses. Of course, as the workup proceeds, some early hypotheses may be dropped and new ones formulated, but experienced clinicians are often able to formulate the probable solution to a diagnostic problem as one of these early hypotheses with a surprising degree of accuracy.

Clinical reasoning employs what philosophers of science call the "hypothetico-deductive" method. The clinician asks, "What findings would be observed if a particular hypothesis were true?" and proceeds to administer the tests or ask the questions needed to answer this question.

This diagnostic method provides a great deal of flexibility in the problem space that the clinician constructs to search for a solution, and thus in the data to be collected. The set of solutions entertained by the clinician is limited by the contents of long-term memory; clearly, clinicians cannot consider, even hypothetically, a condition they have never heard of or know nothing about. The capacity of working memory is also a limiting factor. Empirical studies of medical reasoning (Elstein et al., 1978) have shown that it is difficult to consider more than four or five hypotheses simultaneously. When that limit is reached, new candidates can be added only when old ones are dropped or (what amounts to the same thing) when an old hypothesis is reformulated into a new one. Subject only to these constraints, the clinician has great flexibility in selecting a set of four or five hypotheses out of the considerably larger number in long-term memory for evaluation in a particular problem.

The Clinical Model's Relevance to Education

What educationally-related activities can be fitted to the clinical model? Reading diagnosis and remediation activities fit beautifully, when these activities are conducted by properly qualified specialists. The reading specialist works with individual learners who have been referred

because of problems. The specialist's task is to identify and specify the nature of the problem and then to select an appropriate remedy. The individual one-on-one character of these interactions and the cycle of data collection -hypothesis generation -cue interpretation -hypothesis verification that reading clinicians execute exemplify the clinical model.

The clinical model, either in its diagnostic or therapeutic versions, implies that the process of clinical reasoning does not simply end with collecting data and constructing a list of what might be wrong with the patient. The reasoning is completed only when the data have been interpreted in the light of the alternatives to be considered and some judgment about either an action or diagnosis, or both, has been made. It may be true that a number of relatively untrained reading specialists cannot really employ the clinical model in its entirety because they lack the skills necessary to carry out the last two stages of the model. In our view, this does not invalidate the model. Rather, it points out deficiencies in the preparation of reading specialists that should be remedied by improved training programs.

It is sometimes alleged that reading specialists devote too much time to diagnosis while the proper treatments could be determined with briefer assessment. To the extent that this allegation is justified (though such a discussion is beyond the scope of this paper), it may be suggested that reading clinicians are working too much in the diagnostic mode and could usefully shift some of their energy to the therapeutic mode. This would primarily involve consideration of the alternative treatments available and the probable success of each under varying conditions. The specific conditions (diagnoses) need to

be established only to the degree of precision needed for treatment decisions to be made, and the focus of attention could then shift to those decisions (Shavelson, 1976).

Summary

In this discussion, we have pointed out that the clinical model is problem-initiated and problem-directed. That is why it is so well-suited to the study of reading clinicians. It is less clear that the activities of classroom teachers planning reading activities for a week or more fit this model. Ironically, the degree to which the model is suited for intervention in problems may make it less useful for prevention of problems or for dealing with non-problematic educational planning. Medicine, too, faces this dilemma as it moves from concern with disease to concern with health maintenance and prevention of disease. One purpose of the research on reading as a clinical activity conducted by the Institute for Research on Teaching is to identify the extent to which this model can be appropriately used to understand educational activities. We do not claim that it is a universal model for all educational activity, but we do believe that it fits and helps us to understand those educational programs directed at identifying and remedying learning deficiencies. That itself is a sufficient objective.

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