PRINCIPLES FOR FORMULATING AND EVALUATING
INSTRUCTIONAL CLAIMS

DISSERTATION

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By

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The problem with which this investigation is concerned is that of developing (a) the concept of instructional claim, and (b) credible principles for instructional claim formulation and evaluation. Resolution of the problem entailed resolution of the following subproblems:

A. Development and justification of the concept of instructional claim and associated concepts of instructional goal-state, instructional strategy, and instructional qualifying conditions.

B. Development and justification of a comprehensive set of principles for formulating instructional claims.

C. Development and justification of a comprehensive set of principles for evaluating instructional claims.

The concept of instructional claim and its associated concepts of instructional strategy, instructional goal-state, and instructional qualifying conditions were intended to (1) have a high degree of precision, (2) constitute a coherent fit to the previously developed curricular concepts, and (3) possess the potential for
contributing to the advancement of curricular and instructional practice. Development of instructional concepts was extended to include the concept of a system of instructional claims.

The concept of instructional claim was modeled on the notion of practical claim that is familiar in the practical sciences, but it was tailored to the unique features of teaching where teaching was viewed as a profession. The concepts of instructional claim and its associated concepts were framed to parallel the corresponding curricular concepts that had been developed in earlier work. In forming the new concepts, significant aspects of traditional usage of "curriculum" and "instruction" were preserved, but with increased precision, coherence, and testability.

Principles for adequate instructional-claim formation included the conditions of (1) empirical import, (2) internal coherence within both instructional strategy and goal-state components, and (3) connectedness between the strategy and goal-state components of an instructional claim and the means and ends components of a governing curricular claim. One function of these principles is to guide the construction of instructional claims. Another important function is to guide the evaluation of instructional claims already framed. In addition to the formation principles, principles were also developed for evaluating
instructional claims on the basis of observational evidence. Decision rules were developed for judging the factual validity of an instructional claim by using judgments as to the factual validity of its antecedent and consequent propositions. These decision rules are consistent with credible procedures for judging the factual validity of hypotheses in the empirical sciences.

An illustrative instructional claim was presented along with the assertion that it satisfied the principles of formation. Justification of the belief that the constructed instructional claim was an adequate instructional claim was provided.

Principles for forming an adequate instructional-claim system were framed to include intra-system relations and extra-system relations. For the purpose of illustration, an intricately connected system of instructional claims was constructed in such fashion as to satisfy the developed principles of formation.

The belief that these constructions are capable of contributing to the advancement of curricular and instructional research and practice is grounded in three major features. The first feature is that of increased precision of basic concepts and increased coherence among them. The second feature is the deliberate connecting of instructional strategies and goal-states and the connecting of instructional configurations with curricular configurations. The
third feature is the introduction of fundamental logical principles as evaluative criteria and the framing of instructional plans in such a way as to be subject to empirical tests under the principles of hypothesis testing that are considered credible in the empirical sciences.
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CHAPTER I

INTRODUCTION

Aim of the Study

The present investigation is conceptual in nature. Formation and evaluation of instructional strategies and goals and how different strategies and goals should be interconnected with each other constitute its primary foci. The problems of concern are viewed as language problems; their solutions take the form of logical constructions--e.g. the concept of instructional claim and its associated concepts of instructional goal-state, instructional strategy, and instructional qualifying conditions; and principles of instructional-claim formation and evaluation.

These concepts and principles are constructed in such a way as to be systemically related to each other and to previously formed curricular concepts as well. The aim is to construct a conceptual system of such quality as to offer a sound and promising route to advancement of instructional research and practice.

To achieve this aim, certain conditions must be met. First, the system of concepts and principles should be characterized by high degrees of precision and coherence.
Second, the conceptual system should make feasible the conduct of a wide range of logical tests in order to identify significant structural weaknesses. Third, instructional belief should be separated from the observational data upon which empirical validity of the belief is judged. Realization of these conditions makes possible publicly-verifiable judgments of logical validity and effectiveness (i.e. empirical validity) of instructional-belief systems.

A conceptual system constructed in such a manner as to satisfy the foregoing conditions has important implications for instructional researchers, developers, and practitioners. The latter would be concerned with instructional hypotheses which are distinctly different from the hypotheses of current interest. The curricular context would have to be taken into account in evaluating instructional hypotheses, and new methods of conducting empirical tests would become necessary (see Chapters III and IV for further clarification of these notions).

Educational developers utilizing the newly-formed concepts and principles could take a more comprehensive range of considerations into account in building instructional systems. Practicing teachers would have the conceptual bases for relating their instructional strategies* to

*"Instructional strategy" is discussed at greater length in Chapter II in the section entitled "Methodology of Formation and Evaluation of Instructional Means."
each other and connecting those strategies with curricular ends and means.

Scope and Limitations

The theorems of a practical field are formed and validated under two purposes: (1) for the purpose of representing existing structural or functional aspects of the field; and (2) for the purpose of representing relations between desired ends and the means for achieving those ends. The antecedent proposition includes procedural rules to guide the ways in which relevant agents act, and the consequent proposition includes representation of the state of affairs whose realization is desired.

In this study, theorems of the first kind are called descriptive theorems, while those of the second kind are called practical theorems. Practical theorems of instruction constitute the central concern of the present investigation and its major outcomes will consist of principles for forming and evaluating such theorems. In the literature of practical action, practical theorems often are called praxiological theorems or practical claims. The characteristic form of a practical claim is "If course of action A is taken, then goal-state S is likely to be attained."

A number of other conceptual frameworks have been developed in the instructional domain, each of which has its adherents. The conceptual framework to be constructed
during the course of this investigation will differ significantly from those already in use. The present investigation is concerned with the formation of practical claims of instruction, the formation of instructional-claim systems, the interrelationships between instructional-claim systems and an associated curricular claim, and the evaluation of instructional claims and instructional-claim systems. Evaluative methods include both logical and empirical (factual) aspects. It is significant to note that the conceptual frameworks in general use at present do not include this range of considerations. However, the question as to which of the various frameworks will prove more useful, and which will -- in the long run -- gain the greatest number of adherents, is an empirical question whose answer must be based upon future events.

Significance of the Study

From one perspective the problem is grounded in a coherent and rather comprehensive conceptual and value framework. The development, continuing explication and evaluation of this framework and its various abstract and concrete ramifications have occupied the research interests of the present investigator for the past eight years (McCray, 1972; McCray and Lottes, 1969, 1976a, 1976b; Lottes and McCray, 1975). The present study occupies a position analogous to that of a section of a complex
network of nodes and connecting links. The nodes of the section are concepts and principles of instruction, and these are interconnected by various logical relationships; the nodes and links of the "instructional" section are linked via chains of relationships to all the other interrelated nodes of the network.* Such interconnectedness is, in the developed disciplines and fields of practice, called "systematic import"** and is interpreted as significance.***

From a second perspective, examination of consequences of the curricular and instructional framework provides evidence of the investigation's importance. The precision of language of curriculum and instruction and the coherence among concepts make possible the conduct of instructional research and practice under the conditions that (a) the curricular context is clearly represented, and (b) instructional goals and strategies are deliberately connected with curricular ends and means.

Treating curricular and instructional planning as formation of practical claims of curriculum and practical claims of instruction results in (a) separation of curricular and instructional beliefs from the observational bases

*See the works cited previously in this section by the same author and Chapters III and IV for further explication of these interconnections.

**See Hempel (1966, pp. 94-97).

***See Brodbeck (1963, p. 56).
upon which one judges their factual validity; (b) extension of the range of tests used in judging logical and empirical validity of instructional beliefs; and (c) making relevant and useful the important methodology of concept formation and hypothesis testing in empirical science (e.g. Hempel, 1967; Carnap, 1936, 1937).

From a third perspective, the study is likely to contribute to the potential for greater validity of practical instructional procedures. Three features support this belief. First, practical instructional plans are framed in reference to a well-defined curricular structure. Second, the pupil-state is taken into account in instructional claim formation. Third, interrelationships among the various instructional strategies and goals are matters of deliberate construction. Although the question as to whether realization of these distinguishing features will result in increased effectiveness in instructional practice is a matter for empirical test, some reasons can be offered in support of the expectation of increased effectiveness.

First, instructional strategies and goals are, by deliberate design and justification, relevant to curricular goals and procedural rules. Consequently, each factually valid instructional strategy contributes to curricular goal attainment. Moreover, the inefficiency or ineffectiveness introduced by non-relevant or mutually incompatible instructional strategies and goals is eliminated. For example,
where the intended curricular end is "competence in critical thinking," instructional strategies that entail only jumping and climbing activity would obviously be non-relevant to pupil attainment of competence in critical thinking; inclusion of such strategies could contribute nothing to the effectiveness of the means and could only reduce their efficiency. Or, a frequently used strategy that provides pupils the opportunity of critical analysis of significant teacher and pupil statements would be incompatible with a frequently used strategy that prohibits, and punishes attempts at, pupil analysis of significant teacher and pupil statements; the effectiveness of one strategy is likely to be inversely related to the effectiveness of the other strategy.

Second, given means may lead to attainment of a particular end in one situation, but those same means may prove ineffective to attainment of that end in a different situation. For this reason, the range of validity of a practical claim is confined to a particular set of circumstances. In framing an instructional claim, pupil characteristics are included within the conditions of application.

Third, the critical search for interrelationships among the various instructional strategies and goals should ensure greater coherence between practical strategies and
goals. For example, the error resulting from the effects of one strategy counteracting the effects of another is more likely to be eliminated. At least equally important is the fact that the power of a coherent set of instructional strategies to produce certain desired outcomes is likely to be much greater than the power of disconnected strategies to produce the same outcome.

Statement of the Problem

The problem is to develop (a) the concept of instructional claim, and (b) credible principles for instructional claim formulation and evaluation.

Resolution of the foregoing problem entails the resolution of certain subproblems. Specific subproblems to be resolved include

A. Development and justification of the concept of instructional claim and associated concepts of instructional goal-state, instructional strategy, and instructional qualifying conditions;

B. Development and justification of a comprehensive set of principles for formulating instructional claims;

C. Development and justification of a comprehensive set of principles for evaluating instructional claims.
Procedures

The following outline of procedures indicates the approach followed in this study.*

A. A review of the current methods of forming and evaluating instructional goal-states, instructional strategies and instructional beliefs will be conducted.

B. The conceptual framework underlying the study will be examined with respect to the following: professional bases, curricular claim, and conditions of an adequate and desirable curricular claim.

C. The concepts of instructional claim, instructional strategy, instructional goal-state, and instructional qualifying conditions will be constructed in such fashion that (1) they have a high degree of precision, (2) they are coherently related to the language of curriculum, and (3) they have potential practical utility.

D. Conditions of an adequate instructional claim will be developed to include both logical and empirical conditions. Principles for judging the factual validity of instructional claims will be formulated.

E. An illustrative instructional claim which will satisfy all conditions of adequacy will be constructed.

*Deliberate lines of justification are set forth in support of all concepts and principles constructed within the context of these conceptual investigations.
F. The concept of a system of instructional claims will be constructed.

G. The conditions of an adequate instructional-claim system which will include intra-system relations and extra-system relations will be constructed.

H. An illustrative instructional-claim system which will satisfy all conditions of adequacy will be constructed.

I. The conceptual constructions will be examined for expected outcomes, for their implications for theoretical constructions, and for practical instructional and evaluation action.
CHAPTER II

REVIEW OF LITERATURE

Introduction

Decisions as to what data are relevant and what data are not relevant depend upon the conceptions of the investigator.* It should be recalled that the present problem and the perspectives of the investigator are grounded in a coherent and rather comprehensive conceptual and value framework identified in Chapter I and explicated more fully in Chapter III and its successor chapters.

Moreover, the present work is not an initial conceptual investigation; it is a conceptual investigation whose aim is to construct new concepts and principles in such a way as to fit previously constructed concepts and principles. Where newly introduced concepts and principles of instruction must constitute a coherent fit to an existing governing framework of some complexity, it is unlikely that non-deliberately constructed conceptual elements can be used. In analogous circumstances one does not expect to find that useful conceptual or concrete elements will be formed by some fortuitous happenstance.

*See Hempel (1966, pp. 11-13) and Kuhn (1970, pp. 15-17) for discussions of relevant data.
For example, the modern chemist is not likely to find concepts or propositions of the alchemists to prove useful to his theory building. Nor does a mathematician look outside his existing mathematical structure for new concepts or theorems to introduce as elements of that mathematical structure. Nor would a person be very likely to build unique foundations of a house and then begin to look around for an existing dwelling to move onto those foundations. The greater the complexity and interconnectedness of an existing framework, the less likely it is that non-deliberately formed elements will fit it.

For the foregoing reasons, the following review of literature was not conducted with the expectation of finding information that could be directly incorporated into the intended instructional constructions. The review of literature was conducted, instead, for the purpose of providing a check on the comprehensiveness of the range of considerations taken into account in constructing the instructional concepts and principles. The purpose was to avoid failure through omission to take potentially significant considerations into account in forming or justifying the constructions.

Subjects in the literature reviewed in this study include the concept of instruction, the nature of instructional theorems, instructional systems, methodology of
formation and evaluation of instructional ends and means, and instructional theory. These were included because they correspond in some way to the instructional aspects included in the statement of the problem.

The Concept of Instruction

The concept of instruction most frequently seems to denote a process which is conducted in reference to a "curriculum," particularly in the sense of implementing curriculum or curricular plans. For example, Merrill (1971, p. 1) points out that instruction and curriculum development are different in that instruction emphasizes the "how to" aspect while curriculum development emphasizes "what to."

Similarly, Maccia and Johnson define "instruction" within the context provided by their concepts of "curriculum." Maccia defines instruction as "influence toward rule-governed behavior" (1968, p. 4). Johnson (1967) sets forth this meaning of instruction:

Instruction consists of two sets of interaction. One is Dewey's "transaction" between the student and the environment manipulated by the teacher. . . . The second interaction is the interpersonal one between the teacher and students. (p. 134)

Johnson stipulates that "curriculum is a structured series of intended learning outcomes" (p. 130). He views curriculum as prescribing (or at least anticipating) the
results of instruction, but not as prescribing the means, i.e., the activities, materials, or even the instructional content to be used in achieving the results. Johnson states that "curriculum is concerned with ends. . . . In other words, curriculum indicates what is to be learned" (p. 130). He contends that curriculum has reference to what it is intended that students learn, not what it is intended that they do to learn it.

Corey and Lumsdaine view instruction in a manner similar to that of Johnson. For example, Lumsdaine (1963) says,

Instruction is used as a generic term referring to any specifiable means of controlling or manipulating a series of events to produce modifications of behavior through learning. It is applicable whenever the outcomes of learning can be specified in sufficiently explicit terms to permit their measurement. (p. 584)

Corey (1971) defines instruction as the "process whereby the environment of an individual is deliberately manipulated to enable him to learn to emit or engage in specified behaviors under specified conditions or as responses to specified situations" (p. 6). He views the process of instruction as starting with "givens," preferably stated as behaviors and consisting of sequenced instructional stimuli designed to achieve the desired behaviors. He states that

the planning of instruction as well as instruction itself are based upon the prediction that certain types of environmental manipulations will have certain effects upon the learner as manifested by his behavior. These predictions
or hypotheses can only be confirmed by observing whether or not the anticipated consequences of the instruction actually result from it. . . . In a very real sense, we believe, instruction is a series of experiments. (p. 9)

Lottes (1975) recently analyzed the concepts of curriculum and instruction and incorporated useful aspects of their meaning in a reconstructed language of curricular claims and instructional claims, and he explicated the relationships between the two. Lottes views "a curricular claim . . . as an hypothesis to which both teacher(s) and pupils subscribe, and under which both act" and "an instructional claim . . . as an hypothesis to which only the teacher subscribes, and under which only the teacher acts" (pp. 15-16). Both the curricular claims and instructional claims specify a relation between some course of action and attainment of an intended goal-state by an individual (pupil). Lottes and McCray (1975) later extended the concepts and developed principles of validation for curricular claims and instructional claims.

The study builds on these concepts of curricular claim and instructional claim. The structure and function of curricular claims and instructional claims are explicated in Chapters III and IV. Chapters V and VI contain various illustrations of the two types of claims and explicate the relationships between the two.
Instructional Theorems

The Nature of Praxiological Theorems

In "Praxiological Sentences and How They Are Proved," Kotarbinski (1962) sets forth the aim and ways of scientific inquiry in a field of practical action. The purpose of such study in a field of practical action is to develop practical directives, the theorems of the field, which specify relations between particular courses of action and their consequences in terms of achievement of specified ends in the most efficient way. The theorems assume the following form: "Under circumstances A it is necessary (or it is advisable, or it suffices) to do B in order to cause C" (p. 212). Because of the empirical nature of the theorems developed, the study of practical action is appropriately viewed as scientific, which is congruent with Kotarbinski's definition of 'praxiology' as the "science of efficient action" (p. 211).

Kotarbinski notes further that simple practical directives give rise to various compound directives, some of which are of particular interest to the praxiologist. Among these are comparative directives which lend themselves to the evaluation of effectiveness or efficiency of different methods of action. In fields of practical action, it is often useful to compare alternative courses of action in order to gain information for recommending a particular
mode of action. Kotarbinski represents the general formula of comparative directives in this way: "under given circumstances, C is achieved with a greater probability (or sooner, or with a smaller loss of certain values or properties) if course of action A is taken rather than course of action B" (p. 218).

The methodology of practical theorem formulation utilizes potentially relevant information from the theoretical foundations, technological base, and from practice (ways of selecting and ordering actions). The behavioral sciences constitute an important component of the theoretical foundations of relevance to fields of practical action; they provide generalizations about relationships among humans or between an individual and his environment. Theory of action, another significant aspect of the relevant theoretical foundations, provides information concerning the nature of human action, the logic of explanations and justifications of actions, and the relationship of these views to the nature of history and law. Of particular relevance is the work of Hempel (1965) and Popper (1962) who extended their model of analysis of explanation in science, particularly the physical sciences, to history and to human action in general.

The technological base includes the complex set of ways of doing things with human products and material
instruments. Among the technological developments of interest to the praxiologist are transportation systems, communication systems, systems engineering, and decision-making procedures. Kotarbinski notes that in practical directives, the appeal is to causal dependencies that are specific either to substances which do not exist in a natural state, or to instruments with a definite structure and functioning. He further states that "such substances and instruments are called the technical base of a practical directive" (p. 12).

The field of practice provides unique information of utility in formulating practical theorems. Different selection or different ordering of actions produces results with varying degrees of effectiveness or efficiency. By observing different selections or orderings of actions, it becomes possible to denote certain persevering tendencies of efficiency to increase or to decrease after making certain changes.

The Nature of Instructional Theorems

Instructional theorems constitute a particular type of praxiological theorem. In essence, praxiological theorems are of this form: Under certain conditions, if course of action A is taken, then goal S will (probably) be achieved. In the instructional realm, the course of action taken can be represented by a set of rules that specify the kinds of
action which are obligatory, permissible, or not permissible on the part of the teacher. Such a set of rules is often called an "instructional strategy" or "method of teaching." In an instructional theorem, the intended goal is some desired pupil-state. Representations of desired pupil-states are often called "instructional objectives" or "instructional goals." In a language which allows greater freedom of linguistic form, a representation of a desired pupil-state might be called "instructional goal-state" (see e.g., Merrill and Wood, 1974; Heimer, Lottes and Klein, 1971; and McCray and Lottes, 1976b). The latter representation of a desired pupil-state is used in this study and is described more fully in Chapter IV.

**Comparative Instructional Theorems**

In addition to the elementary instructional theorems whose general formula was displayed in the previous section, comparative theorems concerning the roles of two or more instructional strategies have an important function in instructional research and practice. These comparative theorems of instruction can be expressed in the general form: "Under circumstances C, strategy A is more effective than strategy B in reference to pupil-attainment of goal-state S."* Meaningful comparisons of two or more courses

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*This general form is intended to allow comparisons among more than two alternative courses of action.
of action can be conducted only when the courses of action are invoked under reasonably similar circumstances and in reference to a common goal-state.

Any comparative instructional theorem can be stated in terms of at least two elementary instructional theorems. These elementary instructional theorems assume the following form:

Under circumstances C, if strategy A is used, then the pupil will (probably) attain goal-state S with probability $P_A$.

Under circumstances C, if strategy B is used, then the pupil will (probably) attain goal-state S with probability $P_B$.

To complete the explication of the comparative theorem, a proposition that relates the probabilities also must be included:

$P_A$ is greater than $P_B$.*

This explication assumes that all instructional activity is conducted with the intent of influencing the pupil toward goal-state attainment. Under this assumption, a strategy (e.g. A or B) is invoked only in the presence of the belief that it is likely to be effective, hence the implicit claim: "If strategy A, or strategy B, is used, then the pupil will (probably) attain goal-state S." In the absence of such a

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*The probability of attainment of goal-state S given strategy Q is construed as the "effectiveness" of strategy Q in reference to goal-state S.
belief there is no justification for conducting a test of the comparative theorem. The test of a comparative theorem is always reducible to a comparison of information attainable through tests of two or more simple instructional theorems.

**Instructional Systems**

Some general definitions of "system" are listed as follows:

- A system . . . [is] any entity, conceptual or physical, which consists of interdependent parts. (Ackoff, 1961, pp. 27-28)

- A system is the structure or organization of an orderly whole, clearly showing the interrelationships of the parts to each other and to the whole itself. (Silvern, 1965, p. 367)

- A system is any group of parts or components working together as a functional unit. (Merrill, 1968, p. 5)

- A system is a set of parts dynamically interrelated. Dynamic interrelationship implies that the parts of the system have the capability to change not only the performance of the system as a whole but to affect the performance of one or more other parts of the system. (Montgomery, 1965, p. 366)

In examining applications of the concept of system to the instructional process, one finds differing views of what is to be included in an instructional system. For example, Merrill (1968) includes the learner, the environment, and the instruction as components of an instructional system. Inputs to the instructional system include learner traits, all instructional materials, objectives, and feedback.
Outputs from the system are knowledge of results, record of responses, and display to the learner. The processor controls the presentation and modifies the presentation of the display and/or knowledge of results on the basis of student response correspondence to the objectives.

Mannello (1972, p. 130) defines an instructional system as "the totality of all the interacting components of an educational program designed to achieve efficiently some clearly identified goal. The functioning of each part affects the entire apparatus as well as the performance of each of the other parts." The significant interacting components of the instructional system include: objectives, the learner, the teacher, the content, resources, teaching-learning methods, deployment, and evaluation.

Knirk and Gentry (1971) propose a schema for an instructional system which consists of six components: goal determination, analysis, prescription, implementation, evaluation and revision. These components are controlled by planned feedback.

Lysaught (1971) defines an instructional system as "a planned series of interrelated, interacting, precisely controlled learning experiences that are designed to meet enunciated learning objectives" (p. 624). Lysaught's instructional system consists of the following steps: the determination of training requirements; the design of a curriculum to encompass the requirements; the development
of an instructional strategy consisting of methods, media, facilities, and instructors to carry out the curriculum; the actual implementation of instruction; and the measurement or evaluation of the system's results.

Eraut (1967) applies the systems approach to the process of instructional design, primarily to the process of course development. He views a course as an instructional system with the following components: the learners, the instructors, the materials, the machines, and the technicians. Input is the learner's initial knowledge, and output is the learner's final knowledge. Eraut views the instructional system as being divided into several subsystems, each with its own defined input and output, so that decisions about media and teaching techniques can be made at the subsystem level.

Randall (1969) defines an instructional system as follows:

An instructional system is that part of the learner's environment which is purposely controlled by an instructional institution so as to secure by that learner the attainment of specified learning objectives. (p. 8)

Randall defines the components of an instructional system on the basis of such resource categories as the following: men, materials, machines, master facilities, and methods.

The ways of thinking about education, instruction, system, components of a system, and the purpose that the
system is to serve, determine, to some considerable degree, the form and function of the various models for instructional systems. It is also significant to note that the desire for increased efficiency has been a prime motivation in the formation of such models.

The concept of 'instructional system' seems to be used in at least two different ways. In a loose way "instructional system" seems to mean a set of procedures, or a model for planning, to be followed in planning and evaluating instructional activities (Lysaught, 1971; Knirk and Gentry, 1971). A more precise use of 'instructional system' seems to include the working parts and sometimes the interactions of plan realization (Merrill, 1971; Eraut, 1967; Randall, 1968; Mannello, 1972).

Instructional systems generally are designed toward efficient achievement of goals. One common concern, whatever the goal, is that it be represented in such a manner as to know what needs to be done to measure it. Another common concern is to develop procedures for evaluating goal attainment. Under the systems concept, it ordinarily is possible to have a highly efficient instructional system which is designed to attain trivial goals. This pitfall can be avoided, however, if the instructional system is considered to be a subsystem of the larger educational system. While there should be aspects of evaluation which
are concerned solely with the operations and functions of
the instructional system, there should be others which are
concerned with relationships between the instructional
system and the larger educational system. Although the
designers of instructional systems usually acknowledge that
the system is a part of a larger educational system, usually
principles of evaluation which are concerned with this
relationship are not taken into account. Evaluation prin-
ciples, generally, are concerned only with student
attainment of objectives.

Each of the models for instructional systems contains
aspects related to the determination of goals, the selection
of materials or methods, and provisions for evaluating
assertions about goal attainment by the pupil. Implicit
within each of the models is the assumption that the process
of instruction ought to be a rational enterprise. Conse-
quently, the design of an instructional system is based
upon the prediction that certain types of environmental
variations will have certain effects upon the learner.
This prediction or claim can be confirmed only by judging
whether or not the anticipated consequences correspond to
the observed consequences.

The concept of 'instructional system' is usually
construed in such a way that no clear distinction can be
made between curriculum and instruction. Components of an
instructional system usually contain aspects common to both curriculum and instruction. For example, Lysaught's instructional system includes the definition of goals as well as the design of curriculum, which are usually considered aspects of the curriculum process.

Methodology of Formation and Evaluation of Instructional Ends

Conceptions of instructional ends.--There exists considerable agreement on the desirability of forming the goals or objectives of instruction. However, this rational approach is not new to the field of education. The belief in the usefulness of precise educational objectives emerged at the beginning of the twentieth century with the birth of the scientific movement in education. In 1918 Franklin Bobbitt (1924), often thought of as the father of curriculum theory, approached curriculum development theoretically and demonstrated how curriculum components, especially educational objectives, were to be formulated.

The scientific movement was revived in the late forties and during the fifties by curriculum specialists who began to stress the importance of specific educational objectives and to lay down guidelines for their formulation. Tyler (1949) proposed a rationale for viewing, analyzing and interpreting the curriculum and instructional program of an educational institution. The Tyler rationale centers
around four fundamental questions which must be answered in developing any curriculum and plan of instruction. These are as follows.

1. What educational purposes should the school seek to attain?

2. What educational experiences can be provided that are likely to attain these purposes?

3. How can these educational experiences be effectively organized?

4. How can we determine whether these purposes are being attained? (1949, p. 1)

Tyler places great importance on the stating of objectives. He says, "The most useful form for stating objectives is to express them in terms which identify both the kind of behavior to be developed in the student and the content or area of life in which this behavior is to operate" (1949, p. 46).

Taba (1962) holds a view quite similar to that of Tyler. She made a clear distinction between two levels of objectives, namely general objectives and specific objectives. General objectives involve what she calls "school-wide outcomes," and more specific objectives describe the behaviors to be attained. These specific objectives guide the decisions that have to be made in regard to the curriculum, suggest what should be covered, what should be emphasized, what content should be selected and what learning experiences should be stressed. Taba
offers six recommendations for teachers concerned with writing objectives. They are as follows.

A statement of objectives should describe both the kind of behavior expected and the content or context to which that behavior applies.

Complex objectives need to be stated analytically and specifically enough so that there is no doubt as to the kind of behavior expected, or what the behavior applies to.

Objectives should also be so formulated that there are clear distinctions among learning experiences required to attain different behaviors.

Objectives are developmental, representing roads to travel rather than terminal points.

Objectives should be realistic and should include only what can be translated into curriculum and classroom experience.

The scope of objectives should be broad enough to encompass all types of outcomes for which the school is responsible. (1962, pp. 200-205)

In the past twenty years, considerable amounts of time and effort have been expended in developing the methodology for formulating educational objectives. A number of formats have been proposed for writing highly specific objectives and have gone under such names as 'behavioral objectives', 'instructional objectives', 'performance objectives', and 'competencies'. Some of these methods are described in the following section.

Mager (1962) identifies three components as being characteristics of a meaningful objective. They are:
First, identify the terminal behavior by name; you can specify the kind of behavior that will be accepted as evidence that the learner has achieved the objective.

Second, try to define the desired behavior further by describing the important conditions under which the behavior will be expected to occur.

Third, specify the criteria of acceptable performance by describing how well the learner must perform to be considered acceptable. (p. 12)

Mager points out that these three components are identified for the sake of guidance and that he does not intend to suggest that every objective must include all three. Mager contends that once an objective successfully communicates a teacher's intentions, there is no longer any point in including excess detail.

Gagne' defines a statement of an objective as "a verbal statement that communicates reliably to any individual . . . the set of circumstances that identifies a class of human performances" (1965, p. 326). Such statements of objectives are comprised of four basic components:

1. A verb denoting observable action,
2. A description of the class of stimuli being responded to,
3. A word or phrase denoting the object used for action by the performer, unless this is implied by the verb,
4. A description of the class of correct responses.

Gagne' contends that by defining objectives in this way one individual should be able to classify any human
performance in the same way that some other individual would. This makes it possible not only to observe the human performances to which the objective refers, but also to assess (or measure) the attainment of these objectives.

Plowman describes the characteristics of well-formulated behavioral objectives as follows:

First, they are stated in precise language and define the desired behavior clearly. Next, they establish proficiency levels for this behavior that are observable or measurable. In doing so, it may be either necessary or desirable to describe the behavior in some detail, using qualifying phrases or statements that describe conditions under which the terminal behavior will be observed, tested, or judged. Finally, behavioral objectives may also describe procedures for determining whether or not the student can perform at an established level of proficiency. (1971, p. 2)

Plowman goes on to list four specific steps which serve as a guideline for framing behavioral objectives. These steps are as follows:

1. Make a clear, precise determination of what it is you want the learner to do;

2. Establish both the limiting and facilitating conditions under which the learner is to do what is asked;

3. Define the minimally acceptable level of proficiency;

4. Decide what methods to use in judging whether or not a student is behaving at the established level(s) of proficiency. (1971, p. 15)

Persons learning to prepare objectives are advised to follow steps 1, 2, and 3, and periodically to follow all four steps.
Hyman contends that in the field of teaching there is a definite need for both general objectives and specific objectives. He believes that "teachers need to write specific behavioral objectives within the context of more general activities. By listing first the general objective and then the specific objectives subsumed under it, the teacher will get direction for the long period of time as well as guidelines for the short period of time" (1974b, pp. 43-44). Hyman claims that a series of specific activities alone does not provide the direction needed for a teacher planning for a long period of time. Hyman proposes six essential rules to observe in writing worthwhile specific behavioral objectives. They are as follows.

Rule 1. Describe the expected behavior of the student rather than the teacher.

Rule 2. Describe observable behavior in terms of an outcome verb which the student will perform (e.g., pantomime, identify, arrange, weigh, hammer).

Rule 3. Describe the criterion for evaluating an acceptable performance of the behavior (e.g., name at least four colors of the rainbow, hammer three nails one inch deep, run a mile in six minutes).

Rule 4. Specify important conditions under which the student will perform the behavior (e.g., run a mile before breakfast, kick three field goals in a championship football game, solve a quadratic equation during a classroom session).

Rule 5. State only one outcome verb in each objective.

Rule 6. Subsume sets of specific behavioral objectives under an appropriate, more general, objective (e.g., comprehend, understand, think critically, appreciate). The individual items listed should be important and
representative manifestations of the general heading. (1974b, pp. 42-45)

Hyman justifies the inclusion of Rule 6 in the following way:

The point here is significant. A general objective takes on meaning as it is understood through the specific objectives it subsumes as well as through its relationship with other general objectives. Just as specific objectives have meaning only within the context of a more general objective, so, too, does a general objective have meaning only within its context. It is the context that gives meaning to any objective. (1974b, p. 45)

While these procedures or considerations for formulating specific behavioral objectives differ in certain details, they do share common elements. All serve a common purpose, namely, to guide the selection of subject matter to teach, materials to use, methods to employ, tests by which to measure achievement, and criteria for evaluating the accomplishments of teaching.

The term 'objective' is generally used to denote some intended end or desired state of affairs. The expression 'behavioral objective' is used to denote a particular way of representing what is to be learned. Conditions to be satisfied in the formation of behavioral objectives include (a) specification of an action (behavior) component, a stimulus conditions component, and a standards component, and (b) these specifications must be framed in reference to the learner.
Some significant unique features of the procedures or considerations for formulating behavioral objectives should be noted. Hyman's rules are somewhat unique in the sense that they are the only ones described which include in their specifications a deliberate attempt to guarantee inclusion of only specific objectives which are subsumed under a more general objective.

While Gagne' and Plowman are concerned with the structuring of behavioral objectives, each attempts to provide a structure in a manner different from that of the other. Gagne' proposes a structure whereby behavioral objectives can be sequenced according to his hierarchy of learning types. He hypothesizes that there are several types or levels of learning that can be ordered along a hierarchy whose controlling concept is complexity. The eight types of learning (1965, pp. 35-62), listed from simple to complex, are: signal learning, stimulus-response learning, chaining, verbal association, discrimination learning, concept learning, rule learning, and problem solving.

Plowman states that "constructing sequences of objectives may be a discrete step-by-step approach, or it may be an approach that involves setting up a cumulative hierarchy in which skill or knowledge acquisition at one step becomes a part of each more complex succeeding step" (1971, p. 31). Plowman summarizes the usual steps in sequencing behavioral objectives as follows:
1. Determine what it is you want the learner to be able to do;

2. Define this objective in behavioral terms and identify mediating conditions, expected levels of proficiency, and methods for assessing proficiency;

3. Decide what are the preparatory tasks;

4. Cast the preparatory tasks into full-fledged behavioral objectives and order these along a continuum -- or

5. Decide what the cumulative elements are in each of a number of objectives, and on this basis arrange the objectives in a taxonomic (hierarchical) structure. (1971, p. 31)

Plowman identifies several types of learning sequences which could serve to establish the sequence in behavioral objectives. Among these are the cognitive taxonomy developed by Bloom and his colleagues (1956); the affective taxonomy developed by Krathwohl and his colleagues (1964); the psychomotor taxonomy developed by Harrow (1972); and the use of the need-objective continuum. When sequencing certain types of objectives, particularly those relating to intellectual skills, Plowman urges one to be aware not only of the overlap of categories and sequences of objectives, but also of the cyclical and spiraling nature of the sequences.

An additional perspective of instructional objective formation merits attention at this point. Eisner contends that our educational institutions are concerned not only "with enabling students to acquire those intellectual codes
and skills which will make it possible for them to profit from the contributions of those who have gone before" (e.g., reading, writing and arithmetic), but also "with enabling children to make a contribution to that culture by providing opportunities for the individual to construe his own interpretation to the material he encounters or constructs" (1971, p. 98). Eisner contends these dual concerns give rise to the need for two different types of educational objective. While the instructional objective, as commonly defined, is appropriate for curriculum planning in the area of transmission of available cultural tools, another type of objective is called for in helping children to modify and expand these tools. Eisner calls this second type of objective an expressive objective and describes it as follows:

Expressive objectives differ considerably from instructional objectives. An expressive objective does not specify the behavior the student is to acquire after having engaged in one or more learning activities. An expressive objective describes an educational encounter: It identifies a situation in which children are to work, a problem with which they are to cope, a task in which they are to engage; but it does not specify what from that encounter, situation, problem, or task they are to learn. An expressive objective provides both the teacher and the student with an invitation to explore, defer, or focus on issues that are of peculiar interest or import to the inquirer. An expressive objective is evocative rather than prescriptive.

The expressive objective is intended to serve as a theme around which skills and understandings learned
earlier can be brought to bear, but through which those skills and understandings can be expanded, elaborated, and made idiosyncratic. With an expressive objective what is desired is not homogeneity of response among students but diversity. (1971, p. 99)

Eisner gives as examples of expressive objectives: "To interpret the meaning of Paradise Lost," or "To examine and appraise the significance of The Old Man and the Sea" (1971, p. 100). Eisner sees the task of evaluation as not one of applying a common standard to the products produced, but one of reflecting upon what has been produced in order to reveal its uniqueness and significance. Eisner states that "In this context the mode of evaluation is similar to aesthetic criticism; that is, the critic appraises a product, examines its qualities and import, but does not direct the artist toward the painting of a specific type of picture" (1971, p. 100).

Eisner argues that the problem of formulating educational objectives is not simply a question of technique, but is related directly to one's conception of education; and this problem, ultimately, is a value decision.

Ways of evaluating instructional ends.—A fundamental difference exists between "evaluation of attainment of instructional ends" and "evaluation of instructional ends." In "evaluation of attainment of instructional ends," one judges the relation between the instructional end and
relevant pupil performance. If relevant pupil performance constitutes a realization of the conditions embedded in the instructional end, the judgment is made that "the pupil has attained the instructional end"; in the event of non-realization, the judgment is made that "the pupil has not attained the instructional end."

In "evaluation of instructional ends," however, the objects of evaluation are the instructional ends themselves. The outcome of the evaluation is a judgment as to whether the instructional end is "adequate" or "inadequate" (or assigns some other value term to the instructional end). Evaluation of instructional ends is the focal point of this section.

The literature reflects little activity in the development of methodology for evaluating instructional ends, although it is frequently recognized that objectives ought to be worthwhile. While the behavioral analysts seem to assume that for an objective to be worthwhile it must have observable and measurable counterparts, Atkins (1968) contends that the assumption is untenable. Atkins speaks to the issue in this way:

\[
\text{Worthwhile goals come first, not our methods for assessing progress toward these goals. Goals are derived from our needs and from our philosophies. They are not and should not be derived primarily from our measures. It borders on the irresponsible for those who exhort us to state objectives in behavioral terms to avoid the issue of determining worth.}
\]
Inevitably there is an implication of worth behind any act of measurement. What the educational community poorly realizes at the moment is that behavioral goals may or may not be worthwhile. (1968, p. 30)

Of the procedures described in the previous section for formulating objectives, Hyman was the only one who explicitly included in his set of statements a deliberate concern for the formulation of worthwhile objectives. Hyman's Rule 6 (see page 31) is concerned primarily with guaranteeing connectedness among specific objectives by requiring that they be subsumed under more general objectives.

Tyler (1971, p. 92) addresses the question of how to decide what objectives are worth teaching and proposes the following considerations in selecting objectives:

One of these is an analysis of our culture. Other things being equal it is important to teach those kinds of behavior, those ways of thinking, feeling, and acting that have value in our society and that help the person to become an effective human being in it.

A second factor in selecting appropriate objectives is the present status of the student. What has he already learned? What is he ready for?

A third factor in selecting objectives is what we know enough about to teach. It might be nice, for example, to teach a person to employ extrasensory perception, but we don't know enough about this to teach it.

Of course, a fourth basic consideration in the selection of objectives is their relevance to the school's philosophy of education.
Finally, a fifth factor in selecting and stating our objectives is the consistency of these objectives with our theory of learning. (1971, pp. 92-94)

Scheffler (1973) offers an analysis of the process of justification and proposes rules to govern the justifying of curricular decisions. Scheffler distinguishes two levels of justification and applies each to the justification of educational decisions. On one level is relative justification which involves conformity with a set of rules or to some code. The second level is general (or non-relative) justification which involves the issue of deciding among sets of rules or codes.

While the relative types of justification are familiar in educational contexts, the difficult question is that of what rules one should appeal to in general justification of educational decisions on content. Scheffler states that "the answer to this question consists of a set of rules, not assertions, but the process of compiling an adequate set of rules is as empirical a task as can be imagined" (1973, p. 122). Scheffler offers a list of rules relating to decisions on curriculum and states "This list should be construed as a hypothesis, tentatively offered and inviting criticism. If it proves wrong, the process of correcting it will itself help clarify the grounds of our curricular decisions" (1973, pp. 122-123).
The guiding principle underlying Scheffler's rules is that educational content should help the learner attain maximum self-sufficiency as economically as possible. Three rules of self-sufficiency are listed. First, content should enable the learner to make responsible personal and moral decisions. Second, content should provide students with the technical or instrumental prerequisites for carrying out their decisions. Third, content should provide theoretical sophistication to whatever degree possible. In formulating rules for deciding on content, Scheffler considers "all the content to be learned by a child during his formal schooling" (1973, p. 123). From this perspective, Scheffler's rules for content decisions are relevant to the determination of educational ends. More specifically, his proposed rules apply to formation of the conceptual aspect of curricular and instructional ends.

Scheffler also holds that content that is judged most economical should be selected. Three types of economy are relevant. First, content should be economical of teaching effort and resources. Second, content should be economical of learners' effort. Finally, content should have maximum generalizability or transfer value (economy of subject matter). Two types of subject-matter economy are distinguished. First, is there an empirically ascertainable tendency for the learning of some content to facilitate
other learning? Second, is the content sufficiently central logically to apply to a wide range of problems?

Lottes (1976) is also concerned with the justification of curricular decisions and contends that a person who makes curricular decisions should be accountable for those decisions. Lottes sets forth the meaning of curricular goal-state (curricular ends) and develops principles of curricular goal-state formation which include both logical and empirical aspects. These principles include conditions of an adequate curricular goal-state and conditions of a desirable curricular goal-state.

The conditions of an adequate curricular goal-state represent minimal conditions of utility and include both logical and empirical aspects (1976, pp. 16-17). The first condition of adequacy rules out goal-states containing contradictions. A contradiction exists when any two statements within a goal-state representation cannot both be true, or when two different aspects of a goal-state cannot be realized simultaneously by an individual.

The second condition requires empirical meaning. The third condition demands that an acceptable curricular goal-state be logically valid in reference to credible educational aims. The fourth condition rules out goal-states whose realization includes acquisition of false or unsupported beliefs by the pupil.
The conditions of a desirable curricular goal-state represent an extension of the conditions of adequacy and impose requirements of simplicity, coherence, and comprehensiveness. The conditions of desirability include both logical and empirical conditions (1976, pp. 18-21). The condition of coherence requires a deliberately constructed interconnectedness among the various parts of the goal-state representation. The condition of simplicity makes it possible to grasp the full meaning of a curricular goal-state representation and also means that the representation is confined to essentials. The condition of comprehensiveness requires that a curricular goal-state include a cognitive, affective, and action aspect. The empirical condition of desirability requires that there exist good reason for believing that the goal-state has some chance of attainment before being included in a practical claim to be implemented. The amount of chance that is acceptable can only be determined by deciding how desirable the goal-state is. Under certain conditions, the attainment of highly desirable goal-states might be worth the risk.
Methodology of Formation and Evaluation of Instructional Means

Literature relating to the methodology of instructional means formation is found under such rubrics as the following: instructional strategies, instructional methods, methods of teaching, design of instruction, teaching techniques, teacher roles, and instructional algorithms. Although the different labels may be defined or described in somewhat varying ways by different authors, each of these is concerned with a plan for guiding the instructional actions of a teacher.

Instructional strategy.--The concept of strategy applies to the activity of teaching just as it applies to any other kind of purposive activity. In the instructional situation there are specified goals to be attained, and there is a choice to be made as to what course of action will most likely attain them. The teacher is responsible for developing a plan for attaining the goal of learning, and this plan must take into account the prevailing circumstances. In teaching, a strategy can be viewed as a plan for achieving the goal of learning, where plan realization requires cooperative teacher-pupil effort. These general notions undergird the perspectives of instructional strategy outlined in the paragraphs following.
Hyman (1974a) states the following concerning a strategy:

"... a strategy is a deliberate pattern of actions aimed at achieving a specific goal. A strategy comes after we determine the goal and understand fully the nature of the activities to be performed. Thus, we need a strategy, or strategies, to achieve certain cognitive behavior or bring about a particular climate in the classroom. (p. 439)"

Taba and Hills define a teaching strategy as "a pattern and a sequence of teacher behaviors designed to accommodate all important variables, consciously and systematically" (1965, p. 48). The variables to be taken into account include the teacher, the nature of the subject matter, the learner, the learning process, and the instructional setting.

Merrill and Wood (1974) propose a vocabulary for describing instructional strategies and propose also a taxometric organization for relating these variables in a way which facilitates the statement of instructional theorems. Development of a taxonomy of instructional strategies is an attempt to provide a common vocabulary for the variables investigated as well as a taxometric formulation relating these variables to one another in a meaningful way. Although Merrill and Wood are primarily concerned with instructional strategies, they attempt to put instructional strategies into a broader context of instruction by indicating how research on instructional
strategies is related to other types of relevant research on instruction. Four facets of instruction are identified: learner aptitudes, subject matter content, instructional strategies, and instructional delivery systems (1974, p. 2).

Young (1971) lists three phases considered to be fundamental to the development of instructional strategies. These are as follows.

First, it is necessary for a teacher to define both general and specific learning objectives -- hopefully objectives that define rather precise behavioral outcomes for the intended learners.

The second phase is the analysis of relevant factors that will influence the particular instructional design.

Finally, the teacher determines rather precisely what activities he and the learners will engage in, under what conditions, and with what materials or in what facilities. Implementation of his plan follows, . . . he will at last evaluate the effectiveness of his instructional scheme to see how it might be modified, replaced, or supplemented. (1971, p. 221)

Four requisites for adequate use of the three phases for instructional strategy development are: analysis of self; analysis of the learner; analysis of content; and analysis of conditions of learning.

Instructional design. --Instructional design is the rubric commonly used by those in the areas of programmed instruction and computer-assisted instruction, as well as by those who view instruction from other systems-oriented points of view. Merrill notes that "design procedures are
based on empirically verified or verifiable principles" (1971, p. 2). He describes the principal activities of an instructional designer as including the following:

(1) He specifies learning outcomes in terms of observable student performance and (2) characteristics of the particular students to be taught; (3) considering both 1 and 2 above, he selects and arranges stimulus situations to be displayed to the student; (4) he specifies media appropriate for these displays, and (5) specifies the conditions under which a student's response must be observed to be considered an instance of the specified behavior; (6) he also specifies criteria of acceptable performance; (7) considering 1, 5, and 6 above, he selects displays appropriate for assessing the student's ability to demonstrate the behavior specified in 1; (8) he also specifies mechanisms that provide for monitoring the student's interactions with the displays, and (9) possible modifications in the displays when the student's responses do not correspond with specified outcomes.

(p. 2)

Merrill's procedure for instructional design consists of the "paradigm" or "model building" approach. He states that:

This approach postulates that outcomes can be classified into a finite set of types and that for each type of objective a set of unique selection rules can be specified, unique conditions for observing the response can be specified, and particular modification procedures can be identified. In the process of designing instruction, a systematic attempt is made to apply these rules to the design process so that the empirical tryout of a given program yields information not only about the effectiveness of that particular program but also provides an additional test of the paradigm or model. (1971, pp. 2-3).
Methods of teaching.—Wallen and Travers (1963) note that the concepts of teaching method and teacher role are often used interchangeably to represent patterns of behavior of the teacher in the classroom believed to be related in some way to the learning process. Wallen and Travers acknowledge that the term role is generally used rather loosely in education and define a teacher role "as simply a pattern of behavior shared by a group of teachers which is identifiable and generally believed to be related in some way to the learning process" (1963, p. 449). They advocate that teaching methods be based on a learning model stemming from psychological research.

The systematic design of a teaching method is viewed as involving the following two steps:

First, a set of identifiable conditions related to learning must be specified. The importance of these conditions must have been established by empirical research; i.e., their relevance to the learning of children must have been either directly established or there must be other compelling reasons for believing that the conditions have an important relation to classroom learning.

A second step in the design of teaching methods involves the design of teacher behavior. This has to be so designed that it generates the learning conditions which have already been specified. (p. 485)

The general classes of independent variables (i.e., variables related to the learning process that the teacher may be able to manipulate) which are viewed as necessary to take into account in the design of a teaching method are:
situation characteristics, motivation, reinforcement, readiness, and mediating response (1963, pp. 487-490).

Wallen and Travers note that the response variable (i.e., variables derived from any publicly observable behavior) should also be defined as part of the design of a teaching method. They state that "This step is necessary if evaluation procedures are to be built into the design" and further that "it is inconceivable that a teaching method could be designed without building into it techniques for the evaluation of pupil progress" (1963, pp. 486-487).

Broudy and Palmer define method in the following manner:

Method refers to a set of procedures that are carried out according to some rule. The rule prescribes that in a certain class of situations, for example, the teaching of reading, steps are to be taken in a certain sequence, and that the procedures are to use certain materials in certain ways at certain times. To know the rule is to know "how to" carry out the procedure; to have gone through the procedure many times not only helps to make sure that one knows the rule, but also that one can carry out the actions prescribed by it. (1965, p. 9)

While Broudy and Palmer recognize that there are many methods of teaching, they analyze the teaching act and divide it into phases or steps that presumably occur regardless of the particular style of teaching. These seven common steps or phases in teaching (1965, pp. 9-14) are as follows:
1. Preparation for instruction - what the teacher does before he confronts the student;

2. Motivation - what the teacher does to capture the attention of the student;

3. Presentation of the learning task - what the teacher offers to the student; what the student is to learn;

4. Inducement of the trial response - what the teacher does or asks the student to do in order to determine whether the student has learned the material or task presented;

5. Correction of the trial response - what the teacher does in order to correct the response of the student;

6. Fixation of response - what the teacher does to assure that the student retains what he has learned;

7. Test response and evaluation - what the teacher does to determine how well the student has learned the task presented.

In an effort to gain a clearer concept of method, Hyman examines various views of the common steps or phrases in teaching and abstracts several elements common to different teaching methods. Among these are Broudy and Palmer's (1965, p. 9) seven phases in teaching; the five Herbartian steps (McMurry and McMurry, 1926, p. 288); Jackson's (1966, p. 12) three categories of teaching;
Strasser's (1967, pp. 63-74) conceptual model of instruction; and Hyman's (1967) own work as well as that of his colleagues Bellack, Kliebard, and Smith (1966) on the language of the classroom. From these views, Hyman (1974b) sets forth criteria for method selection. In summary Hyman states that:

. . . in deciding which method is appropriate to a particular lesson or series of lessons, the teacher must consider the following aspects of his teaching situation: the context of the teaching situation (time and place); the number, ability, interests, and previous experience of the students; the nature of the subject matter; the teacher's own abilities and inclinations; and what he wishes to emphasize in his teaching - skills, knowledge, or values.

The teacher must also consider, in reference to his method, the time requirements of the method; the demands the method will make on him and his students; the materials required in using the method; the results that the method brings. (pp. 64-65)

Instructional Theory

The term theory has many common meanings outside the domain of the sciences. Gordon (1968) notes some of these present day uses of the word theory. For example, the term theory is frequently used to denote a speculation or hypothesis concerning why something happens. The term is often used in the field of education to denote a plan of action, particularly that of the teacher, and is often referred to as a theory of education. Philosophers and scholars in the humanities frequently use the term theory to refer to systematic formulations about man's place in
the world. Theory of this kind is composed of sets of assumptions or considered beliefs derived from a scholar's personal experience in the world and his contemplation of it in relation to the studied experience of others. In mathematics the term *theory* is frequently used in a technical sense to refer to a system of interrelated propositions that includes both primitive propositions (axioms) and deductively derived propositions (theorems); and which has no relationship to empirical objects or events.

In the natural sciences, the term *theory* is used to denote a set of interrelated generalizations having some correspondence with empirical objects or events; and which permit some degree of prediction or control over the phenomena to which they pertain. Snow (1973) defines theory as follows:

In its simplest form, a theory is a symbolic construction designed to bring generalizable facts (or laws) into systematic connection. It consists of a) a set of units (facts, concepts, variables) and b) a system of relationships among the units. These are defined and interpreted in statements that are understandable to others and make predictions about empirical events. (p. 78)

Empirical science, through the use of its methods of theory formation and validation, has enjoyed striking success in terms of usage. Throughout the years, empirical science has expanded the reach of its applications and has provided a basis from which the results of scientific inquiry have
been put to practical use. Perhaps it is for these reasons that empirical science today enjoys such high prestige and is used as a model for activity in many less developed fields. The field of education is one such field which recognizes the existing potential for progress by utilizing science as a model, both with respect to its structural and methodological characteristics. The literature on theory of instruction reflects the ways in which the concept of theory is used in the sciences.

Many educators believe that the major deterrent in the development of a set of statements representing an instructional theory is the lack of a technical language needed for the task (Travers, 1966; Merrill and Wood, 1974; Snow, 1973). Snow (1973) proposes six grades of theory which he believes to have long-range importance for the kinds of theoretical statements appropriate for behavioral and social research in general and for research on teaching in particular. These levels include not only the formal theory to which all science aspires but, also, less rigorous formulations of potential value in developing useful knowledge. These grades of theory are: A-theory (axiomatic theory); B-theory (broken axiomatic theory); C-theory (conceptual theories and constructs); D-theory (descriptive theories and taxonomies); E-theory (elementisms); and F-theory (formative hypotheses) (pp. 82-86).
Concept of Theory of Instruction

Travers "conceive[s] of a theory of instruction as consisting of a set of propositions stating relationships between, on the one hand, measures of the outcomes of education and, on the other hand, measures of both the conditions to which the learner is exposed and the variables representing characteristics of the learner" (1966, p. 50). In addition to the aspects of scientific theory, Travers believes that a theory of instruction must also have certain other characteristics. These characteristics are as follows.

First, it has to be empirically based and the propositions of the theory must have a clear relation to data.

Second, a theory of instruction will have to represent the relationship between a wide range of learning conditions and achievements.

Third, the optimum conditions would be those which maximized some function, say a linear function, of the measures of the variables defining the outcomes. The weight given to each variable would reflect a value judgment.

Fourth, a theory of instruction of any value will have to be based on quantitative data, but these data will probably be reducible to a set of verbal nonmathematical propositions. (pp. 50-51)

Merrill (1968) states that in order for a theory of instruction to be useful, it must be prescriptive as well as descriptive. Merrill defines a theory of instruction as follows:
A theory of instruction consists of the identification of the component parts of the instructional system and a description of the principles which are used by the components to select, modify, and present the display and knowledge of results so as to produce particular kinds of responses in the learner. . . . Principles specified by such a theory should include rules specifying the display and knowledge of results requirements for producing particular responses (presentation rules); rules specifying the requirements for measuring particular responses and for comparing responses with objectives (evaluation rules); rules for altering the presentation to adapt to the particular requirements of individual statements (individualization rules), and rules indicating modification required when feedback from the student indicates that a particular presentation failed to produce the desired behavior (modification rules). (p. 9)

Bruner (1966) believes that a theory of instruction is a prescriptive theory as well as a normative theory. Bruner states that it "is prescriptive in the sense that it sets forth rules concerning the most effective way of achieving knowledge or skill. By the same token, it provides a yardstick for criticizing or evaluating any particular way of teaching or learning" (p. 40). Bruner further states that a theory of instruction is a normative theory in that "it sets up criteria and states the conditions for meeting them" (p. 40).

Bruner (1963) believes that a theory of instruction must concern itself with the relationship between how things are presented and how they are learned; it must serve as a guide for actions directed toward the achievement of certain objectives. Bruner (1966) lists four major features of a theory of instruction. These are as follows:
First, a theory of instruction should specify the experiences which most effectively implant in the individual a predisposition toward learning -- learning in general or a particular type of learning.

Second, a theory of instruction must specify the ways in which a body of knowledge should be structured so that it can be most readily grasped by the learner.

Third, a theory of instruction should specify the most effective sequences in which to present the materials to be learned.

Finally, a theory of instruction should specify the nature and pacing of rewards and punishments in the process of learning and teaching. (pp. 40-41)

The ASCD Commission on Instructional Theory (Gordon, 1968) states that "a theory of instruction would be represented by a set of statements, based on sound replicable research, which would permit one to predict how particular changes in the educational environment (classroom setting) would affect pupil learning" (p. 3). The Commission notes that while a theory serves to provide guidance for teacher behavior, it also serves many other purposes. The Commission acknowledges Kaplan's (1964) enumeration of the many purposes served by scientific theory besides those of providing guidance in the solution of practical problems. These are as follows:

First, theory construction serves the function of forcing the theory builder to bring together in a concise and parsimonious form the knowledge that is currently available. It forces him to review carefully what is known and
to separate that knowledge from both tenuous speculation and the body of ambiguous findings.

Second, it replaces, in a sense, the large number of protocol statements found in the supporting studies with a relatively few generalizations that are inductive inferences from them. The stated generalizations are formulated in such a way that they lead to better prediction and control than any other alternative sets of generalizations.

Third, the theory thus formulated becomes a basis for research. Not all research has to be theory oriented, but much that has been of immense value in advancing knowledge has been so oriented.

Criteria for Theories of Instruction

The ASCD Commission on Instructional Theory (Gordon, 1968) was the first to develop criteria for evaluating the properties of theories of instruction. These criteria were developed to serve two purposes: first, they were to serve as a guide for those interested in building a theory of instruction by indicating the formal properties that the theory should provide; second, they were to provide a basis for reviewing theories of instruction that had been built and that would be built in the future. The criteria were designed to apply only to empirically-based theories which meet certain minimum formal requirements. The criteria proposed by the ASCD Commission (pp. 16-24) are listed as follows.
1. A statement of an instructional theory should include a set of postulates and definition of terms involved in these postulates.

2. The statement of an instructional theory or sub-theory should make explicit the boundaries of its concern and the limitations under which it is proposed.

3. A theoretical construction must have internal consistency -- a logical set of interrelationships.

4. An instructional theory should be congruent with empirical data.

5. An instructional theory must be capable of generating hypotheses.

6. An instructional theory must contain generalizations which go beyond the data.

7. An instructional theory must be verifiable.

8. An instructional theory must be stated in such a way that it is possible to collect data to disprove it.

9. An instructional theory must not only explain past events but also must be capable of predicting future events.

10. At the present time, instructional theories may be expected to represent qualitative synthesis.

Hosford (1973), by building on the work of Bruner and the ASCD Commission, attempts to establish an acceptable vocabulary as well as a basic referent structure framework for a theory of instruction. Hosford (1973, pp. 66-71)
argues that only five criteria are sufficient and necessary for a theory of instruction. These are as follows.

1. A theory of instruction must provide for careful definition of terms and these definitions must be internally consistent.

2. All constraints limiting the theory must be clearly noted and their effects acknowledged.

3. A theory of instruction must be based on an efficient and sufficient analysis of relevant empirical data.

4. A theory of instruction must generalize beyond the data.

5. A theory of instruction must not be trivial.

Hosford (pp. 71-79) also proposes three functions which a theory of instruction must serve. These three functions constitute the basic yardstick by which to assess the value of any theory. These functions are as follows.

1. A valuable theory of instruction will stimulate and give direction to research and instructional behavior.

2. A valuable theory of instruction will stimulate and direct general curriculum improvement.

3. A valuable theory of instruction will define and relate relevant knowledge.
Summary

A considerable amount of literature was reviewed for this study. However, the literature which provided information of influence to the study was considerably small in quantity. Information which influenced the conceptual development undertaken in the study, excluding the prior work by this author on which this study builds, is enumerated in the following paragraph.

The nature and form of praxiological theorems provided information which was directly utilized in the conceptual construction of an instructional claim. Aspects of "instruction" which provided useful information included (1) the notion that instruction should be goal-oriented and guided by planned procedures, (2) the notion that instruction should be empirically testable, and (3) the idea that instruction is conducted within the context of some curricular framework.

Principles for formulating and evaluating instruction found in the literature proved to be not useful in the constructions. These principles were judged to be not useful since they did not fit the framework. The areas of science, logic, and philosophy of science, primarily, provided the information utilized in developing the principles of formation and evaluation contained in the study.
CHAPTER III

THE CONCEPTUAL FRAMEWORK

The Concept of Profession*

Instructional planning and evaluation are construed as professional activity.** All significant professions are enterprises whose practitioners exist for the purpose of providing some essential service to members of the society. Lay members of the society expect and also judge the value of the service provided by members of a profession. This service will be referred to as the pragmatic base of that profession.

Members of a profession acquire specialized knowledge of certain principles and of the techniques of their effective application. As a result, the professional is presumed to be able to perform his service more efficiently and effectively than a layman. The term conceptual base will be used to denote the theoretical structures, concepts, logical and empirical propositions, and rules. Those elements constitute the credible knowledge of a professional.

*The ideas presented in this section were developed by the author and other staff members of the TCU Teacher Center Project, Texas Christian University, 1972. For a supporting view of profession see Blackington and Patterson, 1968; Lieberman, 1956; and NSSE Yearbook, 1962.

**See Scheffler (1968) for a supporting view of teaching.
A profession is also governed by certain values and ethical rules. Articulation of these values and ethical rules constitute a representation of the value base of the profession. The best value base not only ensures a high quality of service, but also provides a guarantee against mistreatment of the client, his interlocutors, or relevant members of the society or profession.

The pragmatic, conceptual, and value bases provide the definitions as to what kinds of actions ought to be performed and the principles and rules which guide the manner of performance. Once the professional has decided what course of action should be followed, or has performed his individual acts, then the professional bases provide the grounds for justification and evaluation of those proposed or performed actions.

Rationality, Objectivity, and Practical Claims

Rationality and objectivity are fundamental values in such diverse endeavors as mathematics, science, philosophy, the professions, and practical affairs. They are fundamental values of teaching as well.

In a field of practical action, subscription to the ideal of rationality implies that a practitioner is expected to act in reference to deliberately formulated goals and planned procedures which are likely to lead to goal attainment in the prevailing circumstances. That is,
the practitioner must ground his decisions within the context of a relation which links ends, means, and existing circumstances. This relation is, in effect, an empirical claim.

An ideal closely connected with rationality is that of objectivity. Objectivity entails the requirement that one's claim must be publicly verifiable. A claim can satisfy this requirement only if it is made explicit. Representation of the general form of a practical claim is as follows:

*Under circumstances A, if course of action B is taken, then goal C will probably be achieved.*

The Concept of Curricular Claim

If teaching is viewed as a profession and is thus governed by the ideals of rationality and objectivity, then every teacher or designer whose plans are used by teachers must frame educational ends and means as components of claims expressible in the general form shown in the prior section. Such an educational claim specifies a relation between some course of action, defined by a set of rules, and attainment of an intended goal-state by an individual (pupil) and includes specification of the set of individuals for which the relation is believed to be valid. Propositions of this kind which house curricular ends, curricular means, and curricular qualifying conditions as components, will be given the label "curricular claim."
A curricular claim will be viewed as an hypothesis to which both teacher(s) and pupils subscribe, and under which both act. From this perspective, practical claims of the curriculum builder might be represented in the following way:

**General* Form of a Curricular Claim**

For all permissible replacements of variables X and T, where each value of X is a pupil satisfying conditions C, and each value of T is a teacher satisfying conditions K;

If both X and T act in a manner consistent with rules R, then X will (probably) attain goal-state S.

Curricular claims of this kind contain both extra-logical components, i.e., empirical expressions that are used as replacements for the variables X, C, T, K, R, and S, and logical terms that connect those extra-logical components, e.g., 'it,' 'then,' 'and.' Curricular goal-state representations will be used as replacements for the variable S. Curricular rule sets will be used as replacements for the variable R, and sets of curricular qualifying conditions will be used as replacements for the variables C and K. When empirical components are substituted for the variables, the curricular claim can be judged true or false. The foregoing terminology will be used in the study and

*This is not entirely a general language; a completely general language can only be achieved by going to a logical language. At this point, a modest level of precision is adopted for the convenience of readers.
their denotations relative to teaching and learning activities will be set forth in the following paragraphs.

The expression *curricular goal-state* denotes some desired pupil-state; a curricular goal-state is represented by a set of concepts or* sentences or perhaps by some linguistic-iconic** display. This set of concepts or sentences is used within the predicate of the consequent proposition of a curricular claim (i.e., is used as a replacement for the variable $S$).

A set of *curricular rules* is a set of rules which (a) specifies that which is obligatory, permissible, and not permissible on the part of both teacher and pupil, and (b) is used as a component of the antecedent proposition of a curricular claim (i.e., is used as the replacement for the variable $R$).

A set of *curricular qualifying conditions* consists of (a) propositions which define the set of pupils and (b) propositions which define the set of teachers for whom the specified claim is believed to be valid (i.e., the curricular qualifying conditions define the permissible replacement sets for the variables $X$ and $T$). The propositions which constitute the curricular qualifying conditions

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* "Or" is used in the inclusive sense.

** "Iconic display" denotes some pictorial analogue of the desired pupil-state.
describe the initial pupil-state and initial teacher-state assumed to be necessary to effective functioning under the curricular rules, and in reference to the curricular goal-state.

Principles of Curricular Claim Formation

A curricular end might be framed in such a manner as to fulfill the meaning of "curricular goal-state"; or curricular means might be framed in such a manner as to fulfill the meaning of "curricular rules," yet neither may be capable of functioning as a component of a curricular claim should function. Certain minimal conditions need to be met in order to ensure that a curricular goal-state and set of curricular rules are adequately conceived and represented. These conditions for the formation of a curricular goal-state and set of curricular rules are set forth as conditions of adequacy and are as follows.

The first condition of adequacy is met when the curricular goal-state or the set of curricular rules has empirical import (i.e., capability of empirical test).

The second condition of adequacy is met when the curricular goal-state or set of curricular rules possess internal coherence.* The condition of coherence is met

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*Internal coherence has adequate meaning as a prerequisite. An expression has adequate meaning when we are reasonably clear as to its connotation and denotation.
when there is a deliberately constructed connectedness among the various parts of the goal-state representation, or among the various components of the rule-set representation. In order to fulfill this condition of adequacy the set of concepts or sentences which represent the curricular goal-state must be delineated, and relationships between the concepts or sentences must be expressed. Also, the set of curricular rules must be framed in terms which belong to a coherent conceptual system; all rules relevant to a possible acting-situation must be capable of realization in conjunction with each other. Further, neither different logical types nor different levels of resolution should be confounded within the curricular rule structure.

The third condition of adequacy is met when the curricular goal-state or set of curricular rules is consistent* with the professional bases. This condition implies that the curricular goal-state must be consistent with the fundamental educational aims; and the set of curricular rules must be consistent with the ethical postulates embedded in the value base of teaching.

A further condition of adequacy, applying only to a set of curricular rules, is met only when a curricular rule-set contains both a content aspect and a process aspect.

*External coherence has adequate meaning as a prerequisite.
The content aspect of a set of curricular rules is construed in such a manner as to include identification of the basic elements or objects with which the participants (i.e., teacher and pupil) will deal, and the interrelationships among these basic elements. The process aspect of a set of curricular rules will be construed in such a way as to include identification of the ways in which teacher and pupil actions, performed in reference to the basic content elements, will be initiated, conducted, terminated, and evaluated.

The delineated principles of curricular claim formation are used in two ways. First, they guide the process of curricular claim construction; second, they provide the criteria for evaluation of curricular claims once they have been framed.
CHAPTER IV

THE CONCEPT OF INSTRUCTIONAL CLAIM

The extra-logical components of a curricular claim (the curricular goal-state, curricular rules, and curricular qualifying conditions) govern instructional and learning activities in much the same way as the rules of a game govern the activities of all players during the course of the game. The rules of any game specify, for each player, actions which are either mandatory, permissible, or forbidden; other actions are value-free* in reference to the rules. The rules of any game allow each player some degrees of freedom to develop individual strategies that guide the way he performs individual acts during the course of the game as well as allowing the opportunity for him to change his strategies in response to acts of opposing players. Any strategy is allowable which conforms to the rules of the game and has as its purpose achievement of the goal of the game.

Curricular rules specify actions that are obligatory, permissible, and forbidden on the part of the pupil and teacher. They also leave both teacher and pupil some

*Value-free actions are actions which are unregulated by the set of rules.
degrees of freedom to determine the manner in which their individual acts will be performed. This allows the teacher freedom to develop strategies for influencing the pupil toward goal-state attainment, and to adapt these strategies in response to the patterns of individual pupil acts. In turn, the pupil, deliberately or otherwise, forms strategies which guide his individual acts toward goal-attainment and adapts these strategies in response to the patterns of individual teacher acts. Teacher strategies and pupil strategies, as well as teacher and pupil acts, should conform to the governing curricular rules.

It is important to note that education is being viewed as a cooperative enterprise between teacher and pupil. Under the curricular claim, the teacher and pupil hold a common goal and act under governing rules to which they both subscribe in their attempt to facilitate pupil attainment of that goal. However, as is discussed in the following paragraphs, only the teacher subscribes to and acts under the instructional rule component of an instructional claim.

Any given strategy is reasonable only if it is believed that, under the existing circumstances, implementation of that strategy will lead to achievement of certain ends. Within the professional context, a teacher's strategy is justified only when it is embedded within the rule
component of some claim which the teacher has reason to believe is valid. This type of claim will be called an *instructional claim*. While both teacher and pupil act under the conditions of a curricular claim, only the teacher acts under an instructional claim. An *instructional claim* is instrumental to realization of the various conditions embedded within a curricular claim, thus making it crucial to curricular claim validation.

The general form of an instructional claim might be represented in the following way:

**General Form of an Instructional Claim**

For all permissible replacements of variables X and T, where each value of X is a pupil who satisfies conditions Q and each value of T is a teacher who satisfies condition M;

If T acts according to rules I (in relation to X), then X will (probably) attain goal-state E.

Instructional claims of this kind contain both extra-logical components, i.e., empirical expressions that are used as replacements for the variables X, T, Q, M, I, and E, and logical terms that connect those extra-logical components, e.g., 'it,' 'then,' 'and.' *Instructional goal-state* representations will be used as replacements for the variable E. *Instructional rule* sets will be used as replacements for the variable I, and sets of *instructional qualifying conditions* will be used as replacements for the variables Q and M. When empirical components are
substituted for the variables, the instructional claim can be judged true or false.

The expression *instructional goal-state* denotes some desired pupil-state to be achieved; an instructional goal-state is represented by a set of concepts or* sentences or perhaps by some linguistic-iconic display. The instructional goal-state can be synonymous with the curricular goal-state, logically necessary to attainment of the curricular goal-state, or* empirically useful to attainment of the curricular goal-state. This set of concepts or sentences or linguistic-iconic display is used within the predicate of the consequent proposition of an instructional claim (i.e., is used as a replacement for the variable E).

*Instructional rules* specify how the teacher shall act in the situations that arise as the teacher and pupil attempt to realize the implications of the curricular rules. A set of instructional rules constitutes a plan, strategy, or set of procedures formulated for the purpose of guiding teacher actions in such situations. Instructional rules are framed within the context of an instructional claim’s antecedent proposition (i.e., the set of instructional rules is used as a replacement for the variable I).

* "Or" is used in the inclusive sense.
The instructional qualifying conditions are represented by a set of propositions which describes the pupil characteristics and teacher characteristics that are believed to be necessary to pupil realization of the instructional goal-state if the instructional rules are followed by the teacher. The instructional qualifying conditions define the permissible replacements for variables X and T of the general form of an instructional claim.

The concept of instructional claim and its associated extra-logical components (instructional rules, instructional goal-state, and instructional qualifying conditions) have been deliberately constructed to constitute a coherent fit with the language of curriculum. In both cases, formation of the concepts was governed by the ideals of rationality and objectivity. The language facilitated the linking of instructional ends and means with curricular ends and means.

The Concept of Instructional Goal-State

A pupil comes to every educational situation with some bundle of physical, cognitive, moral, and behavioral traits. This bundle of traits characterizes each pupil and might be called the state of that pupil at that particular time. The educational activities engaged in by that pupil, if they are effective, will cause the initial state, at
least some aspect of which is not fully satisfactory, of the individual to cease to be and a more satisfactory state to come to be. The goal-state governing these educational activities is a model for this desired new state of the pupil. In the instructional situation, the instructional goal-state serves as a model for the intra-curricular pupil-state.

In framing an instructional goal-state, one is concerned only with representing some desired pupil-state; that is, representing some bundle of desired physical, cognitive, or other traits. The concept of goal-state is introduced because there is no concept, in the usual language of educational ends, which denotes such a bundle of desired learner traits and only such a bundle of traits. The notions of "objective" and "goal," for example, are commonly used in a way that confounds desired learner-trait representation with the statements in which those representations are housed. Also, the problem of judging pupil attainment of the desired ends often is introduced as an additional confounding factor in representation of ends.

The Concept of Instructional Strategy

In an instructional situation, once there is a specified goal-state, the teacher is responsible for developing a plan for attaining the goal-state, and this plan must take into account the prevailing circumstances. This plan
for achieving the intended learning will be referred to as an *instructional strategy*, an expression which will be used synonymously with a set of *instructional rules*.

An instructional strategy is represented by a set of rule-statements which specifies each individual act that the teacher will perform in every acting-situation expected to occur. The set of expected acting-situations is defined by the curricular rules.

The concept of "rule" has been investigated by many, including Black (1962); Baier (1958); Rawls (1955); and Diggs (1964). In his enlightening analysis, Black (1962) concluded that although rules can be expressed in a variety of ways, there is no distinctive formula which governs every rule-formulation. Black further concluded that all of the ways of expressing a rule were found to contain common features which represent the manner in which the concept of "rule" is used in the present study, namely, every construction that can be termed a "rule-formulation" must satisfy two conditions. First, there is a description of a class of actions, possibly restricted to actions performed by some designated class of persons. Second, there is an indication as to whether that class of actions is obligatory, permissible, or forbidden.

A strategy can be expressed by a set of rules which determines basic actions in a way that is fixed with reference to different situations; also, a strategy can be
expressed by rules that are adaptive with reference to
different situations. For example, if the goal is to go
to Dallas from Fort Worth, a non-adaptive strategy might
be expressed by the following rule: "Always take the
turnpike."

For the same goal, a strategy capable of adapting to
a range of particular situations can be framed by using
conditional statements. The following strategy includes
conditional rules that give it adaptive power:

Check with turnpike authorities to determine if
traffic is blocked between Fort Worth and Dallas.
If traffic is not blocked, take the turnpike. If
there is a traffic block, determine whether it is
between Fort Worth and Arlington or Arlington and
Dallas. If traffic is blocked between Arlington
and Dallas take the turnpike to Dallas. If traffic
is blocked between Fort Worth and Arlington, take
route 80 to Arlington, then take the turnpike to
Dallas.

The Concept of Instructional
Qualifying Conditions

The circumstances in which the teacher believes that
the instructional strategy will prove effective constitute
the instructional qualifying conditions. These conditions
include a set of propositions representing beliefs about
the existing state of the pupil. The pupil-state is
represented in reference to (a) the curricular rules or
curricular goal-state, or (b) instructional goal-states
contained within instructional claims invoked previously
in reference to the curricular claim (or claims), or
(c) individual pupil goals, moves, strategies, or assumptions under which the pupil acts. Suppose, for example, that comprehension of concept Q is used as an instructional goal-state within a curricular enterprise; also suppose pupil Mary Smith is judged to have comprehended concept Q. Then the proposition that "Mary Smith comprehends concept Q" is assumed to be valid by the teacher, and consequently is incorporated into the teacher's view of Mary Smith's existing state in the formation of new instructional goal-states and strategies for use in reference to Mary.

Or suppose that the teacher notices that Mary Smith goes about certain kinds of curricular tasks in a particular way. The teacher then may utilize this information about Mary's learning strategies in developing instructional strategies and goal-states appropriate for use with Mary.

Instructional qualifying conditions are intra-curricular whereas curricular qualifying conditions are extra-curricular. In the extra-curricular situation, the validity of the propositions representing qualifying conditions must be judged on the basis of data that are available prior to initiation of action under the curricular rules. In the intra-curricular situation the validity of the propositions representing qualifying conditions must be judged on the basis of data that become available subsequent to initiation of action under the curricular rules.
CHAPTER V

PRINCIPLES OF INSTRUCTIONAL CLAIM FORMATION AND EVALUATION

Conditions of an Adequate Instructional Claim

The fact that a claim might be framed in a way such that it fulfills the meaning of the concept of "instructional claim" does not imply that the claim can adequately perform the function of an instructional claim. An adequate instructional claim not only fulfills the meaning of "instructional claim," but also satisfies certain additional conditions which are necessary to useful functioning. For example, an ancient Ford that has been in a junk yard for forty years is called an "automobile"; i.e., the Ford constitutes an instance of the concept "automobile" because it fulfills certain essential properties by which objects that belong to the class of objects called "automobiles" can be distinguished from objects that do not belong to that class. Yet it may have three flat tires, no engine, and a rusted-out body. In this condition the automobile would not ordinarily be considered to be an adequate automobile because one cannot use it for the sort of transportation automobiles usually provide. In this case, the automobile does not possess the additional properties
necessary for performance of the transportation function normally expected of an automobile.

Similarly, Miss Jones might form an instructional goal-state and strategy, and assert her belief that the strategy will lead to pupil attainment of the goal-state (i.e., make an "instructional claim"). Although Miss Jones may have indeed formulated an instructional claim, that claim is not necessarily able to perform its intended function. For example, the strategy may contain procedural rules that contradict each other. In this case, it is impossible for the teacher's action to conform to the intended rules. The strategy rules cannot fulfill their purpose, and consequently the claim which houses that strategy has no utility; the claim is not an adequate claim.

Additional conditions which ensure useful functioning of an instructional claim will be referred to as conditions of adequacy. These conditions of an adequate instructional claim, which include both logical and empirical aspects, are set forth in Figure 1. The following section offers explication and justification of each condition of adequacy.
C(1): The instructional claim should have empirical import. For an instructional claim to have empirical import it must satisfy the following conditions:

(a) Each expression that is ostensibly functioning as an extra-logical component of the instructional claim must have at least some possible empirical referent.

(1) No extra-logical component may contain a logical contradiction.

(2) No extra-logical component may contain a tautology.

C(2): The extra-logical components of an instructional claim should be characterized by internal coherence. Internal coherence is realized if the following conditions are satisfied:

(a) For an instructional goal-state:

(1) each concept or each sentence should be connected, via chains of identifiable relationships, to every other concept or sentence, and

(2) neither different logical functions nor different levels of resolution are confounded within the instructional goal-state structure.

(b) For a set of instructional rules:

(1) neither different logical functions nor different levels of resolution are confounded within the instructional-rule structure, and

(2) the particular rules that are relevant to the expected acting-situations are capable of realization in conjunction with each other.

Fig. 1--Conditions of an adequate instructional claim
C(3): The extra-logical components of an instructional claim should be characterized by external coherence in reference to the relevant curricular claim and the professional bases. External coherence is realized if the following conditions are satisfied:

(a) The instructional goal-state must be:

1. logically relevant* or+ empirically relevant** to the curricular goal-state, or+ C(2) below.

*Logical relevance in this context means that the instructional goal-state may be (1) synonymous with the curricular goal-state, (2) a logical derivation of the curricular goal-state, or (3) logically necessary to a component of the curricular goal-state.

**Empirical relevance in this context means that the probability of pupil attainment of the curricular goal-state, given instructional goal-state attainment, is greater than the probability of curricular goal-state attainment, given non-attainment of the instructional goal-state.

(2) logically relevant* or+ empirically relevant** to the curricular-rule set.

*Logical relevance means that the instructional goal-state is embedded within the curricular-rule set.

**Empirical relevance means that the probability of valid pupil action under the curricular rules, given instructional goal-state attainment, is greater than the probability of valid pupil action under the curricular rules given non-attainment of the instructional goal-state.

"Or" is used in the inclusive sense.

Fig. 1--Continued
(b) No set of instructional rules (strategy) may constitute a logical contradiction of the set of curricular rules under which that strategy is invoked.

(c) The set of instructional rules (strategy) must be logically relevant* to the set of curricular rules under which that strategy is invoked.

*Logical relevance means that the instructional strategy should specify teacher actions to be taken in fulfillment of the curricular rules.

(d) All instructional rules must be permissible in reference to the fundamental values and ethical postulates of the profession.

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Explication and Justification of the Conditions of Adequacy

The first condition of an adequate instructional claim is as follows: C(1): The instructional claim should have empirical import. A claim is said to have empirical import if each of its expressions, ostensibly serving as extra-logical components, has the potential for empirical realization.

The instructional strategy rules must have empirical implications if they are to fulfill their function of guiding teacher action. The instructional goal-state representation also must have some potential realization in order to function as an end toward which useful means are
designed. A practical claim whose means and ends components have no potential empirical realizations belies its own purpose of expressing the belief that implementation of its stated means will lead to attainment of its stated ends.

Where certain logical forms are used in goal-state or strategy representation, empirical import is precluded. For example, neither logical contradictions nor tautological statements can have empirical implications. To allow a logical contradiction is to permit use of expressions devoid of meaning. For example, consider the set of strategy rules: "In situation S, always do A" and "In situation S, always do not-A." There is no possible set of actions which conforms to this set of rules.

A tautology is a statement form which is true regardless of the particular extra-logical terms that are used. A tautology is devoid of empirical meaning; it cannot be judged on the basis of observational evidence. For example, the statement At noon tomorrow it will either rain or it will not rain, is necessarily true. Such a statement is true regardless of weather conditions; hence, it is tautological.

The second and third conditions of adequacy are:

\( C(2) \): The extra-logical components of an instructional claim should be characterized by internal coherence,
and C(3): The extra-logical components of an instructional
claim should be characterized by external coherence in
reference to the relevant curricular claim and the profes-
sional bases. The concept of "coherence" is concerned with
the quality of logical or functional integration. An
object is said to be coherent if the different parts of the
object fit together. Different objects, perhaps objects of
quite different kinds, are said to be coherent if they fit
together in a compatible way. To say that something is
characterized by "coherence" implies that there exists a
systematic connectedness or interrelatedness among its
various aspects or components.

For example, an individual whose statements are re-
lated to each other in sound logical patterns is said to be
"coherent." If a person's actions are characteristically
in accord with his espoused values, we say that he has a
high degree of "integrity"; i.e., his actions and statements
constitute a "coherent fit." If the various aspects of a
work of art belong together, the painting is said to have
"unity," i.e., "coherence." If the members of a barber
shop quartet sing in individual patterns that "fit," we say
that they have good "harmony," i.e., "coherence." When the
movements of two trapeze artists mesh so that one catches
the other after a mid-air stunt, we admire their "timing,"

i.e., the temporal fit of their movement-patterns (i.e.,
"coherence").
The concept of "coherence" is applicable to the arts and sciences, to the logical and empirical worlds, to cognitive and moral domains, and to theoretical and practical fields. In addition to being a concept, coherence is also a fundamental value which has widespread subscription in professional, scientific, and artistic fields. Credibility in the sphere of rational men, as well as practical instructional richness and utility, requires that the linguistic structures of instruction also satisfy the universal desideratum of coherence.

An instructional claim should possess both internal coherence and external coherence. The second condition of an adequate instructional claim, namely $C(2)$ is met when the claim has internal coherence.

Condition $C(2)-(a)$ is concerned with the aspect of coherence within the instructional goal-state representation and is as follows: For an instructional goal-state:

1. each concept or each sentence should be connected, via chains of identifiable relationships, to every other concept or sentence, and
2. neither different logical functions nor different levels of resolution are confounded within the instructional goal-state structure.

The first condition prevents the inclusion of discrete concepts or sentences by requiring that each concept or sentence be linked to every other concept or sentence.
A goal-state component that is unrelated to the other components does not "fit" or "belong" to that configuration although it may fit a goal-state configuration associated with some other instructional claim. In addition to having the value already cited, the requirement of interrelatedness among the various aspects of an instructional goal-state also has empirical support in the learning principle that retention of related concepts or principles is greater than retention of unrelated concepts or principles.

The second condition under $C(2)-(a)$ is met when there is no confounding of different logical functions or different levels of resolution within the instructional goal-state structure. For example, this condition would preclude the confounding of primitive and derived sentences within goal-state representations. It also preserves the functional aspects of systematic structures. From the perspective of level of resolution, it provides assurance against such shifts of perspective as from a macroscopic point of view to a microscopic point of view within an ostensibly singular framework. For example, suppose that an instructional goal-state is comprised of the following two components:

| Comprehension of the principles of scientific inquiry |
| Comprehension of the relationship between explanatory statements and that which is explained in empirical science. |
These statements are set forth ostensibly as instructional goal-state components that have identical functions within the goal-state structure; they each provide unique information. Upon analysis of meanings of the two components, however, it becomes clear that the second component is a logical derivative of the first component. Therefore, the function of the second component is only that of providing partial explication of the first component. It provides no information not available in the first component. Thus, the second component is ostensibly used not as a component having an explicating function, but as a component providing unique information parallel to that of the first component; the function of the second component is confounded with the function of the first component.

Suppose that an instructional goal-state is framed in the following manner:

Comprehend the meaning of "value"

Interpret the defining properties of "action" and translate those properties into the form of positive instances of "action"

The first component is expressed in terms of the highest level of resolution in the language of the Bloom Taxonomy; i.e., the level of resolution at which the major classes are framed: knowledge, comprehension, application, analysis, synthesis, evaluation.
The second goal-state component, however, is expressed at a lower level of resolution in the Bloom Taxonomy language. It is expressed in the terms "interpret" and "translate," which are used in describing the structure of the concept "comprehension."

Condition $C(2)-(b)$ is as follows: For a set of instructional rules: (1) neither different logical functions nor different levels of resolution are confounded within the instructional-rule structure, and (2) the particular rules that are relevant to the expected acting-situations are capable of realization in conjunction with each other. This condition constitutes specific criteria of coherence within a set of instructional rules. The first condition is met when there is no confounding of different logical functions or different levels of resolution within the instructional-rule structure. For example, the terms used in the set of instructional rules should belong to the same conceptual system. The second condition requires that the particular rules relevant to the expected acting-situations be capable of realization in conjunction with each other. This condition is satisfied if (1) no two rules entail conflicting actions in a given situation and (2) no rule leads to a predicament from which there is no permissible outlet.
Condition \(C(3)\) is as follows: The extra-logical components of an instructional claim should be characterized by external coherence in reference to the relevant curricular claim and the professional bases. External coherence is concerned with the interrelatedness between the components of the instructional claim and the components of the relevant curricular claim, and between the components of the instructional claim and the professional bases.

Condition \(C(3)-(a)\) is as follows: The instructional goal-state must be: (1) logically relevant or empirically relevant to the curricular goal-state, or (2) logically relevant or empirically relevant to the curricular-rule set. Fulfillment of this condition is necessary to the instructional claim's purpose of facilitating effective implementation of the curricular rules in order to gain pupil attainment of the curricular goal-state.

Conditions \(C(3)-(b), (c),\) and \(d\) are fulfilled by an instructional strategy when the strategy rules are related in certain ways to curricular claim components and the professional value and ethical orientations. Display and further explanation of each of these "conditions of external coherence" follow.

Condition \(C(3)-(b)\) is as follows: No set of instructional rules (strategy) may constitute a logical contradiction of the set of curricular rules under which
that strategy is invoked. This condition ensures that the set of instructional rules will not prevent realization of the conditions embedded within the set of curricular rules.

Condition \( C(3)-(c) \) is as follows: The set of instructional rules (strategy) must be logically relevant to the set of curricular rules under which that strategy is invoked. This condition is met when the set of instructional rules specifies teacher actions to be taken in fulfillment of the curricular rules. These conditions imposed on the instructional-rule set are necessary to the instructional claim's purpose of being instrumental to realization of the conditions embedded within a curricular claim.

Condition \( C(3)-(d) \) is as follows: All instructional rules must be permissible in reference to the fundamental values and ethical postulates of the profession. This condition is necessary in order for the ethical postulates to fulfill their function. The function of a teacher's ethical postulates, in fact, is to guide the way in which the teacher interacts with the pupil. This guidance has two different aspects. On one hand the ethical postulates provide some substantive information appropriately embedded in instructional rules. On the other hand they establish prohibitions as to substantive information that may not be embedded in instructional rules.
Factual Validation of an Instructional Claim

The component propositions of an instructional claim, i.e., antecedent and consequent propositions, may be judged to be valid or contravalid on the basis of observation sentences.* If the extra-logical conditions of a proposition correspond with a set of relevant observation sentences, the proposition is judged to be "valid." If the set of observation sentences stands in contradiction to the proposition's extra-logical conditions, then the proposition is judged to be "contravalid."

An instructional claim** may be judged factually valid, factually contravalid, or factually indeterminate, where that decision depends upon the judgments as to the validity of the component propositions of that claim. Suppose that the proposition "the pupil satisfies qualifying conditions Q and the teacher satisfies qualifying conditions M" is valid, the proposition "the teacher acts under strategy R" is valid, and the proposition "the pupil

*An observation sentence is a sentence affirming or denying that a given object, or sequence of objects, possesses particular observable attributes (see Hempel, 1965, pp. 22-24).

**An instructional claim is a compound proposition that houses simple propositions as components; these component propositions include antecedent propositions, consequent propositions, and propositions which comprise the qualifying conditions.

***The factual validity of a proposition is judged on the basis of observation sentences. It is important to distinguish between factual validity and logical validity.
has attained the goal-state" is valid. Then the instructional claim that houses those component propositions is judged to be factually valid; i.e., the belief that implementation of the set of rules led to attainment of the goal-state by the pupil was confirmed.* This is the only circumstance under which the claim may be declared to be valid. Such a combination of judgments of component propositions and the corresponding judgment of factual validity of the instructional claim are shown in the first row of Figure 2.

However, suppose that the proposition "the pupil satisfies qualifying conditions Q and the teacher satisfies qualifying conditions M" is valid, the proposition "the teacher acts under strategy R" is valid, and the proposition "the pupil has attained the goal-state" is contra-valid. Then the instructional claim is judged to be factually contravalid; i.e., it is not the case that implementation of the strategy rules led to attainment of the goal-state by the pupil under the specified set of conditions. This is the only circumstance under which the claim may be declared to be contravalid. Such a combination of judgments of component propositions and the

*Confirmation of empirical propositions is always tentative, the degree of confidence one attaches to a judgment that a claim has been "confirmed" depends upon the consistency of outcomes and the variety of supporting evidence.
<table>
<thead>
<tr>
<th>Pupil satisfies conditions Q and teacher satisfies conditions M</th>
<th>Teacher acts under strategy R</th>
<th>Factual Validity of Instructional Claim</th>
</tr>
</thead>
<tbody>
<tr>
<td>valid</td>
<td>valid</td>
<td>valid</td>
</tr>
<tr>
<td>invalid</td>
<td>invalid</td>
<td>invalid</td>
</tr>
<tr>
<td>contravalid</td>
<td>contravalid</td>
<td>contravalid</td>
</tr>
<tr>
<td>indeterminate</td>
<td>indeterminate</td>
<td>indeterminate</td>
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<td>indeterminate</td>
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</tr>
<tr>
<td>indeterminate</td>
<td>indeterminate</td>
<td>indeterminate</td>
</tr>
</tbody>
</table>

Fig. 2—Factual validity of an instructional claim.
corresponding judgment of factual validity of the instructional claim are shown in the second row of Figure 2.

Other circumstances may arise, however, in which an instructional claim is judged to be factually indeterminate. Certain combinations of judgments as to the validity of its component propositions make it impossible to reach a justified decision as to whether an instructional claim is "valid" or "contravalid." In such a case the instructional claim is judged to be "factually indeterminate." For example, suppose that the proposition "the pupil satisfies qualifying conditions Q and the teacher satisfies qualifying conditions M" is valid, the proposition "the teacher acts under strategy R" is contravalid, and the proposition "the pupil has attained the goal-state" is valid. Then a judgment of "indeterminate" is assigned to the claim. The set of procedural rules was not invoked by the teacher; hence, there can be no justified judgment as to the means-ends relationship. To clarify the reasons for these conclusions, consider the following hypothesis:

Under the condition that there is no segment of I-20 between Dallas and Shreveport where the speed limit is less than 55 miles per hour,

if Henry drives his auto on I-20 at the maximum speed limit, starting at Dallas and heading toward Shreveport,

then he will arrive at Shreveport in less than three hours.
Suppose these observation sentences report Henry's actions and the outcome:

Henry takes an airplane from Dallas to Shreveport.

The plane leaves Dallas at 3:00 P.M. and arrives in Shreveport at 4:00 P.M. the same day (the elapsed time is 1 hour).

On the basis of this set of observation sentences, what judgment can be made as to the validity of the hypothesis? The observation sentences support the belief that the goal-state is attained, but do not support the belief that Henry acted under the procedural rules (i.e., Henry did not drive his auto, but took an airplane). From this information, no justified judgment of either "valid" or "contravalid" can be made about the factual validity of the hypothesis; hence, the claim is judged to be "factually indeterminate." Such a combination of judgments of component propositions and the corresponding judgment of factual validity of the instructional claim are shown in the third row of Figure 2.

Now, consider the same hypothesis and these observation sentences which report the prevailing circumstance, Henry's actions, and the outcome:

Twenty miles of I-20 is under repair and the maximum speed limit is 25 miles per hour in the repair zone.

Henry drives his auto from Dallas to Shreveport at the maximum speed limit.

Henry leaves Dallas at 1:00 P.M. and arrives in Shreveport at 5:00 P.M. the same day (the elapsed time is 4 hours).
These observation sentences support the belief that Henry acted under the procedural rules, but support neither the belief that the goal-state is attained nor the belief that the qualifying condition is satisfied. There is no test of the asserted if-then hypothesis because its associated qualifying conditions were not fulfilled; the observed facts that twenty miles of I-20 is under repair and there is a 25 mile per hour speed limit in the repair zones stands in contradiction to the conditions under which the if-then relation was claimed to be valid. Thus, the set of observation sentences neither confirms nor disconfirms the hypothesis; hence, the hypothesis is judged to be "factually indeterminate." Such a combination of judgments of component propositions and the corresponding judgment of factual validity of the instructional claim are shown in the sixth row of Figure 2.

Judgments of factual validity of an instructional claim are shown in Figure 2 for various combinations of judgments of its component propositions. However, the figure does not contain the cases where component propositions are judged to be "indeterminate." This possibility gives rise to numerous additional combinations, but in each case where a component proposition is judged to be "indeterminate," the judgment of the validity of the instructional claim is always "indeterminate."
An Example of an Instructional Claim Which Satisfies the Conditions of Adequacy

If an instructional claim is to facilitate realization of the various conditions embedded within a governing curricular claim, certain fundamental relationships are mandated between the components of the instructional claim and components of the curricular claim. These relationships were explicated in the preceding section as conditions of adequacy. The purposes of this section are (1) to set forth an example of an instructional claim which is claimed to satisfy the conditions of adequacy and (2) to justify this claim.

An illustrative curricular claim is displayed in Figure 3. All illustrative instructional claims of this study, whether individual or in a system, will be framed in reference to that illustrative curricular claim. Curricular claim formation was governed by the conditions of adequacy as delineated in Chapter III.

If the conditions of adequacy are satisfied, a set of curricular rules has both a content aspect and a process aspect. The content aspect consists of specification of the things with which teacher and pupil shall deal (e.g. facts, concepts, principles, problems, movements, physical objects), and specification of how they are interrelated.

The process aspect consists of rules that specify how teacher and pupil shall act in reference to those things
CURRICULAR QUALIFYING CONDITIONS

C(1): The pupil comprehends basic principles of inductive and deductive logic.

C(2): The pupil has a favorable disposition toward reason in the realm of values and practical action.

C(3): The pupil is willing and able to assume a creative role in problem solving.

CURRICULAR RULES: CONTENT

R(1): Teacher and pupils will deal with (a) problems that entail explanation, justification, and evaluation of action, where the explanation, justification, or evaluation is grounded in values; and (b) concepts and principles that belong to the conceptual structure displayed below:

<table>
<thead>
<tr>
<th>Conceptual Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Action</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Explanation</td>
</tr>
<tr>
<td>Justification</td>
</tr>
<tr>
<td>Value</td>
</tr>
<tr>
<td>Evaluation</td>
</tr>
<tr>
<td>Principles of explanation of action</td>
</tr>
<tr>
<td>Principles of justification of action</td>
</tr>
<tr>
<td>Principles of evaluation of action</td>
</tr>
</tbody>
</table>

"A→B" means "The meaning of A is used in the meaning of B."

R(2): The set of problems will be framed in reference to both simulated environments and real environments.

Fig. 3--An illustrative curricular claim
CURRICULAR RULES: PROCESS

Initiation Rules

R(3): The teacher will select and propose each concept, principle, or problem for acceptance by specified sets of pupils.

R(4): The teacher will propose conceptual elements and problems in a sequence such that the following conditions are satisfied:

(a) If the meaning of a conceptual element A is used in the meaning of conceptual element B, then conceptual element A must precede element B.

(b) Each concept or principle must precede any problem where adequate solution efforts entail use of that concept or principle.

(c) Problems whose solutions entail explanation, justification, or evaluation of actions in reference to simulated environments must precede problems whose solutions entail explanation, justification, or evaluation of actions in reference to real environments.

R(5): Teacher and pupil action in reference to a teacher's proposal will commence when the pupil accepts that proposal.

Activity Rules

R(6): For conceptual-development activity, these rules will apply:

(a) The teacher will introduce each new concept or principle, where the introduction includes clarification of the meaning of each concept or principle.

(b) The teacher is permitted to ask questions of fact, inference, explanation, evaluation, or justification in reference to the concepts or principles; and is obligated to attempt to provide valid responses to pupil questions.

Fig. 3--Continued
(c) The pupil is permitted to ask any question which is relevant to the current conceptual elements; and is obligated to attempt to offer valid responses to teacher questions.

R(7): For problem-activity these rules will be in effect:

(a) Each pupil will assume independent responsibility for planning and conducting his problem solving efforts.

(b) The teacher is obligated to provide critical analysis on request of the pupil; and is permitted to provide substantive guidance, but only indirectly, by asking questions to which the pupil provides the answers.

Termination Rules

R(8): Pupil activity in reference to the conceptual elements will terminate when the pupil has passed a comprehension test over the relevant concepts or principles.

R(9): Pupil activity in reference to a problem will terminate when:

(a) the pupil claims an adequate solution has been reached, or else claims further solution efforts are not useful;
(b) the pupil offers reasons supporting the claim made; and
(c) the teacher accepts the claim as valid.

Evaluation Rules

R(10): The teacher is obligated to evaluate each pupil in reference to:

(a) conceptual-development activities under the conditions of adequate comprehension of meaning, and
(b) problem-solving activities under the principles of problem-solving.

Fig. 3--Continued
R(11): Each pupil, and the teacher, is obligated to evaluate all significant statements and actions (by self or others) under the conditions of (a) adequate language usage, (b) principles of deductive or inductive logic, or (c) rational action; and is obligated to justify his own curricular statements and actions.

CURRICULAR GOAL-STATE

Competence*

in

the use of values to explain, justify, and evaluate practical action

*Definition: An individual is said to be competent in the use of values to explain, justify, and evaluate practical action, if and only if:

(a) that individual characteristically performs the action of explaining, justifying, and evaluating practical action on appropriate occasions, and

(b) does so in a manner that is consistent with credible value orientations and credible principles of explanation, justification, and evaluation of practical action.

Fig. 3--Continued
(the "content"), and how they shall act in reference to each other. These rules should indicate (a) how curricular activities shall be initiated, (b) how the activities shall be conducted, (c) how the activities shall be terminated, and (d) how the activities shall be evaluated. Moreover, that which is obligatory, permissible, and not permissible in initiating, conducting, terminating, and evaluating curricular activity should be indicated for both teacher and pupil.

From the teacher's point of view, a variety of actions is entailed by the curricular rules. The teacher must perform actions in initiating, conducting, terminating, and evaluating curricular activities, and in reference to the specified "content." Any of the process aspects of a set of curricular rules may specify general lines of teacher action, but may provide little guidance as to the specifics of particular teacher acts. Such circumstances constitute the occasions of instructional-claim formation. An occasion of instructional-claim formation may arise in reference to the initiation, conduct, termination, or* evaluation aspects of the set of curricular rules.

An illustrative instructional claim is shown in Figure 4. The function of this instructional claim is to guide the

* "Or" is used in the inclusive sense.
**INSTRUCTIONAL QUALIFYING CONDITIONS**

C(1): The pupil satisfies the set of curricular qualifying conditions.

C(2): The pupil is willing to attempt to realize the implications of the initial proposal accepted under the initiation rules of the curricular claim (assume that the proposal entails introduction of all concepts and principles embedded in the conceptual structure of curricular rule R(1)).

**INSTRUCTIONAL STRATEGY**

R(1): The set of concepts and principles will be introduced (by the teacher) in this sequence:

<table>
<thead>
<tr>
<th>Order of introduction</th>
<th>Concept or principle</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>action</td>
</tr>
<tr>
<td>2</td>
<td>&quot;a reason&quot;</td>
</tr>
<tr>
<td>3</td>
<td>value</td>
</tr>
<tr>
<td>4</td>
<td>explanation</td>
</tr>
<tr>
<td>5</td>
<td>explanation of action</td>
</tr>
<tr>
<td>6</td>
<td>justification</td>
</tr>
<tr>
<td>7</td>
<td>justification of action</td>
</tr>
<tr>
<td>8</td>
<td>evaluation</td>
</tr>
<tr>
<td>9</td>
<td>evaluation of action</td>
</tr>
</tbody>
</table>

Fig. 4--An illustrative instructional claim
R(2): For each concept specified by rule R(1), the teacher will:

(a) display the connotation of the concept, and
(b) invoke questioning tactics allowed by curricular rule R(6)-(b) in guiding the pupil toward:
   (1) displaying the denotation of the concept, and
   (2) displaying the relationships of the concept to other relevant concepts.

R(3): For each principle introduced, the teacher will:

(a) display the connotation of each extra-logical concept unless that concept has been introduced previously, and
(b) invoke questioning tactics allowed by rule R(6)-(b) in guiding the pupil toward illustrating application of the principle.

R(4): If a pupil fails to comprehend a concept or principle on an occasion of evaluation, then the teacher will attempt to implement a remedial strategy in reference to that pupil.

INSTRUCTIONAL GOAL-STATE

Comprehension of

the concepts of action, "a reason," value, explanation, justification, and evaluation; and

the principles of explanation of action, justification of action, and evaluation of action.
teacher's attempt to fulfill the conditions of the curricular activity rules governing conceptual-development activity (i.e., curricular rule R(6)). Assumptions underlying the illustrative instructional claim are that (a) an initial set of curricular activities has been proposed and accepted under initiation rules R(3), R(4), and R(5) of the curricular claim (Figure 3), (b) each pupil is willing to attempt realization of the implications of the accepted proposal, and (c) each pupil satisfies the set of curricular qualifying conditions. The illustrative instructional claim (Figure 4) is believed to satisfy all the conditions of an adequate instructional claim delineated in Figure 1. The justification of this belief is presented in the following section.

Justification of the Adequacy of the Claim

Condition 1: The instructional claim should have empirical import. --The instructional claim contains extralogical components having empirical implications. No component contains a tautology or a logical contradiction that precludes empirical interpretations. It is possible for the strategy component to be fulfilled by teacher actions and the goal component represents some possible pupil state. The qualifying conditions describe pupil characteristics which have empirical referents. The
instructional claim's antecedent and consequent propositions, taken individually and as a whole, are capable of empirical test.

Condition 2: The extra-logical components of an instructional claim should be characterized by internal coherence.--The instructional goal-state contains first-order concepts and principles that constitute the "content" with which one is concerned, i.e., the concepts of action, "a reason," value, explanation, justification, and evaluation; and the principles of explanation of action, justification of action, and evaluation of action. The goal-state also contains a second-order concept, i.e., "comprehension," which denotes a relation between an individual and "content." The meaning of "comprehension" is explicated in terms of the operations of interpretation, translation, and extrapolation in the Bloom (1956) Taxonomy of Educational Objectives. The intended relations among the first-order concepts and principles are clearly identified in R(1) of the curricular claim (Figure 3). The meaning of each concept is utilized in the meaning of other concepts or principles. The principles share a common logical structure which is adapted for conceptually similar, but functionally unique, practical uses.

Use of the second-order concept of "comprehension" fits the first-order concepts and principles since it is
appropriate to say that "X comprehends concept C" and "X comprehends principle P." This usage has been documented by Bloom (1956).

Neither different logical functions nor different levels of resolution are confounded within the instructional goal-state structure. The first-order concepts and principles that constitute the "content" of concern are not confounded with the second-order concept of "comprehension" that denotes a relationship between an individual and the content, e.g. "Henry comprehends the concept of 'action'."

There is neither a confounding of different logical functions nor different levels of resolution with the set of instructional rules. For example, the first-order concepts (e.g. "action," "a reason," "value," etc.) are not confounded with the second-order concepts (e.g. "display the connotation," "invoke questioning tactics") which denote ways of dealing with the first-order concepts.

The particular rules that are relevant to the expected acting-situation are, also, capable of realization in conjunction with each other. If, for example, a teacher is trying to promote comprehension of the concepts enumerated in the instructional goal-state, strategy rules R(1), R(2), and R(4) apply. Rule R(1) specifies the sequence of the concepts presented, R(2) specifies the manner of
presentation, and R(4) specifies what to do if the pupil fails to comprehend the concept; all of these rules are capable of realization in conjunction with each other. The same conclusion is reached if the teacher is trying to promote comprehension of the principles listed in the instructional goal-state; namely, rules R(1), R(3), and R(4) are capable of realization in conjunction with each other.

Condition 3: The extra-logical components of an instructional claim should be characterized by external coherence in reference to the relevant curricular claim and the professional bases. The instructional goal-state is logically relevant to the curricular goal-state, i.e., the instructional goal-state is a logical derivation of the curricular goal-state. There is no information contained in the instructional goal-state which is not contained in the curricular goal-state. For these reasons the instructional goal-state is claimed to be characterized by external coherence.

The instructional rules are characterized by external coherence. There exists no contradiction between the set of instructional rules and the set of curricular rules under which that strategy is invoked. The set of instructional rules is logically relevant to the set of curricular rules (i.e., the instructional rules specify teacher actions to be taken in fulfillment of the
curricular rules). Also, all instructional rules are permissible in reference to the fundamental values and ethical postulates of the profession. Since the instructional rules and instructional goal-state satisfy the conditions of external coherence contained in C(3), the extra-logical components of the illustrative instructional claim are believed to be characterized by external coherence.

The illustrative instructional claim has been examined against the conditions of adequacy, has been found to satisfy these conditions, and justifications of these judgments have been set forth. Consequently, the claim is considered to be an adequate instructional claim; that is, the claim is considered to be capable of useful functioning.
CHAPTER VI

INSTRUCTIONAL-CLAIM SYSTEM

The Concept of an Instructional-Claim System

Occasions of instructional-claim formation are stimulated by various combinations of governing curricular rules. There is no logical limit to the number or variety of instructional claims that can be framed in reference to a given curricular claim. The set of instructional claims formulated in reference to a particular curricular claim may contain only related claims or may include discrete claims unrelated to other claims. Where a cluster of interrelated instructional claims is formed, the claims, in conjunction with their connecting links, will be called an instructional-claim system.

Systemic instructional claims can be linked in either functional (empirical) or logical ways. Feasible connections of these kinds are illustrated in the following paragraphs.

The goal-state and strategy of one instructional claim may take into account a significant, but distinctly different, set of variables from that of another instructional claim. Where the strategy rules of an instructional claim fail to take a crucial consideration into account, the
resulting gap may give rise to the need for another instructional claim whose strategy rules plug the gap. Thus, incompleteness in the strategy component of one claim may result in the formation of additional claims which serve to "complete" the original claim. Such instructional claims are complementary claims; such claims are functionally connected.

An instructional claim which is complementary to the instructional claim shown in Figure 4 is illustrated in Figure 5. The claim in Figure 4 specifies no rules for the assessment of pupil comprehension of the concepts or principles of concern; yet, rule 4 of the displayed strategy specifies what to do in consequence of an assessment of comprehension.

The instructional claim in Figure 5 complements the claim in Figure 4 by providing a strategy for pupil assessment of his comprehension of the concepts and principles of concern. It should be noted that the claim in Figure 5 is implemented in tandem with the claim in Figure 4, and both of these instructional claims are governed by the curricular claim.

Two instructional claims are logically connected if the goal-state of claim B is derived from, is necessary to, or is a component of, the goal-state of instructional claim A. One possible case of such a connection is where
**INSTRUCTIONAL QUALIFYING CONDITIONS**

C(1): The pupil satisfies the set of curricular qualifying conditions.

C(2): The pupil is willing to attempt to realize the implications of the initial proposal accepted under the initiation rules of the curricular claim.

C(3): The pupil comprehends all prior concepts and principles introduced under rule R(1) of the complementary instructional strategy (i.e. the instructional strategy displayed in Figure 4).

C(4): The conditions of either rule R(2) or R(3) of the complementary instructional strategy (displayed in Fig. 4) have been fulfilled in reference to the currently relevant concept or principle, and the pupil has attempted to comprehend the information introduced.

**INSTRUCTIONAL GOAL-STATE**

Pupil assessment of his comprehension of the concepts of action, "a reason," value, explanation, justification, and evaluation; and the principles of explanation of action, justification of action, and evaluation of action.

**INSTRUCTIONAL STRATEGY**

R(1): A set of examples will be displayed (by the teacher) where one of these conditions is satisfied:

(a) If a concept is of current relevance, then the examples will include both positive and negative instances of the concept; or

(b) If a principle is of current relevance, then the examples will include ostensible applications of the principle that are both sound and unsound.

Fig. 5--An illustrative complementary instructional claim
R(2): Display example and ask the relevant question:
"Does this example constitute a positive instance of concept C?"
or
"Does this example constitute a sound application of principle P?"

R(3): Ask the relevant question as to connotation:
If a concept is of current relevance, ask the pupil to document the connotation of the concept;
or
If a principle is of current relevance, ask the pupil to interpret the principle (i.e. explain its meaning in the pupil's own words).

R(4): Having obtained responses from each pupil in reference to rules R(2) and R(3), the teacher will follow these sequential steps in clarifying the nature of acceptable responses:

```
start

Ask relevant question specified by R(2) and then by R(3)

Solicit judgment of a single pupil; and supporting reasons

Display next example

Is pupil judgment/reasons sound?

yes

no

Guide pupil in identifying the defect

Select a different pupil
```

R(5): Ask the pupil to make a judgment as to whether he comprehends the concept or principle of current relevance and provide reasons in support of his judgment.

Fig. 5--Continued
instructional claim A is at a more primitive level of a hierarchy of claims than instructional claim B. Such a connection is illustrated by the pair of instructional claims in Figure 6 and in Figure 4. The instructional goal-state shown in Figure 4 is concerned with the comprehension of all the concepts and principles introduced, while the goal-state of the claim shown in Figure 6 is concerned only with the comprehension of one introduced concept, i.e., value. The instructional claim specified by Figure 6 is invoked when the concept of "value" occurs in the sequence of concepts identified by rule 1 in Figure 4, i.e., after the pupil comprehends the concepts of "action" and "a reason."

Another type of logical connection between two instructional claims is where instructional claim B is a predecessor of instructional claim A in a temporally ordered (invoked) chain of claims. Such a related pair of instructional claims is illustrated by the claims shown in Figure 4 and Figure 7. While the claim in Figure 4 is concerned only with the comprehension of all concepts and principles introduced, the claim in Figure 7 contains a problem-solving strategy whose goal is "competence in the use of values to explain, justify and evaluate individual action in a simulated environment."
INSTRUCTIONAL QUALIFYING CONDITIONS

C(1): The pupil satisfies the set of curricular qualifying conditions.

C(2): The pupil is willing to attempt to realize the implications of the initial proposal accepted under the initiation rules of the curricular claim.

C(3): The pupil comprehends the concepts of "action" and "a reason."

INSTRUCTIONAL GOAL-STATE

Comprehension of the concept "value."

INSTRUCTIONAL STRATEGY

R(1): Display this connotation of "value":

If "V" is a value of Miss Jones, then:

(a) Miss Jones has deliberately subscribed to 'V';
(b) Miss Jones characteristically invoked 'V' as a primitive basis for the justification and evaluation of her actions; and judges favorably similar appeals to 'V' by others; and
(c) There is some possible state of affairs that constitute a realization of 'V'.

Fig. 6--An illustrative hierarchical instructional claim
R(2): Clarify the denotation of the concept "value" by following these sequential steps:

1. Display a set of conditions such that it is the case that "V is a value of X" (case #1)
2. Replace "it is the case that V is a value of X" with "it is not the case that V is a value of X" (case #2)
3. Ask question: "Is V a value of X?"
4. Solicit judgment of a single pupil and supporting reasons
5. Select new set of conditions
6. Ask set of questions whose goal is identification of the defect by the pupil

Fig. 6--Continued
INSTRUCTIONAL QUALIFYING CONDITIONS

C(1): The pupil satisfies the set of instructional qualifying conditions listed in Figure 4.

C(2): The pupil comprehends all concepts and principles introduced under rule R(1) of the instructional strategy displayed in Figure 4.

INSTRUCTIONAL GOAL-STATE

Competence in the use of values to explain, justify, and evaluate individual action in simulated environments

INSTRUCTIONAL STRATEGY

R(1): The teacher will propose an ordered set of problems of explanation, justification, and evaluation of individual action where the problems are framed in reference to the simulated social and value environments shown in the following tabular display.

<table>
<thead>
<tr>
<th>Order of Problems</th>
<th>Operation Entailed in Problem Resolution</th>
<th>Environmental Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Societal Conditions</td>
</tr>
<tr>
<td>1</td>
<td>explain</td>
<td>one individual living</td>
</tr>
<tr>
<td>2</td>
<td>justify</td>
<td>in isolation</td>
</tr>
<tr>
<td>3</td>
<td>evaluate</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>explain</td>
<td>two individuals living</td>
</tr>
<tr>
<td>5</td>
<td>justify</td>
<td>in isolation</td>
</tr>
<tr>
<td>6</td>
<td>evaluate</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>explain</td>
<td>large no. of individuals</td>
</tr>
<tr>
<td>8</td>
<td>justify</td>
<td>living in a community</td>
</tr>
<tr>
<td>9</td>
<td>evaluate</td>
<td></td>
</tr>
</tbody>
</table>

Fig. 7—An illustrative problem-solving instructional claim
R(2): (This rule is invoked if the set of problems has been proposed by the teacher and accepted by the pupil in a manner governed by the curricular initiation rules.) In reference to the currently relevant problem, the teacher will offer the opportunity of critical analysis by the teacher when the pupil has formed a tentative problem-solving plan or a tentative problem solution.

R(3): In conducting a critical analysis of the pupil's problem-solving plan or tentative solution, the teacher will follow these procedures:

(a) Invoke the following criteria in the indicated ordered stages:

<table>
<thead>
<tr>
<th>Stage</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Adequacy of meaning</td>
</tr>
<tr>
<td></td>
<td>Relevance to the problem</td>
</tr>
<tr>
<td>2</td>
<td>Coherence</td>
</tr>
<tr>
<td></td>
<td>Comprehensiveness</td>
</tr>
<tr>
<td></td>
<td>Potential utility</td>
</tr>
<tr>
<td>3</td>
<td>Factual validity</td>
</tr>
</tbody>
</table>

(b) If the plan or solution is judged inadequate at any stage of the analysis, terminate further analysis until the pupil has attempted reformulation to satisfy the relevant criteria.

Curricular rule R(4)-(b) of the governing curricular claim (Figure 3) requires that the instructional claim concerned with comprehension of concepts (Figure 4) be invoked before the claim dealing with problem activity utilizing these concepts (Figure 7). It should be noted that curricular rule R(4)-(c) of the governing curricular claim
(Figure 3) requires that problems dealing with actions in a simulated environment must precede problems dealing with actions in a real environment. Consequently, any instructional claim formulated to deal with problems in a real environment must be invoked after the claim in Figure 7.

Instructional claims may also be logically connected in a way that is quite different from the logical connections described in the preceding paragraphs. For example, logical connections may exist between the two instructional claims A and B because A and B are both logically related to a governing instructional claim or curricular claim. If the two instructional claims were divorced from their governing instructional or curricular claim context and examined individually, the connections between the two claims would not be apparent. However, once the two claims are put in the context of their governing instructional claim or curricular claim, the logical connection between the two claims becomes apparent.

An example of two instructional claims connected in this manner is illustrated in Figure 8 and Figure 9. The claims in Figure 8 and Figure 9 are each logically related to the governing instructional claim shown in Figure 4. The governing instructional claim is concerned with comprehension of all concepts and principles specified by the curricular claim; and the claims in Figures 8 and 9 are
INSTRUCTIONAL QUALIFYING CONDITIONS

C(1): The pupil satisfies the set of instructional qualifying conditions listed in Figure 4.

INSTRUCTIONAL GOAL-STATE

Comprehension of the concept of "action"

INSTRUCTIONAL STRATEGY

R(1): Display the connotation of the concept "action":

(1) An action must always be done by an agent; a description of the form "The agent did X" must always be applicable.

(2) An action is an event over whose occurrence the agent exercises control; i.e. it is not mere behavior nor a "happening."

(3) There is a critical difference between doing not-X, which is an action, and not-doing X, which need not be an action.

(4) Every action must have an overt-activity aspect.

R(2): Display, in a random pattern, positive instances and negative instances of the concept "action," and solicit pupil judgments as to whether the displayed instance constitutes realization of the concept.

R(3): For each pupil judgment, ask for the supporting reason, and do either (a) or (b):

(a) If the reason is sound, accept the reason and judgment as valid.

(b) If the reason is not sound, pursue a line of questioning designed toward pupil discovery of the defect.

R(4): Solicit pupil selection or construction of positive instances of the concept and for each instance proposed (i.e. a judgment), invoke rule R(3).

Fig. 8—An illustrative instructional claim which is logically related to a governing instructional claim
INSTRUCTIONAL QUALIFYING CONDITIONS

C(1): The pupil satisfies the set of instructional qualifying conditions listed in Figure 4.

C(2): The pupil comprehends the following concepts or principles: action, "a reason," value, explanation, explanation of action, and justification of action.

INSTRUCTIONAL GOAL-STATE

Comprehension of the concept of evaluation

INSTRUCTIONAL STRATEGY

R(1): Display this definition of "evaluation":

Evaluation is measurement conducted within a value framework resulting in the assignment of a value term (e.g. good, bad; adequate, inadequate; valid, contravalid; etc.) to the object or event being judged. The assignment of a value term (i.e. the judgment) is made on the basis of:

(a) the extent to which the value (or values) is realized in the object or event; or

(b) the extent to which the object or event facilitates realization of the value (or values) by some other object or event.

R(2): Display, in a random pattern, positive instances and negative instances of the concept "evaluation," and solicit pupil judgments as to whether the displayed instances constitutes realization of the concept.

R(3): For each pupil judgment, ask for the supporting reason and do either (a) or (b):

(a) If the reason is sound, accept the reason and judgment as valid.

(b) If the reason is not sound, pursue a line of questioning designed toward pupil discovery of the defect.

R(4): Solicit pupil selection or construction of positive instances of the concept and for each instance proposed (i.e. a judgment), invoke rule R(3).

Fig. 9--An illustrative instructional claim which is logically related to a governing instructional claim
concerned only with the comprehension of the specified concepts of "action" and "evaluation," respectively. When the two claims in Figures 8 and 9 are separated from the governing instructional claim and examined, the logical connection between the two is not apparent (i.e., the concepts of "action" and "evaluation" do not appear to be necessarily related). Once the governing instructional claim is taken into account, the logical connection between the concepts becomes more apparent. The two claims shown in Figures 8 and 9 facilitate realization of the governing instructional claim. They commence where R(1) and R(2) of the governing instructional claim (Figure 4) stop.

Conditions of an Adequate Instructional-Claim System

Not only must the system of instructional claims fulfill the meaning of the concept of "instructional-claim system," but it must also satisfy additional conditions which are necessary to useful functioning. These additional conditions will be referred to as conditions of adequacy. The conditions of an adequate instructional-claim system are set forth in Figure 10.
C(1): Each instructional claim should be an adequate instructional claim (i.e., the claim satisfies the conditions of adequacy delineated in Figure 1).

C(2): The instructional-claim system should be coherent. The system is coherent if each claim is related to every other claim in at least one of the following ways:

(a) The goal-state of one instructional claim is logically relevant* to the goal-state of another instructional claim, and the instructional rules contained in each claim are not contradictory.

*Logically relevant means that the goal-state of one instructional claim is derived from, necessary to, or a component of, another instructional goal-state.

(b) An instructional claim is logically related to the same governing instructional claim or curricular claim as another instructional claim.

(c) One instructional claim complements** another instructional claim.

**One claim takes into account a significant, but distinctly different, set of variables and completes the pattern established by the strategy rules or goal-state of another claim.

Fig. 10--Conditions of an adequate instructional claim system
Justification of the Conditions of Adequacy of an Instructional Claim System

In order to satisfy the first condition of adequacy, namely C(1), any adequate instructional claim system must, first of all, contain only claims which satisfy the conditions of adequacy for an individual instructional claim delineated in Figure 1. An individual claim must be capable of useful functioning within the context of a governing curricular claim and in reference to the fundamental values of the profession before it can reasonably be expected to function in a useful way within the context of a system of claims.

Although an adequate instructional claim satisfies conditions of both internal coherence and external coherence in reference to the relevant curricular claim, additional considerations must be taken into account in order to ensure that instructional claims included within the system are coherent with each other. Condition C(2) of Figure 10 is concerned with coherence between instructional claims. It specifies ways in which claims should be related to each other in order for the system to function in a useful manner. These specified relationships between instructional claims include both logical connections and functional (empirical) connections.
The consequences of allowing instructional claims not related in the manner delineated in Figure 10 result in circumstances which thwart realization of the governing curricular claim. On one hand, such circumstances would allow instructional strategies, as well as goals, which are contradictory. On the other hand, such circumstances would make realization of the values of effectiveness and efficiency impossible.

The notion of a system of instructional claims has been developed by describing and illustrating some major features. The component claims of such a system not only are related to each other, but also are intricately connected with a governing curricular claim. The whole configuration, the curricular and instructional claims and their interrelationships, might be compared to an assembled jigsaw puzzle which reproduces some classic painting. The central section of the puzzle, analogous to the curricular claim, provides the integrating theme of the reproduction; the geometric and color relationships among its various pieces are like the complex interrelationships among the elements of a well-formed set of curricular rules and between the curricular rules and goal-state. Surrounding the central section of the puzzle are pieces that add to and illuminate the points of focus; the supplementing and facilitating functions of the surrounding pieces of the
puzzle are analogous to the functions of the instructional claims. Moreover, where the instructional claims are systemic, the dovetailing and complementing of their strategies and goal-states can be likened to the form and color fits of the puzzle pieces outside the central section. The instructional claims fit each other and fit the curricular claim as well, just as the surrounding pieces of the puzzle must fit both the central section and each other.
CHAPTER VII

SUMMARY AND IMPLICATIONS

Summary

The problem for this study was to develop (a) the concept of instructional claim and (b) credible principles for instructional claim formation and evaluation. Resolution of this problem entailed the resolution of three specific subproblems. The first subproblem is as follows: Development and justification of the concept of instructional claim and associated concepts of instructional goal-state, instructional strategy, and instructional qualifying conditions. The first step taken in order to resolve this problem was to examine the conceptual framework underlying the study with respect to the professional bases, curricular claim, and conditions of an adequate and desirable curricular claim. This examination is presented in Chapter III of the study. Next, the concept of instructional claim and its associated concepts of instructional strategy, instructional goal-state, and instructional qualifying conditions were developed with the intent of (1) having a high degree of precision, (2) constituting a coherent fit to the previously developed curricular concepts, and having the potential for contributing to the
advancement of curricular and instructional practice (see Chapter IV for these conceptual constructions). Development of instructional concepts was extended to include the concept of a system of instructional claims (see Chapter VI).

The concept of instructional claim was modeled on the general form of practical claims that is familiar in the practical sciences, but it was tailored to the unique features of teaching where teaching was viewed as a profession. The concepts of instructional claim and its associated concepts were framed to parallel the corresponding curricular concepts that had been developed in earlier work (briefly described in Chapter III). In forming the new concepts, the traditional relations between the notions of curriculum and instruction were preserved, but with increased precision, coherence, and testability.

The second and third subproblems are as follows:

Development and justification of a comprehensive set of principles for formulating instructional claims; and

Development and justification of a comprehensive set of principles for evaluating instructional claims. Principles for adequate formation of an instructional claim were developed and included (1) empirical import, (2) internal coherence within both strategy and goal-state components, and (3) connectedness between the strategy and goal-state components of an instructional claim and the means and ends
components of a governing curricular claim (see Chapter V for these principles). One function of these principles is to guide the development of instructional claims. Another important function is to guide the evaluation of instructional claims already framed. In addition to the formation principles, principles were also developed for evaluating instructional claims on the basis of observational evidence. Decision rules were developed for judging the factual validity of an instructional claim by using judgments as to the factual validity of its antecedent and consequent propositions; these decision rules are consistent with credible procedures for judging the factual validity of hypotheses in the empirical sciences.

An example of an instructional claim was presented and was claimed to satisfy the developed principles of formation. Justification of the belief that the constructed instructional claim was an adequate instructional claim was provided (see Chapter V for the developed principles of formation, examples, and justification).

Although the range of the present investigation has been confined to instructional claims and their relation to curricular claims, the author readily acknowledges the possibility of a variety of other kinds of claims that are useful in the instructional enterprise. For example, there are such auxiliary claims as those that govern distribution
of materials; they usually have such goals as "distribution of one set of materials per pupil in minimum time."

It is also worth noting that the investigator preferred to err by admitting some instructional claims that may not have much merit rather than taking the risk of ruling out potentially useful claims without good reason. This is why great care was taken in offering justifications of the principles proposed. On one hand, the attempt was made to set forth only principles that were grounded in values having universal appeal over the range of developed disciplines. On the other hand, display of both the principles and their justifications makes it possible for others to conduct analyses and perhaps detect weaknesses that escaped the author.

Principles for forming an adequate instructional-claim system were framed to include intra-system relations and extra-system relations. For the purpose of illustration, an intricately connected system of instructional claims was constructed which was claimed to satisfy the developed principles of formation (see Chapter VI for formation principles, examples, and justification of a system of instructional claims). Formation of illustrations and development of credible principles proved to be a tremendously complex task, and this accounts in part for the rather crude nature of the constructions made. The desire to avoid the error of pushing beyond that which has strong justification also contributed to the coarse quality of the principles formed.
Overview and Implications

The constructions made during the course of this investigation do not represent aspects of prevailing educational belief or practice. On the contrary, they represent aspects of an educational world toward which the present investigator is striving. The outlined conceptual framework, the concepts of curricular claim and instructional claim, and the principles of claim formation and evaluation constitute a crude representation of the new world's logical structure; the various illustrations are sketches of its curricular and instructional practice.

Distinguishing features of the hypothetical new educational world include (a) the forming of curricular and instructional plans as testable empirical claims (hypotheses), (b) the gluing together of curricular and instructional configurations into coherent patterns, and (c) the conducting of claim formation and evaluation in the manner that is governed by credible professional bases, where the bases include value orientations, aims, and logical and empirical principles.

Realization of these structural and functional characteristics in the realm of curriculum and instruction would bring fundamental changes to both research and practice. Central research interests would include improvement of the professional value and ethical systems, strengthening of the linkage between professional bases and the manner of forming
and testing curricular and instructional hypotheses, development and testing of useful systems of curricular and instructional claims, and investigation of relationships between curricular/instructional contexts and pupil goals and learning strategies. Improvement of the principles of claim formation and evaluation would be a high priority. Instructional research efforts would be concentrated within the context of adequate curricular-claim systems, with a concomitant downgrading of curricular-free investigations.

Formation of curricular and instructional claims, and justification and evaluation of those claims and the manner of their implementation, would constitute major aspects of the teacher's professional activity; teacher preparation would aim toward development of the necessary competence.

In this new educational world the interests, values, language, and activities of the researcher and teacher would merge. The researcher would grapple not only with the problem of strengthening the professional bases of education, but also with the formation and validation of practical curricular and instructional claims. The teacher would also bear a primary responsibility for forming and evaluating his governing curricular and instructional claims, and of course must attempt to act under their rule components in real classroom situations. Thus, the gap between research and practice would be bridged.
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