CHAPTER II

THEORIES OF LEARNING AND TEACHING

Attempts to analyze teaching in terms of overt behavior and skills have not yet provided a complete or satisfactory technology of teaching. Gage suggests that a theory of teaching is needed.

> The demands of teacher education make theories of teaching especially important. In developing theories of teaching, a major step is analysis and specification (Gage, 1964, p. 284).

Gage believes that such an analysis could be based on:

(a) types of teacher activity
(b) types of educational objective
(c) components of the learning process, and
(d) families of learning theory
(Ibid.)

By teacher activities Gage means such things as:

> ...explaining activities, mental hygiene activities, demonstrating activities, guidance activities, order-maintaining activities, housekeeping activities, record-keeping activites, assignment-making activities, curriculum-planning activities, testing and evaluation activities,...(Ibid. p.275).

For educational objectives, Gage lists:

1) affective
2) psychomotor, and
3) cognitive objectives

By components of the learning process Gage means that for each component of the learning process there is a matching teaching component. For example, he lists "Motivation-producing, perception-directing, response-eliciting, and reinforcement-providing (Ibid. p. 276)."

By families of learning theory Gage refers to "conditioning theory," "identification theory," and "cognitive theory."

Learning Theory

One theory of learning, according to Gage, is "conditioning theory." Fraenkel refers to the theory as "Associationism."

> Associationists assume that individuals are a collection of specific responses (R) to specific stimuli (S). "Stimuli are features of the environment which act on an organism to cause it to respond. Responses are reactions of an organism to stimulation (Biggs, 1964, p.9)." Every specific reaction that an individual makes is considered a response to a specific stimulus.
>
> In this theory, learning is viewed as the forming of connections or associations between stimuli and responses (Fraenkel, 1973, p.146).

Krumboltz (1961) organized findings of the research exploring this theory into four headings:

> (a) evoking the desired response
> (b) reinforcing the desired response
> (c) maintaining and improving the desired response, and
> (d) eliminating the undesired response
> (Gage, 1964, p.284)

Gagne (1971) builds upon this theory and constructs a hierarchy of learning. He lists eight levels of learning. The first is a conditioning form of learning as studied by Pavlov. The second is a contingency form of learning as outlined by Skinner. The third level is chaining. The fourth level is verbal chaining. After verbal chaining, links are formed between individual elements and concrete concepts are formed. Then, relationships are discovered between concrete concepts and abstract concepts are formed. Next, abstract concepts are grouped into principles.

Principles are then brought together to form even higher level principles when problems are solved.

This hierarchy is similar to one presented by Mosston (1972). He views learning as progressing from the level of dealing with facts (bits of information-smallest elements), to dealing with clusters of facts (first groupings of facts), to subconcepts (groupings of similar clusters), to concepts (subconcepts grouped by common aspect), to subject matter (categorized grouping of all known concepts), to future information and knowledge (as yet unknown). However, Mosston views this progression as representative of higher and higher cognitive operations rather than as just broadening levels of associations.

> The major aspect that differentiates a cluster of facts from level one (facts) is the realization and identificatio of a relationship among the scattered facts. This intrinsically requires employment of cognitive operations other than memory (Mosston, 1972).

Mosston believes, for example, that:

> To group clusters into a subconcept requires:
> a. comparing and contrasting
> b. analyzing
> c. drawing conclusions
> d. arranging and organizing
> e. reexamining for consistency
> .....
> To state the subconcept requires:
> a. identifying similarities (an idea, principle, law, etc.
> b. understanding the kind of relationships
> c. structuring the subconcept
> d. checking its validity
> e. making linguistic decisions about how to state subconcept (Ibid.)

Fraenkel sees this type of thinking as different from associationist thinking. He refers to this kind of thinking as linked to what he calls "field psychology," which Gage calls Cognitive Theory.

> Field theorists see learning not as the forming of connections between previously unrelated stimuli and responses, but as the discovery of meaning or insight within a given situation. These theorists assume that insight, intelligence, and other cognitive processes are the fundamental characteristics involved in the responses of human beings, evident in even the most simple perception of the environment. A fundamental characteristic of man is his capacity of perceive and to formulate relationships. The understanding of relationships is what guides man's actions.
> .....
> The most productive kind of learning is that which helps students to perceive, develop, and validate generalizations (relationships)(Fraenkel, 1973, p. 147).

Gage (1964) pointed out that people with this view see teaching as "cognitive restructing."

> Studies of cognitive development and learning, such as those by Piaget, have long been available. But manifestations of a growing concern with the teacher's role in fostering such learning have only recently begun to appear (Gage, 1964, p.282).

Gage mentions the work by B. Othanel Smith and Milton O. Meux in studying logical operations of secondary school teachers and students (Smith, Meux, 1962) Runkel's concern with "collinearity," (Runkel, 1956), Suchman's methods of training children in scientific inquiry (Suchman, 1960), and Ausubel's work with organization of material (Ausubel, Fitzgerald, 1961).

Kamii (1972) focuses on what she considers to be three important "Piagetian principles of learning" which represent his cognitive theory.

The first one is that learning takes place from inside the organism by an active process of "construction," rather than by a passive process of "absorption." The second principle is that if each cognitive structure is developmentally integrated with the previous structure, the developmental stages are longitudinally coherent, and the learning achieved in each stage is permanent. The third principle is that learning takes place within the general framework that Piaget calls "intelligence." (Kamii, 1972, p.111, 112).

Kamii explains these three principles in the following way:

> Fundamental to Piaget's theory is the notion that knowledge is not passively received from the environment but actively constructed by the organism. Piaget rejects the S--O--R model because it assumes that the organism perceives and receives the stimulus from the outside in a passive way. As Piaget puts it, there is nothing stimulating about the stimulus itself, and stimuli as such do not stimulate the organism. It is the organism that acts on the stimulus, and not the other way around.
> .....
> Piaget believes that no stage can be skipped if cognitive development is to have a solid foundation for future growth.
> .....
> Each concept is thus rooted in the baby's sensory-motor intelligence and takes a long time to evolve into an adult form. Therefore, concepts can be taught neither in a month nor in a year or two. Any attempt to skip an intermediary stage or to cue out the "wrong" notions is likely to result in hindering later learning. When earlier concepts are shaky, they will not serve as the foundation that generates higher-order concepts. Therefore, rather than cuing out and suppressing "wrong" notions, the teacher must bring them out to the fore to be integrated with other notions.
> When new concepts are integrated with previously acquired ones, the learning is solid and not likely to be forgotten. Each new stage then increases the probability that the next stage will be achieved (Ibid. p.112-114).

In addition to this, Kamii points out that the learning that takes place is influenced by the stage of development. A child who has reached the stage of concrete operations has a different framework to bring to bear on a task than a child in formal operations (Ibid, p. 114-115).

Fraenkel (1973) believes that there are many points which most learning theorists would agree are at least descriptive principles about learning. Some of these are:

> Individuals learn by responding to and interacting with their environment.
> Learning is essentially an active process whereby a change takes place in the ways in which individuals perceive and give meaning to their environment.
> Since every individual in a group has a unique set of experiences, needs, and perceptions, a variety of responses to any given stimulus is likely. Therefore, provision for individual differences in learning is crucial.
> The cultural environment in which an individual finds himself shapes to a considerable extent what he perceives and values.
> A major factor in man's capacity to modify his behavior is his ability to perceive abstract relationships.
> Learning is facilitated when an individual is motivated and interested in what is to be learned.
> Practice is important for many kinds of school learning.
> When a "dissonant" object or fact is inserted into any sequence of objects or facts, attention, curiousity, and interest often increase, thus affecting learning
> The breakdown of a task into its component parts is often necessary if maximal learning of the task is to be accomplished.
> Transfer of learning is not automatic, but it is more likely to occur when an individual learns the underlying principles of a subject or problem and has practice in applying them in varied situations.
> Reward is usually preferable to punishment as a means of controlling learning.
> Meaningful materials and tasks are learned more readily then non-meaningful ones.
> Providing students with information about what constitutes a "good" performance, along with knowledge of mistakes and successful results, aids learning.
> A tolerance for failure can be developed best by providing a backlog of successful learning experiences to compensate for the failures a student experiences. (Fraenkel, 1973).

Teaching Theory

Gage has suggested that these theories and principles of learning can be combined with ananalysis of teaching activities to derive a theory of teaching. Such a theory could provide

a guideline for planning. For example, a teacher showing pupils how to write the letter "F" involves 1) the activity of demonstrating, 2) a psychomotor objective, 3) a response-eliciting component of the learning process, and 4) the identification-imitation (modeling) paradigm of the teaching process.

Gage's hope was that such a framework might provide a structure around which an analysis of teaching could be built. However, this model is still somewhat narrow. It does not mention goal setting or evaluation. Furthermore, it does not address the problems of sequence or rewards and punishment.

Jerome S. Bruner provides for some of these in his list of features that a theory of instruction should contain.

> 1. 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...
> 2. 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...
> 3. Third, the theory of instruction should specify the most effective sequences in which to present the materials to be learned.
> 4. Finally, a theory of instruction should specify the nature of pacing of rewards and punishments in the process of learning and teaching...(Bruner, 1964,p.307,308)

However, this list still does not include goal setting or evaluation processes.

Goal setting and evaluation are important parts of the planning process. Certainly, a comprehensive theory of teaching needs to focus on this aspect of teaching.

John Dewey used an analogy in explaining the importance of planning. In his analogy he described people exploring new

territory wandering, stumbling into new discoveries, taking notes of their new findings, slowly beginning to organize a picture in their mind of the layout of the new territory. After exploring, they could then start to draw a map to aid future explorers.

> The map orders individual experiences...the map, a summary, an arranged and orderly view of previous experiences, serves as a guid to future experience; it gives direction, it facilitates control, it economizes effort, preventing useless wandering, and pointing out the paths which lead most quickly and most certainly to a desired result. Through the map every new traveler may get for his own journey the benefits of the results of other explorations without the waste of energy and loss of time involved in their wanderings---wanderings which he himself would be obliged to repeat were it not for just the assistance of the objective and generalized record of their performances. That which we call a science or study puts the net past experience in the form which makes it most available for the future...Memory is less taxed because the facts are grouped together about some common principle instead of being connected solely with the varying incidents of their original discovery. Observation is assisted; we know what to look for and where to look. It is the difference between looking for a needle in a haystack, and searching for a given paper in a well-arranged cabinet. Reasoning is directed, because there is a certain general path or line laid out along which ideas naturally march, instead of moving from one chance association to another (Dewey, 1943, p. 19-20-21)

Tyler has said that educational planning should address four basic questions.

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 (Tyler, 1950, pp. 1-2).

Taba elaborates this basic list in saying that curriculum design should include:

> (1) diagnosing educational needs; (2) formulating objectives (3) selection of content; (4) organization of content; (5) selection of learning experiences; (6) organization of learning experiences; and (7) determining the ways and means of evaluating effectiveness of what is taught (Taba, 1962, p.12).

These guidelines provided by Taba have become generally accepted and are being elaborated upon. By themselves, of course, they do not represent a theory of teaching. They represent a method of curriculum design.

A theory of teaching would need to integrate the suggestions of Taba, Tyler, Bruner, Gage, and others. It should have implications for planning, structuring, sequencing, pacing rewards, motivating, directing teaching activities toward psycho-motor, cognitive, and affective tasks, using complementary components of the learning process, choosing appropriate learning theory, and identifying important skills.

Currently, the systems approach, which has developed out of the involvement of psychologists in the research and development aspects of training for the military services and industry, attempts to integrate these different aspects of teaching around a framework similar to the one provided by Taba. This approach is summarized in the next two chapters.