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PREVIEW

DIFFERENTIALLY STRUCTURED INTRODUCTORY LEARNING
MATERIALS AND LEARNING TASKS

by
Arden ^{Dale} Grotelueschen

A DISSERTATION

Presented to the Faculty of
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PREVIEW

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PREVIEW

PROBLEM

The effects of prior learning on subsequent learning have been demonstrated by a large number of research studies dealing with infrahuman as well as human subjects. In the field of adult learning as well, the fact that previous educational experience affects the learning of adults is acknowledged by researchers of the adult learning process, teachers of adults, and adult learners themselves who are engaged in formal educational activities. The influence of the educational background of the adult education participant on learning outcomes has been investigated by various researchers (e.g., Sorenson, 1930; Sjogren and Knox, 1965, 1967). Findings from these studies suggest that adults who have not recently participated in an educational activity or who do not have a high level of formal educational background are not able to perform as well in a learning situation as those who have recently been involved in some educational activity or who have a high level of formal education. As a result, the adult with an inadequate educational background frequently becomes dissatisfied and drops out of the activity. Furthermore, the varied educational backgrounds of students in many adult education classes make it difficult for the instructor to arrange the external conditions of learning.

An approach by which the instructor may influence variables relevant to learning outcomes, places emphasis on the structure and

sequencing of a body of knowledge.¹ To facilitate learning, background information is given to the learner through a process that includes the appropriate selection of subject matter which is effectively sequenced.

It is recognized that some learner characteristics will ordinarily influence the achievement of desired learning outcomes. However, it is also important to consider the characteristics of the instructional activity which affect learning. Knowledge about the effectiveness of instructional activity, combined with information about learner characteristics, should result in a more effective educational experience for adults.

The Problem

An important task of the educator is to present the optimal structure and sequence of educative activities. For example, the classroom teacher is concerned with the selection, organization, and presentation of a subject matter in the form of lessons, units, and courses. The curriculum specialist, too, is concerned with the design of an educative experience which is deliberately structured and sequenced in a manner that facilitates the achievement of intended objectives. Other educators, such as the programmed

¹The term *structure* refers to the content and organization of a selected subject matter, and *sequence* refers to the sequential arrangement in which the content is presented. (This distinction is somewhat similar to the familiar curriculum concepts of scope and sequence.)

learning specialist, the author of educational texts and materials, and the educational psychologist have recently placed increased emphasis on the efficient programming of educational materials.

Learning theorists have also emphasized that the structure and sequence of the educative activity have an effect on the outcomes of learning. The appropriate sequential arrangement of the learning material, within a topic to be learned and among the topics that make up a subject matter, is viewed as a requirement for effective learning. For example, both behavioristic and cognitive learning theorists assert that the sequential arrangement of the subject matter is an important variable in the study of learning.

The behavioristic viewpoint, as exemplified by Skinner and linear programmed instruction, emphasizes the logical step by step sequencing of the subject matter. Through appropriate sequential arrangement of the subject matter the learner is guided progressively to a desired outcome.

Cognitive theorists, such as Ausubel, Gagné, and Bruner, also emphasize the necessity of sequential arrangements of the subject matter and, in effect, advocate programming the learning material. Furthermore, they emphasize the importance of the structure of a subject matter (cf., Ausubel, 1963b; Bruner, 1960, 1964; Gagné, 1965). Also, cognitive theorists stress the assumption that subject matter which is appropriately structured and sequenced not only is more readily learned, but also becomes an important independent

variable which influences the subsequent learning of related material (Ausubel, 1965). Hence, in the latter instance, one may theorize that meaningful learning can be brought about most effectively and efficiently by the manipulation of the structure and sequence of selected subject matter.

Two general procedures have been identified by Ausubel (1963b, 1965) whereby *cognitive structure* (i.e., the learner's existing organized body of knowledge regarding a learning topic) can be influenced so as to facilitate the learning of new material. One such variable is the structure of the subject matter itself. This refers to those *substantive* aspects of the subject matter that have the greatest generalizability, inclusiveness, and relatibility within that subject matter area. The second variable is concerned with the manner in which the subject matter is presented, arranged, and ordered. This proper sequence of activities in which a learner is involved is referred to as the *programmatic* aspect of presenting material.

The general purpose of the present study, then, was to experimentally manipulate two aspects of the instructional process, both of which serve to influence adult learning. More specifically, the purpose was to ascertain the effects of introductory materials, which were differentially structured with regard to content, on conceptually related learning tasks which were differentially sequenced.

The first variable manipulated was the structure of the introductory learning material presented to the subject prior to the actual learning task. This variable was manipulated for the purpose of ascertaining the effects on learning which accompany the variation of the substantive aspect of the subject matter. The second variable was manipulated to examine the influence of the sequential arrangement of the learning material on learning outcomes (i.e., the manipulation of a programmatic variable).

Theoretical Background

One of the primary proponents of the recent emphasis on the structure and sequencing of learning materials and of knowledge has been David P. Ausubel. Because the impetus and the conceptual framework for the present study were basically derived from the theoretical concepts of meaningful verbal learning, as presented in various publications by Ausubel (e.g., 1961, 1962, 1963a, 1963b, 1965, 1966), a summary of this theory is necessary. Following this section on theoretical background, a sampling of the empirical literature on this topic is included as a background for the more specific problems of the present research investigation.

Although the major aspects of Ausubel's cognitive theory will be summarized, there are three areas which are particularly relevant to the purpose of this study. These areas include (a) the systematic change in extent and type of knowledge brought about by the integration and incorporation of new information into the learner's

existing cognitive structure; (b) the identification of those factors that have an effect on the acquisition of new information; and (c) the manipulation of the learner's cognitive structure so that the acquisition of newly presented information is enhanced.

In general, this theory is limited to various principles regarding the integration and organization of the learner's knowledge, and to various procedures whereby knowledge is acquired, retained, and forgotten. Within this frame of reference, Ausubel further limits his theory to meaningful verbal reception learning, which he believes is the most characteristic type of school learning. Reception or expository learning, as contrasted to discovery learning, refers to learning material presented in its entirety to the learner. Thus, the entire content to be learned is given to the learner, who only needs to internalize the material presented to him for future reproduction.

For reception learning to take effect, it is assumed that the learner possesses a mature cognitive structure. That is, the learner understands the concepts and principles of the meaningfully presented material without any necessary prior concrete experience with the material. This is in direct contrast to learning characteristics of young learners who need relevant concrete experiences directly prior to their understanding any abstract learning material (Inhelder and Piaget, 1958). Furthermore, because the reception type of learning is presented verbally, it may be presented in

either a rote or a meaningful manner without prior nonverbal and problem solving experiences. It is important, therefore, to note that Ausubel's emphasis is on meaningful reception learning and not on rote learning.

Meaningful learning refers primarily to a learning process rather than a learning outcome, and is distinguished from the process of rote learning. It assumes that the learner possesses an expectation that the learning material will be meaningful to him and that the learning material actually is potentially meaningful to him. The meaningful expectation or set that is a requisite for the occurrence of meaningful learning serves to relate the substantive aspects of the learning material to relevant elements of the learner's existing cognitive structure. Obviously, the meaningful set to learn results in meaningful learning only when the material to be learned is potentially meaningful.

For learning material to be potentially meaningful two important criteria must be satisfied. The first criterion is the non-arbitrary relatability of the learning material to relevant concepts in the potential learner's cognitive structure. This criterion applies only to the total learning material itself and not to the component parts. The second criterion involves the relatability of the learning material to the cognitive structure of a specific learner. This second criterion refers to a characteristic of the learner, whereas, the first criterion has reference to a characteristic of the learning material.

Learning materials which satisfy the criteria of potential meaningfulness are learned according to principles of learning and retention that are quite different from materials learned by rote. Meaningfully learned materials are related and anchored to an existing ideational system within the cognitive structure of the learner. In contrast, materials learned by rote are discrete entities relatable to cognitive structure in an arbitrary manner, and as a consequence are not anchored to any existing ideational system. Therefore, the meaningfully learned material is more effectively learned and has greater stability, retention, and transferability.

For potentially meaningful material to become actually meaningful, it must interact with, and be subsumed or incorporated into, the learner's existing ideational system. For this to occur, it is assumed that the content of the field of knowledge which is being learned is organized and that the relevant content within the learner's cognitive structure is also organized. First, it is assumed that the subject matter of which the potentially meaningful material is a part, is organized in some hierarchical fashion. Second, it is assumed that the organization of the learner's cognitive structure is also hierarchically organized. Within the learner's cognitive structure the most general or inclusive concepts are located at the apex of the structure under which are subsumed the less inclusive concepts and specific information.

The fact that the potentially meaningful material has interacted with and is relatable to organized conceptual and ideational

elements in the learner's cognitive structure is the basis for its meaningfulness. As the new material is introduced into the learner's cognitive structure, the initial efforts of the subsumption process involve various orienting, relational, and cataloging operations. These operations are necessary for learning and retention because they provide the mechanisms whereby new material is subsumed and incorporated within the existing cognitive structure of the learner. Furthermore, anchorage within the ideational system is provided for the newly learned material. That is, newly learned material is attached to or subsumed by related concepts in cognitive structure. As a result, the newly learned material, for some variable time period, remains a separate and distinct entity within the learner's subsuming ideational system. Thus the material can be separated from its subsumer and recalled by the learner.

Although anchorage of the newly learned material within the learner's ideational system enhances its stability and retention, the material in time loses its individual identity. According to Ausubel, this is brought about by a conceptualizing trend in cognitive structure whereby less inclusive concepts and information are subsumed into more highly inclusive concepts. When this second or obliterative stage of the subsumption process begins, the specific identifiable elements of the learned material gradually become less separable from the learner's existing ideational system until they no longer have any distinct identity of their own. At this point the material is said to be forgotten.

Within meaningful reception learning the process of subsumption, therefore, is theorized to be responsible for (a) the acquisition of knowledge, (b) the stability and retention of newly-acquired material, (c) the hierarchical organization of the body of knowledge within the learner's cognitive structure, and (d) the occurrence of forgetting.

Two different types of subsumption theoretically occur in the learning and retention of meaningful material. The meaningful material which is subsumed and related to existing conceptual elements may be either derived from or correlated to established concepts in the learner's cognitive structure. If new learning material is an example or illustration of some established concept or idea in the learner's cognitive structure, it is derivable from or implicit in a more inclusive concept of the established subsumer. The outcome of this type of subsumption is manifest in the easy and quick acquisition of meaning, and in rapid forgetting. The reason for rapid acquisition and forgetting is that the meaning of the new material is highly relatable to a more inclusive concept in the learner's existing cognitive structure. This inclusive concept readily subsumes the meaning of the material so that the identifiable elements of the learned material are lost. Although the learned material loses its specific identity, the material is not entirely forgotten because substantive ideas of the learned material are maintained within relevant subsumers in the learner's cognitive structure.

On the other hand, if new material is an extension, qualification, or elaboration of an established concept in the learner's cognitive structure, then it is defined as correlated to a more inclusive established subsumer. The incorporation and interaction of the meaning of this new material, which is only tangentially related to the more inclusive subsumer, is not implicit in and cannot be adequately represented by the existing subsumption system. As a consequence, newly learned material which is correlated to existing more highly inclusive concepts undergoes oblitative subsumption similar to derivatively subsumed material. The effects of oblitative subsumption are, however, more serious in the case of correlated materials. The reason for this is that when correlated materials lose their identity and can no longer be separated from their subsumers, the substance of the correlated material is not adequately represented within the subsumer and, therefore, cannot be reproduced in the future. Therefore, in this instance, the entire substance of what was learned is lost. Needless to say, oblitative subsumption occurs most rapidly when the existing conceptual subsumers are not stable and clear and when the learning material has not been overlearned.

In summary, the subsumption of potentially meaningful derivative and correlated material is dependent upon an existing hierarchical organization of meaningfully learned materials in the learner's cognitive structure. This subsumption process efficiently