

Ausubel's Learning Theory: An Approach To Teaching Higher Order Thinking Skills.(educational psychologist David Paul Ausubel). Stanley D. Ivie.
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Abstract:

Developing thinking skills in students requires specific instruction and practice rather than application. Teachers should address analysis, evaluation and synthesis using advance organizers that encourage students to operate at higher levels of abstraction. Strengthening cognitive structures helps students retain information longer, and subsumptions provide students with basic structures on which to build new concepts.

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Introduction

The language of education is rife with talk about teaching higher order thinking skills. What exactly are these skills? And how can they best be taught? These are important and difficult questions. All too frequently educators have elected to take the easy way out. They have settled for having students memorize Bloom's taxonomy. "In the minds of many educators," Ennis (1987) informs us, "Bloom's top three levels (analysis, synthesis, and evaluation) are the higher order thinking skills" (p. 10). Though the taxonomy may serve many useful purposes, teaching higher order thinking is not one of them. If the nation's children are to learn how to think clearly and cogently, they must be provided with appropriate instruction.

How well are the nation's schools responding to the challenge of teaching higher order thinking? Quellmalz (1987) believes their performance leaves much to be desired. "Schools' commitment to higher order thinking has been largely rhetorical, while curriculum development has been infrequent and ineffective" (p. 86). In most classrooms higher order thinking receives little or no attention. "When higher order questions do occur, they often concern specific, isolated skills; they seldom ask students to sustain a line of reasoning in order to draw a conclusion or explain a judgment" (p. 94). Quellmalz concludes his dismal assessment by saying: "We have mountains of test data to document that most students of all ages do not perform well on higher order tasks" (p. 95).

Before something can be taught, educators must first decide what it is they wish to teach. What is higher order thinking? Ennis (1987) believes the concept is fraught with ambiguity, "too vague to provide the schools and colleges with specific guidance" (p. 10). He does concede, however, that the concept has served to remind us there is more to learning than the mere memorization of facts and figures. Ennis concludes his analysis of the matter by reminding us that "to teach higher order thinking skills one needs criteria for making such judgments" (p. 11).

Teaching higher order thinking is generally accepted as one of the objectives of public education. The problem arises from the fact that no one seems to know exactly what the concept means. In the absence of a good working definition, let us suggest some criteria for or characteristics of such thinking. (Hopefully, Ennis will not object too strenuously to our use of the word "criteria" in this context.) Higher order thinking tends to reflect three related criteria: (A) The utilization of abstract structures for thinking. Jerome S. Bruner (1965) in his classic work, *The Process of Education*, argues all knowledge has structure. "The basic ideas that lie at the heart of all science and mathematics and the basic themes that give form to life and literature are as simple as they are powerful]" (pp. 12-13). Hence, if we wish to think in abstract terms, we must necessarily come to grips with the structure of knowledge.

(B) The organization of information into an integrated system. Sexton and Poling (1973) pose a contrast between the thinking of low performing and high performing students. The slow learner sees most of the material presented to him as a series of random, unrelated pieces. The student of exceptional ability sees things as classes, systems, relationships, and analogies. His mental world is organized. Consequently, if we are to materially aid the functioning of intelligence, we must design curricula within a structure of related concepts." (p. 7) Higher order thinking organizes information into an integrated system.

(C) The application of sound rules of logic and judgment. Max Black (1959) asserts that logic is the study of reasoning. It is thinking about thinking. "Logic may be thought of as the art of improving reasoning, and the science of the conditions to which this art must conform" (p. 9). Can schools be expected to teach logical thinking? Kneller (1971) answers this question in the affirmative. "The habit of thinking logically can be cultivated by psychological means, that is, by specific tactics of teaching based on an understanding of human behavior" (p. 88).

How can higher order thinking (thinking that reflects the three previously stated criteria) be meaningfully taught in the public schools? It is the thesis of this article that the learning theory developed by David Ausubel offers educators a systematic approach to teaching higher thinking. Though Ausubel's learning theory may not carry us all the way to higher order thinking (and though mastery of Black's logic may have to wait for a few years); nevertheless, his learning theory provides a useful approach for helping students erect meaningful cognitive structures. Higher order thinking, even if we are committed to the use of formal logic, presupposes the existence of orderly minds. The remainder of this article, therefore, is devoted to examining Ausubel's learning theory and to showing how it is useful in teaching higher order thinking skills.

Biography

David Paul Ausubel came to educational psychology from the field of medicine. After completing his training in psychiatry, Ausubel entered Columbia University and earned a Ph.D. in developmental psychology, he switched from psychiatry to psychology in order to pursue an academic career in teaching and research. "Psychiatry," he (1995) writes,

"was completely dominated by psychoanalysis. There was no real opportunity for an academic career in psychiatry, since I viewed psychoanalysis as a farfetched, desperate mythology, with no scientific or empirical basis" (p. 1).

In 1950 Ausubel accepted a position with the Bureau of Educational Research at the University of Illinois. He remained with the Bureau for the next sixteen years. While Ausubel was at the University of Illinois, he published extensively on cognitive psychology. Ausubel left the University of Illinois in 1966 in order to accept a position with the Department of Applied Psychology, Ontario Institute of Studies in Education. He was in Toronto for two years, 1966-68. He moved to become Professor and Head of the Department of Educational Psychology, Graduate School and University Center, City University of New York, where he served until his retirement in 1975 (APA, 1977, p. 52). When Ausubel retired from university teaching, he returned to the practice of psychiatry. He currently resides and conducts a private practice in Espous, New York.

Learning Theory

Metaphor. Ausubel views knowledge as representing an integrated system. Ideas are linked together in an orderly fashion. The human mind follows logical rules for organizing information into respective categories. Mind, metaphorically, is like a Chinese puzzle box. All the smaller boxes, ideas and concepts, are tucked away inside of larger boxes. "Cognitive structure," Ausubel (1960) contends, "is hierarchically organized in terms of highly inclusive concepts under which are subsumed less inclusive subconcepts and informational data" (p. 267). Subsumption is the central idea running through the whole of Ausubel's learning theory. The big boxes in the mental pyramid subsume the small boxes. Subsumers constitute the general categories around which we organize our thinking. Subsumption allows us to absorb new information into our cognitive structures. Teaching and learning, therefore, are largely matters of erecting cognitive structures (scaffolding) to hold new information. By placing information into its proper box, we are better able to retain it for future use. Similarly, forgetting occurs when the smaller boxes (being made of less durable cognitive stuff) fall apart and become incorporated into the larger boxes.

Cognitive Structure. Ausubel (1963a) emphasizes the learner's cognitive structure in the acquisition of new information. Present experience is always fitted into what the learner already knows. "Existing cognitive structure, that is an individual's organization, stability, and clarity of knowledge in a particular subject matter field at any given time, is the principal factor influencing the learning and retention of meaningful new material" (p. 217). A cognitive structure that is clear and well organized facilitates the learning and retention of new information. A cognitive structure that is confused and disorderly, on the other hand, inhibits learning and retention learning can be enhanced by strengthening relevant aspects of cognitive structure. Putting the mind in order is one of the principal objectives of all education. Having a clear and well organized cognitive structure, Ausubel (1968) believes, "is also in its own right the most significant independent variable influencing the learner's capacity for acquiring more new knowledge in the same field" (p. 130).

Hierarchy. How is knowledge organized? Ausubel's and Robinson's (1969) theory of learning assumes the existence of a Hierarchical structure of knowledge. Fields of inquiry are organized like pyramids, "with the most general ideas forming the apex, and more particular ideas and specific details subsumed under them" (p. 47). The most inclusive ideas--those located at the top of the pyramid--are the dominant and most enduring elements in the hierarchy. They possess a longer life span in memory than do particular facts or specific details, which fall at the base of the pyramid. "Learning occurs as potentially meaningful material enters the cognitive field and interacts with and is appropriately subsumed under a relevant and more inclusive conceptual system" (Ausubel, 1963b, p. 25). Thus new information is organized under higher level concepts already existing in the learner's mind.

Subsumption. Ausubel's (1960) learning theory is built around the concept of subsumption. (In his later writings, he came to prefer the word "assimilation.") When a new idea enters consciousness it is processed and classified under one or more of the inclusive concepts already existing in the learner's cognitive structure. (Little boxes, metaphorically, art into bigger boxes.) "New meaningful material becomes incorporated into cognitive structure in so far as it is subsumable under relevant existing concepts" (p. 267). Subsumers provide a basic structure around which information is organized. They are the intellectual linchpins holding the system together. "Subsumption," Ausubel (1962) inform us, "may be described as facilitation of both learning and retention" (p. 217).

Anchorage. The major concepts (subsumers) in cognitive structure act as anchoring posts for new information. The availability of anchoring ideas facilitates meaningful learning. Antecedent learning usually performs this function. "If this ideational scaffolding is clear, stable, and well organized," Ausubel and Fitzgerald (1962) assert, "it is reasonable to suppose that it provides better anchorage for new learning and retention than if it is unclear, unstable, and poorly organized" (p. 244). The cognitive stability provided by anchoring ideas helps to explain why meaningful learning is retained longer than rote learning. Meaningful learning is anchored; rote learning, is not.

Organizers. No feature of Ausubel's (1963b) learning theory has stimulated more discussion or raised greater controversy than his advocacy of advance organizers. Organizers are not to be confused with introductory remarks or brief overviews, which are "typically written at the same level of abstraction, generality, and inclusiveness as the learning material" (p. 214). Organizers are abstract ideas presented in advance of the lesson. They represent a higher level of abstraction, generality, and inclusiveness than the new material. Ausubel (1960) believes organizers can be used to assist learners in assimilating new information. Organizers help to bridge the gap between what is already known and what is to be learned. "The learning and retention of unfamiliar but meaningful verbal material can be facilitated by the advance introduction of relevant subsuming concepts" (p. 267). Organizers are particularly useful when learners do not already possess the relevant concepts needed in order to integrate new information into their cognitive systems.

Which students profit the most from the use of organizers? Ausubel and Fitzgerald (1962) believe good students--those who already possess clear and well organized cognitive structures--profit very little from the use of organizers. This is because their minds are already programmed with anchoring ideas. Slow learners, on the other hand, are the ones who benefit the most from the use of organizers. Such students require additional assistance in learning how to structure their thinking (p. 247). Ausubel's (1963b) research disclosed another interesting aspect of using organizers. Advance organizers are more useful when working with factual material than they are when dealing with abstractions. Organizers "facilitate the learning of factual material more than they do the learning of abstract material, since abstractions in a sense contain their own built-in organizers" (p. 82).

Can advance organizers be used to enhance learning? The research on this question is filled with conflicting results. Anderson, Spiro, and Anderson (1978), for example, concede that Ausubel's general theory of subsumers contains much that is valuable for educational practice. They take exception, however, with his research on advance organizers. Referring to Ausubel's work on using organizers to teach reading comprehension, they say, "It is difficult to see why outlining subsequent material in abstract, inclusive terms should help readers" (p. 43g). If readers possess relevant subsuming concepts, they will use them in assimilating new material. When readers do not possess such concepts, there is little reason to believe advance organizers can be used to take their place. Anderson et al. conclude by saying, "the theoretical justification for the advance organizer is quite flimsy" (p. 439). Ausubel (1995) believes the attention devoted to advance organizers far outweighs their relative importance in his learning theory. His views on this matter (which were shared with the author in personal correspondence) are reflected in the following quotation: Advance organizers are not the most important aspect of my work in educational psychology. They are merely a specific technique or method of presenting information more effectively, which is based on my more general subsumption or assimilation theory of learning. However, they caught the imagination as a "gimmick" for performing empirical studies of meaningful learning. More dissertations--most of them worthless because the organizers used were not genuine--have been written on organizers than on any other topic in psychology. (p. 5)

Retention. What is the best way of improving the retention of information once it has been learned? Ausubel's (1962) views of retention are linked to his larger theory of subsumption. Subsumers, anchoring ideas, help to facilitate learning and retention. Retention is influenced by three factors: "(a) the availability in cognitive structure of relevant subsuming concepts at an appropriate level of inclusiveness; (b) the stability and clarity of these concepts; and (c) their discriminability from the learning task" (p. 223). Learners who possess well organized cognitive structures tend to retain information effectively. Conversely, learners who have poorly organized cognitive systems tend to forget information rapidly. "Thus," concludes Ausubel (1968), "it is largely by strengthening relevant aspects of cognitive structure that new learning and retention can be facilitated" (p. 128). One way of improving retention is to introduce appropriate subsumers prior to presenting the new lesson.

Forgetting. Why do we forget information we labored so painstakingly to learn? Ausubel's answer lies in his theory of subsumption. Just as subsumption explains how information is retained, so it also explains why forgetting occurs. New information is stored when it becomes anchored to a larger subsuming concept. Reciprocally, this same information is forgotten as it becomes progressively absorbed into its cognitive host. Forgetting is complete when the information can no longer be separated from its subsuming concept. Ausubel (1963b) refers to this process as "obliterative subsumption." When the "obliterative stage of subsumption begins, the specific items become progressively less dissociable as entities in their own right until they are no longer available and are said to be forgotten" (p. 25). Forgetting is complete, says Ausubel (1968), when the new information is "reduced to the least common denominator capable of representing it, namely, to the anchoring idea itself" (p. 98).

Educational Applications

Rote Learning. Ausubel's (1962) makes a distinction between rote and meaningful learning, which is important for teaching higher order thinking. Rote learning occurs when the learner memorizes information in an arbitrary fashion. The knowledge or information is stored in an isolated compartment and is not integrated into the person's larger cognitive structure. "Rotely learned materials are discrete and isolated entities which have not been related to

established concepts in the learner's cognitive structure" (pp. 215-216). Because rote learning is not anchored to existing concepts, it is more easily forgotten. Formal education is filled with examples of rote learning. Did you ever memorize the conjugation of Spanish verbs? If the task was treated as an end-in-itself rather than as a means to greater conversational fluency, then it was rote learning.

Meaningful Learning. Meaningful learning, on the other hand, is part and parcel to higher order thinking. Such thinking takes place when we grasp the interrelationship between two or more ideas, old and new. "A first prerequisite for meaningful learning," Ausubel and Robinson (1969) contend, "is that the material presented to the learner be capable of being related in some 'sensible' fashion" (p. 46). The new information must be fitted into a larger pattern or whole. "Second, the learner must possess relevant ideas to which the new idea can be related or anchored" (p. 46). The learner must already have appropriate subsuming concepts in his or her cognitive structure. "Finally, the learner must actually attempt to relate, in some sensible way, the new ideas to those which he presently possesses" (p. 46). If any of these conditions are missing, the end result will be rote learning.

Reception Learning. Verbal reception learning is not necessarily antithetical to higher order thinking, though the method has been characterized as "parrot-like recitation and rote memorization of isolated facts" (Ausubel, 1963b, p. 15). The problem stems from the widespread confusion "between reception and discovery learning, and between rote and meaningful learning" (p. 15). Reception learning is not invariably rote; likewise, discovery learning is not always meaningful. Either one--reception learning or discovery

learning--can be rote or meaningful. Everything depends upon how the knowledge is treated. If the learner merely memorizes the material (even if the conclusions have been arrived at by the discovery method), then, says Ausubel (1961), "the learning outcomes must necessarily be rote and meaningless" (p. 17). Reception learning or discovery learning may promote either rote or meaningful consequences. One does not inherently infer the other. Thus discovery learning, just like reception learning, may be either rote or meaningful. The whole question of rote learning versus meaningful learning depends upon whether or not the new information is integrated into the learner's cognitive structure.

Expository Teaching. The flip side to reception learning is expository teaching. Such teaching offers the educator the most direct route for laying a foundation for higher order thinking. Ausubel (1963b) believes most teachers favor this method of instruction. Expository teaching is an efficient and effective way of organizing classroom learning. Even laboratory sciences--which lend themselves to the discovery method--can be taught as well by using the expository method. Though expository teaching has been criticized as being authoritarian, such criticism is unjustified. "There is nothing inherently authoritarian in presenting or explaining ideas to others as long as they are not obliged, either explicitly or implicitly, to accept them on faith" (p. 160). Teachers have an obligation to share their understanding with their students. To cast out the teacher's understanding because it might impose some structure on the students' thinking is an idea too foolish to require refutation. "Didactic exposition has always constituted the core of any pedagogic system, and, I suspect," adds Ausubel (1963b), "always will, because it is the only feasible and efficient method of transmitting large bodies of knowledge" (p. 160).

Is there a place for practice or drill in teaching higher order thinking? Ausubel would answer this question in the affirmative. "Most integrated sets of ideas are not learned in a single presentation" (Ausubel & Robinson, 1969, p. 131). Formal education is a slow, incremental process. What is acquired one day provides the basis for what will be learned the next. Practice or drill is necessary in order to master most classroom learning. It is a grave error, Ausubel (1963b) cautions us, to assume "all structured practice (drill) is necessarily rote, that unstructured (incidental) practice is maximally effective for school learning tasks" (p. 178). Teachers have been told that drill is an outdated technique. This is not necessarily true. Everything depends upon how drill is used, rotely or meaningfully. Practice is useful "for acquiring many skills and concepts that do not occur frequently and repetitively enough in more natural settings" (p. 12). Though children may learn some things from incidental contact, most of what they acquire at school comes from deliberate, guided practice. Even though many educators have shied away from endorsing drill, "classroom teachers and athletic coaches have continued to place implicit reliance on practice as an essential condition of learning" (p. 179).

Conclusion

How well does Ausubel's learning theory lend itself to answering the second question with which we initiated our inquiry, namely, is there an effective way to teaching higher

order thinking skills? The answer offered by Ausubel's theory should be judged in relationship to how well it conforms to the three criteria stipulated for higher order thinking. The concluding section of this article will restate each of these criteria and offer supporting evidence that Ausubel's learning theory is either directly or indirectly complementary to them.

The utilization of abstract structures for thinking. Ausubel's learning theory addresses this criteria in two ways: First, Ausubel (1960) believes a learner's present cognitive structure constitutes the principal factor influencing whether or not the learner will be able to acquire and retain particular pieces of information. "New meaningful material becomes incorporated into cognitive structure in so far as it is subsumable under relevant existing concepts" (p. 267). Second, Ausubel (1960) asserts that advanced organizers can be used as anchoring devices for enhancing learning. Organizers are abstract ideas presented in advance of the lesson. They represent a higher level of abstraction, generality, and inclusiveness than the new material that is to be learned. Organizers assist the learner in assimilating new information. "The learning and retention of unfamiliar but meaningful verbal material can be facilitated by the advance introduction of relevant subsuming concepts" (P. 267).

The organization of information into an integrated system. Ausubel and Robinson (1969) contend that knowledge is organized in a hierarchical fashion. "The most general ideas forming the apex, and more particular ideas and specific details subsumed under them" (p. 47). Learning occurs as potentially meaningful material enters the student's mind and interacts with appropriate subsuming concepts. Ausubel (1968) uses the concept of subsumption to explain both retention and forgetting. First, information is more effectively retained when it is fitted into a system of mutually supporting ideas. Learners who have well-organized cognitive systems tend to efficiently retain information. On the other hand, learners who have poorly organized cognitive systems tend to rapidly forget information. "It is largely by strengthening relevant aspects of cognitive structure that new learning and retention can be facilitated" (p. 128). Second, Ausubel (1968) uses the concept of subsumption to explain why forgetting occurs. The more completely information is absorbed into its anchoring concept, the more it tends to lose its own distinctive character. Thus, when information is "reduced to the least common denominator capable of representing it, namely, to the anchoring idea itself," it is said to be forgotten (p. 98).

The application of sound rules of logic and judgment. Though Ausubel was a psychologist and not a logician, nevertheless, his learning theory represents a very logical approach to instruction. (Unlike Carl Rogers who would set learners free to experience things on their own, Ausubel places prime responsibility on the teacher for directing the course of instruction.) Ausubel's ideas are derived from a handful of basic premises--that thinking is an orderly activity; that knowledge is arranged in a hierarchical pattern; that higher level concepts subsume lower level ones; that learning is largely a matter of fitting new information into an already existing cognitive structure; that retention and forgetting are two different aspects of the same psychological process, subsumption--all of which fit together in a logically consistent system. Ausubel logical fashion. Teaching follows a

deductive order. Instruction can be arranged in a sequence of five logical steps. Step One: The teacher ascertains if the student already possesses relevant concepts in his or her cognitive structure. Step Two: The teacher provides appropriate advance organizers, which are used to anchor the new material within established cognitive structure. Step Three: The teacher present the new material in an organized fashion, checking to make sure the student is subsuming the new information under appropriate organizers. Step Four: The teacher provides sufficient practice (drill) so that the material is thoroughly learned, becoming an integrated part of the student's cognitive system. Step Five: The teacher guides the student through a problem solving situation that utilizes higher order thinking skills. If the teacher is successful in executing all Or these steps, then he or she will have laid a secure foundation for the student to take the next step on his or her own, namely, implementing the powers of higher order thinking in his or her life.

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