The use of advance organizers in the learning and retention of meaningful verbal material

David P. Ausubel
Bureau of Educational Research, University of Illinois

The purpose of this study is to test the hypothesis that the learning and retention of unfamiliar but meaningful verbal material can be facilitated by the advance introduction of relevant subsuming concepts (organizers). This hypothesis is based on the assumption that cognitive structure is hierarchically organized in terms of highly inclusive concepts under which are subsumed less inclusive subconcepts and informational data. Subjects specializing in industrial education and in vocational agriculture were excluded from the study since they had received specific instruction in the topic covered by the learning passage. The experiment was conducted separately in each section as a required laboratory exercise and was performed during regularly scheduled class hours. In order to maximize ego-involvement, 25 Ss were informed that after the data were processed their individual scores, as well as the class results, would be reported to them.

Learning passage and test of retention

The learning material used in this study was a specially prepared 2,500-word passage dealing with the metallurgical properties of plain carbon steel. Emphasis was placed on the basic principles as the relationship between metallic grain structure, on the one hand, and temperature, carbon content, and rate of cooling, on the other. Important factual information (e.g., critical temperatures), however, was also included, and basic principles were also applied to such technological processes as heat treatment and tempering.

The metallurgical topic was chosen on the basis of being generally unfamiliar to undergraduates in liberal arts and sciences (i.e., not ordinarily included in chemistry courses), but still sufficiently elementary to be both comprehensible and interesting to novices with no prior background in the field. The criterion of unfamiliarity was especially cru-

1 Appreciation is expressed to Robert M. Tomlinson for assistance in the preparation of the learning passage.
because the purpose of the study was to ascertain whether advance organizers could facilitate retention in areas of knowledge new to learners. By using unfamiliar material it was also possible to ensure that all Ss started from approximately the same baseline in learning the material. The empirical proof of unfamiliarity was sought, therefore, by administering the retention test on the steel passage to a comparable group of naive Ss who had not studied the same material; but although this latter group of Ss made scores which, on the average, were only slightly and not significantly better than chance, it was evident from later analysis of the experimental data that scores earned by Ss who had studied the passage were related to both sex and field of specialization. Male students and majors in science and art were better able to learn and retain the steel material than were female students and majors in English, foreign languages, music, and the social sciences. Hence, the criterion of unfamiliarity was not completely satisfied, in as much as these differences undoubtedly reflected in part, variability in recalling incidental experience influencing the learnability of the material.

Knowledge of the steel passage was tested by a 14-item multiple-choice examination with a correct level of 70. Test questions covered principles, facts, and applications, and were selected by an item analysis procedure from a larger population of items. Scores on the test showed a satisfactory range of variability and were distributed normally. Since it was intended as a power test, no time limit was imposed.

*Procedure*

It was first necessary to equate experimental and control groups on the basis of ability to learn and recall steel passage material comparably. The passage used for this purpose was concerned with the endocrinology of human puberty and was approximately 1,860 words long. Ss were given 30 minutes to read and study the material, and were tested immediately thereafter by a 26-item multiple-choice test with a correct split-half reliability of .78. The unfamiliarity of the material had been previously ascertained by administering the test to a comparable group of naive Ss who had not studied the passage, and obtaining a mean score only slightly and not significantly greater than chance. Test scores on the pubescence passage were distributed normally and correlated .64 on a product-moment basis with test scores on the steel passage. F tests were performed on the variance ratios of the pubescence material test scores for all possible combinations of the four sections, and none approached significance, and a test of confidence. It was considered justifiable, therefore, to treat the retention scores of experimental and control groups on the steel passage as if derived, respectively, from one large class rather than from four separate sections.

In each of the four sections were matched on the basis of test scores on the pubescence material and assigned to experimental and control groups. Experimental and control treatments were then administered simultaneously to experimental and control Ss, respectively, within each section. This procedure was possible because the two treatments consisted of a series of introductory passages differing only in content. The use of this procedure also provided the important methodological advantage of holding instructor, class, and situational variables constant for both groups. Each introductory passage of approximately 500 words was studied twice, 5 minutes each time, by the appropriate group of Ss. The two occasions were 48 hours and immediately before exposure to the steel passage passage. The experimental introductory passage contained background material for the learning passage which was presented at a much higher level of abstraction, generality, and inclusiveness than the steel passage itself. It was designed to serve as an organizing or anchoring focus for the steel material and to relate it to existing cognitive structure. Principal emphasis was upon differences in the major similarities and differences between metals and alloys, their respective advantages and limitations, and the reasons for making and using alloys. Although this passage provided little or no information relevant to the steel passage, it was also designed to give an impression of the general nature, it was carefully designed not to contain specific information that would confer a direct advantage in answering any of the questions on the steel test. This latter criterion was tested and found to be warranted when a comparable group of Ss made only a slightly better than chance mean score on the steel test after studying the introductory passage alone.

The control introductory passage, on the other hand, consisted of such historically relevant background material as the historical evolution of the methods used in processing iron and steel. This type of introductory material is traditionally included in most textbooks on metallurgy and is presumably intended to enhance student interest. In contrast, to the introductory passage given to the experimental group, it contained no conceptual material that could serve as an ideational framework for organizing the particular substantive body of more detailed ideas, facts, and relationships in the learning passage.

It was methodologically necessary to provide this control treatment in order that any obtained difference between experimental and control groups could be attributed to the particular nature of the experimental introductory passage (i.e., to its organizing properties) rather than to its presence per se.

Both groups studied the steel passage for 35 minutes and took the multiple-choice test 3 days later. Since it was necessary to hold these latter factors (as well as pubescence test scores) constant, hence, it was no longer possible to use the originally matched pairs of Ss within each section. Sufficient Ss were also not available to rematch individual pairs of Ss on all three variables. By means of matched pairs age-control Ss across sections, however, it was possible to equate two groups of 40 Ss each for the test scores, and field of specialization, the equating of sectional lines in this rematching procedure was justifiable in view of the intersectional homogeneity of variance.

**RESULTS AND DISCUSSION**

The distribution of steel test scores for both experimental and control groups did not deviate significantly from the normal. The mean steel test score of the experimental group was 16.7, as compared to 14.1 for the control group and a mean chance score of 7.2 (one-fifth of 36). The standard deviations of the two groups were 5.8 and 5.4, respectively. The difference between the means of the experimental and control groups was almost significant at the .01 level for a one-tailed test.

The obtained difference in retention between experimental and control groups, although statistically significant, would undoubtedly have been even greater if the learning passage used for matching purposes had been in the same subject matter field as the steel material (i.e., if the relationship between the two sets of scores were higher than that indicated by the correlation of .91 between the steel and pubescence scores). Another experimental condition, probably detracting from the difference between the two groups was the fact that the steel material was not completely unfamiliar to many Ss. Because of some prior general familiarity with the contents of the steel passage, many Ss already possessed relevant and stable subsuming concepts. These obviously rendered less significant the potential learning advantages conferable by advance organizers.

It could be argued, of course, that exposure to the experimental introductory passage constituted in effect a partial substantive equivalent of an additional learning trial. Actually, however, any substantive repetition was at most very indirect, since the introductory passage consisted of much more inclusive and general background material than was contained in the learning task itself,
and also provided no direct advantage in answering the test items. Furthermore, according to behavioristic (interference) theory, prior exposure to similar but not identical learning material induces proactive inhibition rather than facilitation.

Advance organizers probably facilitate the incorporability and longevity of meaningful verbal material in two different ways. First, they explicitly draw upon and mobilize whatever relevant subsuming concepts are already established in the learner's cognitive structure and make them part of the subsuming entity. Thus, not only is the new material rendered more familiar and meaningful, but the most relevant ideational antecedents are also selected and utilized in integrated fashion. Second, advance organizers at an appropriate level of inclusiveness provide optimal anchorage. This promotes both initial incorporation and later resistance to obliterator subsumption.

The appropriate level of inclusiveness may be defined as that level which is as proximate as possible to the degree of conceptualization of the learning task—relative, of course, to the existing degree of differentiation of the subject as a whole in the learner's cognitive background. Thus, the more unfamiliar the learning material (i.e., the more undifferentiated the learner's background of relevant concepts), the more inclusive or highly generalized the subsumers must be in order to be proximate. If appropriately relevant and proximate subsuming concepts are not available, the learner tends to use the most proximate and relevant concepts that are. But since it is highly improbable, however, that we can count on the spontaneous availability of the most relevant and proximate subsuming concepts, the most dependable way of facilitating retention is to introduce the appropriate subsumers and make them part of cognitive structure prior to the actual presentation of the learning task. The introduced subsumers thus become advance organizers or anchoring feet for the reception of new material.

Even though this principle seems rather self-evident it is rarely followed in actual teaching procedures or in the organization of most textbooks. The more typical practice is to segregate topically homogeneous materials into separate chapters, and to present them throughout at a uniform level of conceptualization in accordance with a logical outline of subject matter organization. This practice, of course, although logically sound is psychologically incongruous with the postulated process whereby meaningful learning occurs, i.e., with the hierarchies of organization of cognitive structure in terms of progressive gradations of inclusiveness, and with the mechanism of accretion through a process of progressive differentiation of an undifferentiated field. Thus, in most instances students are required to learn the details of new and unfamiliar disciplines before they have acquired an adequate body of relevant subsumers at an appropriate level of inclusiveness.

As a result, both students and teachers are often coerced into treating meaningful materials as if they were rote in character, and students consequently experience unnecessary difficulty and reduced success in both learning and retention. The teaching of mathematics and science, for example, still relies heavily on rote learning of formulas and procedural steps, on recognition of stereotyped "type problems," and on mechanical manipulation of symbols. In the absence of clear and stable concepts which can serve as anchoring points and organizing feet for the incorporation of new meaningful material, students are trapped in a morass of confusion and have little choice but to roteily memorize learning tasks for examination purposes. The traditional historical introduction to new and primarily nonhistorical, subject matter concepts possibly enhances student interest, but lacks the necessary substantive content to serve this organizing function (see examples under Procedure section above).

The pedagogical value of advance organizers obviously depends in part upon how well organized the learning material itself is. If it contains built-in organizers and proceeds from regions of lesser to greater differentiation (higher to lower inclusiveness), rather than in the manner of the typical textbook or lecture presentation, much of the potential benefit derivable from advance organizers will not be actualized. Regardless of how well-organized learning material is, however, it is hypothesized that learning and retention can still be facilitated by the use of advance organizers at an appropriate level of inclusiveness. Such organizers are available from the very beginning of the learning task, and their integrative properties are also much more salient than when introduced concurrently with the learning material.

**SUMMARY AND CONCLUSIONS**

An empirical test was made of the hypothesis that the learning and retention of unfamiliar but meaningful verbal material could be facilitated by the advance introduction of relevant subsuming concepts (organizers). Experimental and control groups of 40 undergraduate Ss each were equipped on the basis of sex, field of specialization, and ability to learn unfamiliar material. The learning task consisted of a 2,500-word passage of empirically demonstrated unfamiliarity, dealing with the metallurgical properties of steel. On two separate occasions, 48 hours and immediately prior to contact with the learning task, experimental Ss studied a 500-word introductory passage containing substantive background material of a conceptual nature presented at a much higher level of generality, abstraction, and inclusiveness than the steel material itself. This passage was empirically shown to contain no information that could be directly helpful in answering the test items on the metal passage. Control Ss similarly studied a traditional type of historical introduction of identical length. Retention of the learning material was tested 3 days later by means of a multiple-choice test. Comparison of the mean retention scores of the experimental and control groups unequivocally supported the hypothesis.

The facilitating influence of advance organizers on the incorporability and longevity of meaningful learning material was attributed to two factors: (a) the selective mobilization of the most relevant existing concepts in the learner's cognitive structure for integrative use as part of the subsuming focus for the new learning task, thereby increasing the task's familiarity and meaningfulness; and (b) the provision of optimal anchorage for the learning material in the form of relevant and appropriate subsuming concepts at a proximate level of inclusiveness.

The suggestion was offered that the greater use of appropriate (substantive rather than historical) advance organizers in the teaching of meaningful verbal material could lead to more effective retention. This procedure would also render unnecessary much of the rote memorization to which students resort because they are required to
STABILITY AND CORRELATES OF JUDGED CREATIVITY IN FIFTH GRADE WRITINGS

NORMAN E. WALLEN AND GILBERT M. STEVENSON
University of Utah

Proceedings of conferences on creativity (Taylor, 1959) generate the hypothesis that “creativity” may soon be added to “Achievement, Anxiety, and Authoritarianism” as the favorite variables of psychologists. As has been frequently pointed out, however, this variable poses rather severe problems of definition and measurement.

This paper is concerned only with creativity in writing as judged by fifth grade teachers. If creative abilities can be identified at an early age, one approach to measuring such abilities is to have sample writings evaluated by persons with wide experience with such materials. The first question which arises is whether teachers can agree as to the creativity of a given sample of writing. Studies by Wrightstone (1938) and Mary Francis Assisi (1950) indicate that such agreement can be obtained. In the event that judges can agree, the next question is the extent to which such ability as judged is constant over a period of time. In addition to investigating these two questions, we were interested in the relation of this variable to the dimensions of intelligence, academic achievement in the more traditional sense, and social adjustment.

PROCEDURE AND RESULTS

Five teachers in a small town elementary school comprised the group of judges. The student sample (N = 63) consisted of the two fifth grades in the same school. There would appear to be no atypical characteristics of the students. The mean and standard deviation on the California Mental Maturity Test are 103 and 13.7, respectively. Neither do the five judges appear in any major respect atypical of elementary school teachers with the possible exception of two who were the teachers of the two classes comprising the student sample. That they may be somewhat atypical is suggested by the fact that both teachers place considerable emphasis on establishing what is considered to be a creative atmosphere as described by Wilson (1958):

Writers on the subject are in pretty general agreement that the environmental conditions which foster creativity are those which encourage independent thought and which are permissive of new ideas. They seem to be in agreement that conditions which produce fear of criticism are likely to inhibit the individual’s expression of his creative ideas (p. 117).

During the year, the students had considerable experience in writing with emphasis on the expression of original ideas and feelings. Class discussion of their compositions was common.

Four sets of compositions each on a different topic were utilized for purposes of the study. All were obtained during the spring term at 2- to 4-week intervals. The first was used as a preliminary test of judge agreement and was written on one of the first days of spring. The instructions to the students were to express their feelings about the events possible; we favor the notion that his lack of experience with children’s writings is primarily responsible.