Chapter 3
Domains of Learning[5]

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A major contribution of Gagné has been his views regarding the varying categories of learning outcomes and their relevance for instruction. He calls these categories the domains of learning and has identified different principles for designing instruction for each domain. He refers to these principles as the conditions of learning. The domains and their related conditions served as the major thesis of his important book, The Conditions of Learning. These ideas are summarized in this article published after the second edition of Conditions. By this time Gagné was at Florida State University. This article also expands upon the distinctions he had previously made between his views regarding the impact of past learning and those who attribute differences among learners to biological and developmental changes.

Those who profess to study and improve education through methods of research are inevitably concerned with the human activity of learning. It is, after all, the capacity of human beings to learn that makes it possible, and necessary, for a society to have a set of institutions devoted to education. Educational research may, of course, concern itself rather directly with human learning activity, as when one investigates methods of instruction, modes of communication, or procedures for reinforcing the learner's behavior. Or, such research may be related to the activity of learning in a somewhat less direct way, as when the focus of investigation is the institutions established to bring about learning. Wherever the investigation fits along this broad spectrum, there can be little doubt that it is in some manner ultimately to be related to the question of how human beings learn.

From a dictionary, one can identify two primary meanings for the word "learning." Definition one is "the process of acquiring modifications in existing knowledge, skills, habits, or action tendencies." The second definition is "knowledge or skill that is acquired by instruction or study."

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[5] *Editor's Note:* From "Domains of Learning," by R. M. Gagné, 1972, Interchange, 3, 1-8. The ideas were originally presented in a presidential address to the American Educational Research Association.

It is easy enough to identify domains of learning in its second meaning. We do so all the time when we speak of divisions of the curriculum—knowledge about history, society, biology, literature; and skills of language and mathematics. Such domains have been identified in a variety of ways in different periods. The referent is the *content* of learning.

What about the first meaning—the *process* of learning? Are there also domains of learning processes that need to be distinguished, or is it always a single process, to be classified only in terms of its second meaning—the domains of knowledge and skill within which learning occurs? For many years, it would appear, those who conducted research on the learning process proceeded more or less on the assumption that they were searching for a common set of characteristics of the learning process, which would apply whether the learner was engaged in learning to lace a shoe, to define a new word, or to write an essay. Nevertheless, in the course of time, it has evidently become increasingly difficult to deal with the varieties of learning that occur in schools without classifying them in some manner. Accordingly, a number of terms have been invented to differentiate classes of learning, in order to make it possible to think about the learning process more clearly. Such phrases as “cognitive learning,” “rote learning,” “discovery learning,” “concrete vs. symbolic learning,” “effective learning,” “conceptual learning,” and many others, are examples of this strong and demanding tendency.

Each of these categories has some usefulness, of course. However, it also appears that their usefulness is limited—they are not as generally useful as they ought to be. One can readily find examples, for instance, in which learning may be called rote in one situation, conceptual or cognitive in another. Many human performances that may be described as motor from one point of view turn out to be highly symbolic in some other sense. The domains that have been identified for the process of learning are limited in usefulness because they are not well differentiated either by means of the operations required to establish them, or by the consequences to which they lead.

The Need for Domains of the Learning Process

Why should the educational researcher be cognizant of domains of the process of learning? What need do they fulfill? What functions do they serve?

First, they are needed to distinguish the parts of a content area that are subject to different instructional treatments. The learning of science is not simply science learning, and the learning of language is not just language learning. Consider the learning of a foreign language as an example. One part of instruction must typically be concerned with the pronunciation of letters in words. The German word *Gemütlichkeit*, in order to

be understood by a listener, must be said with the proper sound for the umlauted *u*, and for the letter combination *ch* and *ei* —sounds that the student whose native language is English is not used to making. In order to learn to make them, he needs a good deal of practice on these specific letter combinations, as they occur in various words. But what about another part of his foreign language learning, in which he must learn to respond to a German question with a German answer? Is the way to accomplish this to practice a set of German answers? Of course not, and no teacher of German would imagine that it is so. There are, then, different parts to this single subject that need to be *differentially* handled, so far as instruction is concerned. How shall one describe the different domains of the learning process that apply to the parts of this subject, as they do to the parts of other content areas?

A second need for distinctive domains of the learning process is that of relating the instructional procedures of one subject to those of another. If it is true that one cannot generalize about learning conditions from one part of a subject to another, is it nevertheless also true that similar parts can be found among different content areas? The existence of these comparable parts of different subjects is rather easy to demonstrate. Think of what a student is being asked to learn in mathematics, say, when one asks him to learn to answer the question, “What is a triangle?” We expect that he will be able to define this concept, perhaps by using his own words, but better still by showing how such a figure possesses characteristics of a closed curve and intersections of line segments. Suppose instead the subject is social science, and we want the student to answer the question, “What is a city?” In an entirely comparable way, we expect that he will be able to demonstrate a definition of this concept, by showing that a city possesses the characteristics of concentration of population, commerce, and transportation center. In both these subjects, very different in content, we are dealing with the *use of a definition*, and similar mental activities would be required in any other subject field. In other words, one of the kinds of things students are asked to learn is using definitions, and this is true whether we are dealing with mathematics, foreign language, science, or whatever.

A third reason for identifying domains of learning is that they require different techniques of assessment of learning outcomes. One cannot use a single way of measuring what has been learned. This is, of course, the basic point made by the pioneering work of Bloom (1956), Krathwohl, Bloom, and Masia (1964), and their associates. As this work amply demonstrates, one cannot expect to employ the same kind of test item, or question, to determine whether a student has learned an item of knowledge, on the one hand, or the ability to synthesize several different ideas, on the other hand. Again, different categories of the learning domain are needed for measurement, regardless of the particular subject matter. They are needed in order to avoid the serious error of

assuming that if a student knows something about a topic, that he therefore is part of the way to knowing all he needs to know about that topic. Instead, he can learn many more things without ever accomplishing the latter goal; the reason is because he needs to undertake entirely different categories of learning, rather than more of the same. The ways used to measure these different categories are different, and it is these ways that demonstrate how distinct the mental processes are.

Learning Domains

There are, then, a number of reasons for trying to differentiate domains of the learning process that are orthogonal to content, but that at the same time are in opposition to the notion that all learning is the same. From the standpoint of an educational researcher, the search is for domains *within which generalizations of findings can be made*. If the researcher has obtained a result that shows certain conditions to be facilitative of learning, he needs to know how widely this result can be generalized. Does it apply across subject-matter, across age levels, across classrooms? It is this kind of research utilization question to which the differentiation of domains of learning may be most relevant.

I should like here to summarize my conclusions about the desirable distinctions of domains of learning, some of which I have briefly described elsewhere (Gagné, 1970a), before going on to discuss their implications for other kinds of distinctions applicable to the learning process. The domains I would distinguish are five, and I call them (1) motor skills, (2) verbal information, (3) intellectual skills, (4) cognitive strategies, and (5) attitudes.

1. *Motor skills* is a good category to begin with, because it is so generally recognized to be distinctive. These are the capabilities that mediate organized motor performances like tying shoe laces, printing letters, pronouncing letter sounds, using tools and instruments. As everyone knows, learning motor skills takes practice, in the sense of repetition of the essential motor act. This requirement, in fact, appears to be one of the main characteristics that distinguish motor skills from other domains of learning. The evidence (Fitts & Posner, 1967, pp. 15–19) is to the effect that motor skills continue to improve with practice over long periods. As for retention, the differences favoring motor skills (Leavitt & Schlosberg, 1944) over verbal materials have often been confirmed.

2. *Verbal information* is a second category, surely of enormous importance for the schools. Facts, principles, and generalizations constitute a large portion

of any curriculum, in most subjects. Such information is needed in a specific sense for continued learning within a particular subject area. Larger, organized bodies of information are usually called knowledge, and we recognize that people must acquire knowledge not only for further learning within a subject area, but for the lifetime purposes of learning across areas, and for thinking in a very general sense. The learning process for verbal information appears to be quite different from that of motor skills. Many theorists are now convinced that the repetition provided by successive presentations of word lists on a memory drum is not the factor that causes learning (cf. Battig, 1968). Instead, the major requirement for learning and retaining verbal information appears to be its presentation within an organized, meaningful context (cf. Mandler, 1962; Rohwer & Levin, 1968), as the work of Ausubel (1968) also suggests.

3. *Intellectual skills* is a third category I would distinguish and I have written about these skills extensively (Gagné, 1970a). They are, most importantly, the discriminations, concepts, and rules that constitute the basic skills of the elementary curriculum, and all of the elaborations of these that occur throughout more advanced subjects. It seems particularly important to distinguish these from verbal information and knowledge. For example, being able to recall and reinstate a definition verbally is quite different from showing that one can use that definition. The latter is what is meant by an intellectual skill, but not the former. Do intellectual skills require practice for their learning? The evidence does not show that practice, in the usual sense of that term, improves them (cf. Gagné, 1970b). Does their learning require an organized, meaningful context? It is doubtful that it does, at least if one attempts to define meaningful context in the same sense as that required for learning verbal knowledge. Most importantly, the learning of intellectual skills appears to require prior learning of prerequisite skills, in a manner that is surely not true for learning verbal information. The absence of a necessity for particular prior learning is shown in the case of verbal information by studies of programming sequences such as that by Payne, Krathwohl, and Gordon (1967). For these various reasons, it seems essential to consider intellectual skills a domain of learning quite distinct from others.

4. *Cognitive strategies* is the fourth category, a domain that has been particularly emphasized by Bruner (1970; Bruner, Goodnow, & Austin, 1956). In a sense these are also skills, and they are obviously different from verbal knowledge. They are internally organized skills that govern the individual's behavior in learning, remembering, and thinking. Since they are directed

toward self-management (cf. Skinner, 1968) of learning and thinking, they are obviously different from intellectual skills, which have an orientation toward the learner's environment. Although they are obviously very different from motor skills, curiously enough they share with them the property of deriving their learned organization from stimuli that arise within the learner. For this reason, they also require a kind of practice. The word is used here, though, mainly to emphasize the analogy; what appears to be required is repeated occasions in which challenges to thinking are presented. It is notable, therefore, that thinking strategies are not learned all at once, as intellectual skills may be. Instead, they exhibit continued refinement as the learner continues to encounter situations in which he has to learn, to remember, to solve problems, and to define problems for himself.

5. *Attitudes* constitute the fifth domain of learning. Their learning is obviously different from the other categories. They are not learned by practice. They are by no means dependably affected by a meaningful verbal context, as many studies have shown (Hovland, Janis, & Kelley, 1953; Rosenberg, Hovland, McGuire, Abelson, & Brehm, 1960). One of the most effective ways of changing attitudes would appear to be by means of the human model, and the "vicarious reinforcement" described by Bandura (1969). In any case, the apparent requirement for involvement of a human person in the process of modifying attitudes makes this kind of learning highly distinctive and different in many respects from the other varieties.

Generalizability and the Domains of Learning

The suggestion I make, therefore, is that when one deals with learning as a process, rather than as a set of content areas, one needs to distinguish the five domains of motor skills, verbal information, intellectual skills, cognitive strategies, and attitudes. These domains set the primary limits on generalizability of research findings concerned with learning. One can generalize *within* these areas, regardless of subject matter, with a fair degree of confidence. In contrast, generalizing across these domains is at best a highly risky business, and likely to be quite invalid.

Despite the suggestive evidence previously cited concerning the differences among these domains, one can hardly consider them as fully established. My suggestion is that it is these kinds of differences, and these kinds of implications for a generalization, for which the researcher needs to search. One cannot establish domains of learning by means of a few crucial experiments. Instead, conclusions about generalizability or lack of generalizability must be based upon a broad spectrum of findings from many content

areas.

Suppose that one is concerned with how learning can be made most effective in a social studies unit on cities. If the objective is one of having children learn to state the names and locations of major cities of the world, the domain of learning is verbal information. The suggestion is that such an objective will be most readily achieved by providing a meaningful context for each city—for example, the semantic origin of its name, the reasons for its particular location, and so on. But if the objective of the unit on cities is a different one, say, “deriving a definition of the concept city” (an objective requiring cognitive strategies), or “having a positive interest in visiting a city” (an attitude), the provision of a meaningful context for each city will not accomplish the desired learning. For these latter kinds of learning outcomes, something different is required in each case.

The objective of developing cognitive strategies for application to the defining and solving of problems pertaining to cities must be approached, according to the evidence currently available, by providing a series of learning experiences making possible a variety of opportunities for the student to think out solutions to novel problems, including problems that are not necessarily concerned with cities per se. He might, for example, have been provided with other defining problems, such as those of defining a person, or a group, or a school. But the presentation of meaningful contexts about cities is not what will effect this kind of learning, as it will the contrasted objective of “stating the names and locations of major cities.”

Neither will the meaningful context accomplish the job of establishing or changing an attitude toward visiting the city. While one hesitates to say such a context has no effect at all, the evidence is quite substantially lacking that practically significant changes in attitude can be produced in this manner. But they probably can be produced by the modeling of human behavior. Perhaps the teacher, or some other respected person, can show his liking for visiting the city, and the student can observe the pleasure derived from rewarding experiences during such visits. Or, of course, he may be able to experience such rewards for himself. Both direct and vicarious reinforcement are likely to contribute to the establishment of a positive attitude.

The various objectives that have been described for a unit on cities are of course all different, and this is the point at issue. Any or all of these might be desired as an outcome of such an instructional unit. The suggestion from research is that these different learning outcomes require different conditions for effective instruction. The question for research is to verify the generalizability, and the absence of generalizability, of learning conditions and learning outcomes across these domains.

Another example may be useful. Suppose one wishes to offer students a science unit on Moments of Force. The likelihood is, in this case, that the major concern is with an intellectual skill such as “demonstrating the equivalence of moments of force about a fulcrum of a body at equilibrium.” Such a learning task is best described as the application of a general rule to a specific situation, novel to the learner. Naturally, the learner has to be given specific verbal information (about the body, the fulcrum, etc.) in order to attack the problem. Just as obviously, he may have learned some ways of defining and approaching such problems that deserve to be called cognitive strategies. But the critically necessary capabilities he must bring to the task are the intellectual skills that include rules for obtaining moments of force, of multiplying specific values of force and distance, of substituting values in statements of equality, and the like.

How are such rules learned? The conditions for their learning are not the same as those for verbal information, nor are they the same as those for cognitive strategies. According to my interpretation of the existing evidence, the critical condition for their learning is the recall of previously learned intellectual skills (subordinate rules, concepts, etc.). As a further consideration, it may be noted that when one attempts to assess the learning of such skills, one does not set about measuring what factual knowledge (verbal information) the student has, nor how well he formulates the problem (cognitive strategies). Instead, one tries to measure the possession of the intellectual skill—whether or not the learner is able to apply the rules he has acquired to this class of problems.

When these five domains are identified as the primary categories that limit the generalizability of conclusions about the learning process, does it not suggest that some other rather obvious human characteristics are being overlooked? For example, is it possible that sex or racial characteristics may impose such limitations even more clearly? Concerning these variables, it seems unlikely to me that they are the kinds of factors that biologically limit the generalizability of propositions about learning, although some investigators wish to explore this possibility (cf Jensen, 1968). The variable of age, however, may be a good one to consider further in the present context, since it may serve to show not only what the differences in learning are, but why they may be expected to occur.

Age and Learning

Let us consider two students, both of whom are attending school. One is 10 years old, in the fourth grade; the other is 24 years old, and attending graduate school. Is there a difference in the way they learn?

First of all, there are obvious differences in the arrangements made for their instruction. The fourth-grader is learning how to use his language, in speaking, reading, and writing. He is learning to use mathematical concepts and to solve quantitative problems. Perhaps he is learning also about different nations and cultures of the world. Many of these things to be learned are prescribed as part of a school curriculum. The graduate student may also have some prescribed subjects to deal with—foreign languages, or statistics, or computer usage. It is perhaps relevant to note that much of what he learns is determined by him, because he sees the need to learn it—the knowledge of how a specialized field is conceptually organized, of its methods, and of its ways of formulating and solving problems.

There are, then, some differences in the kinds of choices that the learner makes, in these two cases, and in the kinds of objectives being pursued, although perhaps not major ones. The 10-year-old is learning how to do some arithmetic, the 24-year-old is learning how to do some statistics. The 10-year-old may have a choice of a South American country whose culture he wishes to explore; the 24-year-old chooses a particular field of research whose findings he wishes to organize. But how do they go about their learning? Are there differences here?

There are, and they are quite striking ones. In the case of the arithmetic, for example, the fourth-grader is responding to a carefully organized plan of instruction, which provides him with illustrations, a rationale or verbal explanation, some chosen examples, and a means for him to check his operations at frequent intervals. He responds to printed text, to some pictorial presentation, and to the oral communications of the teacher. Arrangements are made for spaced reviews, and for application of the principles he learns in a number of verbally described situations. In the case of the statistics, the graduate student meets quite a different set of circumstances. Mainly, he is expected to learn by reading a book chapter by chapter, by following its terse rationale, and by applying what he has learned to problems containing detailed quantitative data. The book does not provide him with many pictorial aids, nor does it furnish lengthy explanations of procedural steps.

Similar contrasts exist in the learning about a foreign country's culture by the fourth-grader, and the learning of the substance of a field of research by the graduate student. The 10-year-old learns the features of a foreign culture when they are carefully embedded within a meaningful context, which he learns about partly by reading, partly by using audiovisual aids, partly by the teacher's oral communications. Sometimes, in fact, this meaningful context becomes so rich that it is difficult to tell what he is supposed to be learning. The graduate student, in contrast, does a great part of his learning by reading articles in professional journals or technical books. They seldom can include a meaningful context or background since that would require too many pages, and they

seldom include diagrams or other pictorial aids, since they cost too much. The sentences and paragraphs he reads tend to be long and densely written, and they refer to many abstract and technical concepts.

Both of these provide examples of learning, and both may be effective learning. Yet if one were to study what made learning effective in the 10-year-old, would one be able to generalize to the 24-year-old? I think not. The difference in the two instances is often summarized by saying that the 24-year-old has become to a large extent a self-learner, whereas the 10-year-old has not yet achieved this state, and has a ways to go before he does.

What might “being a self-learner” mean? What does the graduate student bring to his learning task that differs from what is brought by the fourth-grader? It seems to me that this question can best be answered in terms of the five domains of learning I have described.

The 24-year-old has acquired much complex, highly organized verbal information in his field of study. Accordingly, he is able to supply the meaningful organization required when he reads the journal article that is so concisely written. The 10-year-old has no such store of verbal information about the cultures of foreign countries, or even perhaps about his own country. The meaningful organization he can bring to bear on the learning task is therefore meager, and we must take a variety of means to supply it for him.

The 24-year-old has some highly relevant intellectual skills, which he has used many times, in approaching the study of statistics. He can perform mixed arithmetic operations, interpret graphs and tables, state and solve proportions, use the concepts of area and of limits. In the case of the 10-year-old, one is not so sure he can recall the prerequisite skills to the new operations he is learning in arithmetic. One therefore takes care to arrange the situation so that these intellectual skills are recalled, and also attempts to insure by means of spaced reviews that the new ones he learns will be readily available in the future. Another kind of difference in intellectual skills is exhibited in language usage. The graduate student is able to respond appropriately to the compact and complicated sentences of text he encounters in his reading, whereas the fourth-grader would be confused by these.

The 24-year-old brings to his learning task some highly valuable cognitive strategies, which the 10-year-old has not yet acquired. The former is probably able to sort out main and subordinate ideas in his attending and in his reading. He may well have some techniques of rehearsal that act in the storage of what is learned, as well as efficient strategies for retrieval of previously learned knowledge and skills. And he almost surely

has acquired and refined some ways of approaching problems, defining problems, and weighing alternative solutions to problems—ways that are available only in a primitive form to the 10-year-old.

In terms of these domains alone, there are likely to be enormous differences in the process of learning in the 10-year-old and the 24-year-old individual. These differences exist, not simply because the passage of time has produced a disparity of 14 years in their ages or stage of biological growth and decay. They exist because of a history of learning, which has left in the older person a residue of increased knowledge, a greater repertoire of intellectual skills, a greatly enhanced collection of cognitive strategies, and quite probably a different set of attitudes. All of these capabilities are different in the two instances, and each of them is bound to affect the process of learning, so that a very different problem exists for the design of instruction for these two individuals.

Is it possible that I have distorted these differences by choosing a graduate student as the 24-year-old, rather than an adult who is a high school graduate? The differences may be magnified, surely, but not distorted. If one equates inherent intellectual capacity, the typical adult is likely to outdo the 10-year-old in amount of verbal information he has, either in general or specialized fields. He is very likely to have more powerful cognitive strategies, particularly as these relate to his capabilities of problem-solving and thinking. As for his intellectual skills, these are most likely to display a very uneven picture, since they can rather readily be forgotten unless they are used constantly. For example, unless there are occasions for use in the intervening years, such an adult may well have forgotten how to add fractions, or to find a square root, or to edit written sentences to make verbs agree with subjects. It would not be surprising, therefore, to find a number of specific instances of knowledge or intellectual skill in which the fourth-grader displayed greater capabilities than the young adult. Such instances, however, merely seem to verify the general proposition that the five categories I have described represent the critical dimensions of domains of learning within which generalization is possible. It is of little use to know that some fourth-graders know how to do some things that some adults do not; this is not at all a remarkable fact. But it is of use to know, particularly if one is designing adult education, the nature of the adult's capabilities in the different domains of learning.

It is of some interest to point out some implications of this analysis of age differences in learning. First, it becomes apparent that college and university courses are not good models for the design of instruction for the fourth grade. A laboratory exercise in college chemistry, for example, cannot be made into a suitable learning experience for a child simply by using simpler language. Although the verbal information contained in the exercise may be made understandable to the child, it is quite another matter to attempt

to reduce age differences in the domains of intellectual skills and cognitive strategies. The latter capabilities must be learned, and if one sets out to teach them to the fourth-grader, it is likely to take some time, possibly even years of time. A second implication is the reverse of the first; the design of instruction for the 10-year-old is not a good model for college instruction. Suggestions are sometimes made along these lines with reference to the education of teachers. However, as suggested by the previous analysis, the college student brings to his instruction a great variety of knowledge, intellectual skills, cognitive strategies, and attitudes that the 10-year-old simply does not have. If one attempts to design instruction for the college student that assumes that these capabilities are not there, it will surely be perceived as both boring and ridiculous. What is needed instead is a clear recognition of the requirement for different instruction for the fourth-grader and for the college student, based upon expected age differences in the different domains of learning.

Conclusions

The ideas presented in this article are expected to be of primary interest to those who perform research on learning and instruction, and to those who attempt to base instructional procedures upon the findings of such research. An examination of the results of studies of learning, particularly those concerned directly with school subjects, strongly indicates the necessity for recognizing five major domains of learning. These are here named motor skills, verbal information, intellectual skills, cognitive strategies, and attitudes. It appears likely, on the basis of present evidence, that generalizations about the critical conditions for learning, as well as about the outcomes of learning, can be validly made within these categories (irrespective of specific content), but not across them. Further validation of this proposition must of course come from a great variety of research evidence; therefore, the categories as now formulated may serve as points of emphasis in studies of school-subject learning.

Considerable usefulness can also be foreseen in the application of these categories in instructional design. In such use, the domains are classes of instructional objectives, each of which requires a different set of critical conditions to insure efficient learning, and each of which implies the need for a different sort of situation for its assessment as a learning outcome.

Examples of the generalizability of learning characteristics within domains and their non-generalizability across domains have been described. An example of age differences in learning between a 10-year-old and a 24-year-old is expanded to clarify the implications of learning domains. The major argument put forth is to the effect that differences in the requirements of instructional design cannot be clearly understood simply by appeal to

differences in biological growth or amount of experience. The older and younger learner begin their learning of a new task with particular differences in previously acquired verbal information, intellectual skills, cognitive strategies, attitudes, and motor skills. Depending on what the new learning task is, the younger learner may begin the learning with greater or lesser capabilities than the older learner, in any of these categories. Effective instruction needs to be designed to take full account of the differences within these learning domains.

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