Chapter V

Discussion

The present study intended to verify certain hypotheses which may be restated here before we discuss the findings. There were two general hypotheses one relating to the gradients of generalization, which was common to the first three experiments, the other relating to the two conditions of learning, namely, INT and INC, which was common to all the four experiments of the study, and six specific hypotheses relating to the specific types of material used in different experiments; the first three were verified, one each by the first three experiments, and the remaining three were verified by the fourth experiment.

a. General Hypotheses

Hypothesis I: Generalization decreases with a decrease in similarity between the test items and the original learning items in different types of verbal material, except for syntactical material to which this hypothesis does not apply, because in this type of material the items in the generalization test are one or another component of the original material and not just the variations of the latter.

Hypothesis II: Generalization under condition of intentional learning (i.e., learning with awareness) which
involves a conscious effort on the part of the learner, is
greater as compared to generalization under condition of
incidental learning (i.e. learning without awareness), which
is casual and, therefore, does not involve any conscious
effort on the part of the learner.

b. Specific Hypotheses

Hypothesis I: As semantically-similar items are
dissimilar physically and are familiar in terms of specific
lawful associations evoked by them as compared to phonemi-
cally-similar items, generalization for the former will be
less than for the latter.

Hypothesis II: Since antonyms convey opposite mean-
ings and are, as such, different and distinct from each
other, whereas synonyms convey same meanings and, hence,
are equivocal and overlapping with each other, the former
are more discriminable and, therefore, less amenable to
generalization than the latter.

Hypothesis III: Variations of an abstract concept in
terms of its defining properties are more amenable to
generalization than variations of a concrete concept in
terms of its specific and discrete instances.

The three hypotheses pertaining to the different types
of syntactical structure are as follows:

Hypothesis IV: In the assertive and interrogative
forms of syntactical structure the generalizability of the whole sentence to the verb component will be greater than to the other two word components.

Hypothesis V: In the optative and exclamatory forms of syntactical structure the generalizability of the whole sentence to the subject component will be greater than to the other two word components.

Hypothesis VI: In the imperative form of syntactical structure the generalizability of the whole sentence to the object component will be greater than to the other two word components.

The first general hypothesis, which is common to the first three experiments, is fully confirmed by the results of these experiments. Expressing the results in more technical terms, one may state that the amount of generalization is a function of the degree of similarity between the material used in the training and that used in the testing phase. The gradients of generalization for phonemically-similar and semantically-similar items (Fig.1), for synonymous and antonymous materials (Fig.2), and for concrete and abstract conceptual materials (Fig.3), show that as similarity between the test material and the original learning material decreases, generalization also decreases, regardless of whether the condition of learning is INT or INC.
One thing that seems to have patently emerged out of the findings of the present study is that generalization is a phenomenon which is not confined only to sensory-perceptual learning, but occurs in verbal learning as well in varying degrees and along different dimensions.

Another important point which deserves our attention is that semantically-similar material as compared to phonemically-similar material, antonymous material as compared to synonymous material and concrete conceptual material involving variations of concrete concepts in terms of their specific and discrete instances as compared to abstract conceptual material involving variations of abstract concepts in terms of their defining properties are more discriminable and, therefore, less amenable to generalization for different reasons to be discussed later.

Considering the second general hypothesis, which is common to all the four experiments, the results indicate that significantly greater amount of generalization occurs under INT than under INC learning condition, regardless of the type of material, due mainly to awareness and conscious effort on the part of the learner to learn and to retain under the former condition, and unawareness and casualness on the part of the learner to learn and to retain under the latter condition.
The INT learner having been called upon to perform the task at hand, not only attends to it in its entirety but also makes a conscious effort to perform it as well as he can. This being as it is, we can explain the occurrence of greater generalization under the INT learning condition, i.e., under learning with awareness, in terms of heightened state of motivation.

That generalization for different types of verbal material is consistently greater under INT than under INC learning condition seems to be justifiable as being due to a heightened state of motivation, but the question, more important than that, is: why do learning and, its after-effect, generalization occur at all under incidental learning condition when the learner is not quite prepared for the task at hand?

One plausible answer to this question is that although the INC learner is not required, unlike the INT learner, to perform the task, he is nevertheless exposed to the instructions and the learning task and is required, specifically in the present experiments, to acquaint himself with the experimental procedure in order to keep a record of the performance of the INT learner. Thus, the whole situation, particularly his role as a recorder and his acquaintance with the experimental procedure, provides adequate cues to him, not to exert
himself to perform the task as such, which only the INT learner is required to do, but to acquaint himself with the nature and the purpose of the task at hand. The performance of the task is, in fact, contingent on both an intention to perform the task and an orientation to, or acquaintance with the nature and purpose of the task. INT learners are equipped with both the intention and the orientation, whereas the INC learners are equipped only with the latter. This explains why INC learners also learn the task to some extent, though only implicitly, and manifest the effect of this implicit learning in their subsequent generalization scores, but since there is no intent on their part to perform the task, their generalization scores are much lower than those of the INT learners who are not only equipped with an orientation to the task but with an intention to perform it as well.

The main purpose of the study, it may be recalled, was to see whether the same or different principles explain the phenomenon of generalization with different types of verbal material ranging from simple material like nonsense syllables to such complex material as complete sentences varying in grammatical arrangements.

In the first experiment, a comparison was made between nonsense syllables (phonemically-similar items) and simple words (semantically-similar items) in order to put to an experimental test the hypothesis that semantically-similar
items are less amenable to generalization than phonemically-similar items, the underlying assumption being that since test items of the semantically-similar material as compared to those of the phonemically-similar material are more dissimilar physically from the original items, and also since semantically-similar items are meaningful having the capacity to evoke specific, that is, familiar associations, whereas phonemically-similar items are meaningless incapable of evoking any lawful association, the former are more discriminable than the latter. The findings, by and large, support the hypothesis.

A comparison between the phenomenon of generalization with phonemically-similar and that with semantically-similar material suggests that the former can be explained in the same manner in which primary stimulus generalization can be explained, i.e., in terms of transfer. When a certain response is conditioned to a verbal object, as in the present experiment, where a figure of two-digit number (51) is conditioned to the CCC type of Hindi nonsense syllable (रेखांत्र), then the number serves as the CR and the nonsense syllable as the CS; subsequently, when CR is extended or generalized to such other nonsense syllables as have a close visual or auditory resemblance with the CS, the process of generalization can be explained in terms of transfer, not involving the use of any meaning or mediating mechanism.
Thus, in generalization for phonemically-similar material, as it is in primary stimulus generalization, a CR once established to a CS will be elicited by other stimuli which resemble the CS in varying degrees along a particular physical dimension, with the strength of CR decreasing in proportion to the degree to which test stimuli differ from the training CS. It seems parsimonious, therefore, to explain phonemic generalization involving physical similarity in terms of the principle of transfer.

Although some investigators (Razran, 1939, 1949, 1961; Philips, 1958) in this field appear to be more in favour of explaining not only phonemic generalization, which is based entirely on similarity between new stimuli and the CS along some physical dimension, but also generalization for semantically-similar items which is based on some relationship of meaning between the new stimulus words and the old CS word, in terms of transfer, it is obvious that something other than physical similarity is needed to explain generalization for semantically-similar items. Since the test items in semantic material were systematically varied in terms of similarity of meaning with the original items, generalization for semantically-similar items, as proposed by Cofer and Foley (1942), may be explained in terms of equivalence of meaning. Equivalence of meaning is in fact, an extension of the principle of conditioning as it applies to semantic conditioning and to linguistic behaviour in general.
It is obvious that semantic generalization cannot occur in the case of those who do not know the meaning of the words used in semantic conditioning, or who fail to see any semantic similarity between different stimulus words. It seems to be a patent fact, therefore, that, unlike phonemic generalization which does not involve any mediating mechanism, and hence can be explained in terms of the first signalling system, involving similarity along some physical dimension, semantic generalization which involves meaning and, therefore, the use of the second signalling system, is contingent upon mediated relationships among the stimuli having been already established.

To be more precise, semantic generalization is based on the assumption that stimuli are similar in meaning only to the extent to which the same or similar implicit responses have been previously conditioned to them. To put it in simple words, the relation of synonymity in language behaviour of a person is dependent upon his previous associations.

Explaining semantic or mediated generalization, Cofer and Foley (1942) state that "at some pre-experimental time, the subject has become conditioned, either by direct reinforcement or by higher order conditioning, to make $R_x$ to $CS_1, CS_2, CS_3...CS_n$. The subject is next experimentally conditioned by reinforcing $CS_1$ with $UCS_y$, setting up a conditioned response, $R_y$." (p.158). Once $R_y$ is conditioned to
It gets generalized to $CS_2$, $CS_3$...$CS_n$, the magnitude of the generalized response being dependent upon the relative strength of the pre-experimental conditioning of $R_x$ to $CS_1$...$CS_n$. It is this process which explains the mediating mechanism and equivalence of meaning.

That familiar items like meaningful words are more discriminable than unfamiliar items like nonsense syllables and that, therefore, the CR is less susceptible to be generalized to semantically-similar than to phonemically-similar material has been supported by the results of the first experiment. To be more elaborate, the results do lend support to the view that the organism's inability to respond differentially to unfamiliar material, is, at least partly, responsible for greater generalization for the phonemically-similar than for the semantically-similar material. This being as it is, one tends to accept the proposition, that discrimination and generalization are strongly related inversely, so that greater discriminability of verbal material results in poorer verbal generalization, and vice versa. Recent researches on generalization and discrimination (Kalish, 1958; Marsh, 1967), which are also very much in favour of the above proposition, lead to the conclusion that generalization is the inverse of discrimination, which involves nondifferential responding to the new stimuli. In 1946 Lashley and Wade argued that generalization is nothing but lack of discrimination.
According to them gradients of generalization exist as empirical phenomena and that they are indices of imperfect discrimination caused, in large measure, by the organism's inability to redirect attention to new aspects of the stimuli. Thus, it is understandable to find that familiarity with the semantically-similar items and lack of familiarity with the phonemically-similar items produce greater generalization for the latter than for the former.

Here in the first experiment, comparison was made between generalization for familiar items, namely, words and that for unfamiliar items, namely, nonsense syllables. In some earlier experiments (Shvarts, 1954; Vinogradova and Eysler, 1959) the findings of which are apparently contrary to the findings of this experiment, a comparison was made between generalization for words which were similar in sound but different in meaning (phonetically related) and that for words which were different in sound but similar in meaning (semantically related), and it was found that generalization was greater for words which were similar in meaning but dissimilar in sound than for words which were dissimilar in meaning but similar in sound. One important conclusion that may be drawn from these experiments is that when both sets of items are familiar, namely, familiar words, and one set is physically similar but semantically dissimilar whereas the other is physically dissimilar but semantically similar,
then physical similarity-dissimilarity, which was one of the factors determining the difference between generalization for phonemic (unfamiliar, i.e., nonsense syllables) and that for semantic (familiar, i.e., meaningful) items, is not as important as semantic similarity-dissimilarity, semantic similarity being more amenable to generalization than semantic dissimilarity. This may explain as well why the findings of these earlier experiments are not as contrary to the findings of the present experiment as they appear to be.

Implicit in the hypothesis of the second experiment, it may be recalled, was that antonyms are different and distinct while synonyms are equivocal and overlapping. This could obviously have led to an alternative hypothesis — apparently more plausible than the one postulated for the present experiment — namely, that synonymous words used in the generalization test are amenable to generalization while antonymous words used in the generalization test are not amenable to generalization at all, because the former are similar to, while the latter are entirely different from the original words. This hypothesis finds support from all those who, like Osgood (1953), believe that words of similar meaning are mediated by similar implicit reactions, whereas words of opposed meaning are mediated by antagonistic implicit reactions. The results of the present experiment, however, do not favour this alternative hypothesis.
It is true that synonyms and antonyms appear to represent different categories or kinds of words, the main difference between the two being that the former resemble the original words and are multitudinous, whereas the latter not only differ from, but are contrasting to the original words, and are extremely restricted in number, the results of the present experiment, nevertheless, suggest that both the types of words may be regarded as differing not in kind but only in degree. Synonyms are amenable to generalization which can reasonably be explained in terms of their communality of certain features with the original words. But, if antonyms differ from synonyms in kind, so much so that they are completely exclusive of the original words, how can one explain the fact that they are also amenable to generalization, though to a much lesser degree than synonyms. One is, therefore, inclined to agree with Anisfeld and Knapp (1968) - and this will also be parsimonious - that antonyms also, like synonyms, share certain common features with the original words, the range of these features being obviously much smaller in the case of the former than in the case of the latter.

According to Anisfeld and Knapp (1968), words may be regarded as complexes of features or attributes, each word being uniquely characterized by a particular set of these features or attributes, on the basis of which it can be distinguished from all other words in the vocabulary system.
Such an approach is parsimonious in that it analyses words - both synonyms and antonyms - in terms of certain elementary meaning processes out of which the meaning of a particular word is constructed, and reduces large number of different words into smaller number of feature complexes which a set of words have in common. According to this interpretation, when a new synonymous word is presented to the subject in a generalization test, that word sharing some common features with the original word, the subject is led to disregard the distinguishing features between the test word and its synonymous original word and tends to give to the test word the response associated with the original word. Similarly, when a new word which is an antonym to the original word, is presented to the subject in a generalization test, the new word must share some common features with the original word, however insignificant and small these features may be as compared to the features shared by the synonymous word, in order to elicit the response associated with the original word.

That verbal material involving concrete concepts is less amenable to generalization than material involving abstract concepts in the third experiment may be explained in terms of the distinctive characteristics of the two types of concept. Variations of concrete concepts in terms of their specific instances, which were the constituents of the
generalization tests for the material consisting of such concepts are physical in nature and directly observable, whereas variations of abstract concepts in terms of their defining properties, which were the constituents of the generalization tests for the material consisting of such concepts are ideational, inferential and rationally deducible. To be more elaborate, concrete concepts are formed by a process of categorization and classification in which observation of particular cases of concrete objects lead to the formation of generalized concepts. Abstract concepts, on the other hand, are derived through reasoning from general definitions, axioms, universally acceptable principles and widely recognized propositions and postulates.

The above distinction brings into clear focus the contrast between the two types of concept. Variations of concrete concepts in terms of their specific instances are essentially sensory-perceptual, distinct, discrete and divergent, whereas variations of abstract concepts in terms of their defining properties are ideational, amorphous, overlapping and convergent.

This reasonably explains why variations of an abstract concept in terms of its defining properties are more amenable to generalization than variation of a concrete concept in terms of its specific and discrete instances.
The purpose of the fourth experiment was entirely different from that of the first three experiments. Whereas in the first three experiments the relationship between the original items and the test items was one of quantitative variation along different dimensions, in the fourth experiment this relationship was one of whole and part. It was so because the purpose of this experiment was to see which of the three word components - the subject, the verb and the object - in a sentence of a given form of syntactical structure has greater 'meaning load' so that the whole sentence tends to generalize to that component than to other two word components, and to see whether the component having the greatest 'meaning load' remains constant for sentences differing in syntactical structure, or it varies from one syntactical structure to another. The results have clearly demonstrated that the word component to which the whole sentence is more generalizable as compared to the remaining two word components varies from one syntactical structure to another. In the assertive and interrogative types of syntactical structure it is the verb component, in the optative and exclamatory types of syntactical structure it is the subject component, while in the imperative type of syntactical structure it is the object component, which stood out so that the whole sentence was more generalizable to it than to the remaining other word components.
That the verb component stands out and has greater 'meaning load' and, consequently, the whole sentence has greater generalizability for this component as compared to the other two word components in the case of the assertive and interrogative types of syntactical arrangement, but not in the optative, exclamatory and imperative types of syntactical arrangement may be explained as being due to the nature and purpose of these two types. In an assertive type of syntactical structure, either a fact is stated, some news is broken, or the occurrence of an event is reported. The emphasis in this type of sentence construction is evidently on some existing state of affair or action and, hence, the verb component of the sentence becomes more functional than the other two components.

The outstanding and functional position of the verb component remains intact in the interrogative type of syntactical arrangement as well, because it has all the characteristics of an assertive type, the only difference being that in the latter an assertion regarding a fact or an action is made while in the former the assertion is transformed into the form of a question.

In the optative and exclamatory types of syntactical structure, on the other hand, it is the subject component which stands out and, accordingly, the whole sentence has greater generalizability for this component as compared to
the other two word components. In an optative type of sentence a wish or desire is expressed for a person or an object to be or to do something, the person or the object occupying the grammatical position of a subject in the sentence. This being so, the subject component for whom the wish or the desire is expressed, understandably, occupies the focal position in this type of syntactical structure. Similarly, in the exclamatory type of syntactical structure, some strong feeling such as wonder, pain or happy surprise is expressed in regard to a person or an object represented by the subject component of the structure, who is depicted as an agent of some action, or being attributed with some quality. It is in this context that the subject component of the sentence becomes more significant and functional as compared to the other two word components in this type of syntactical structure.

The only syntactical structure in which the object component occupies the focal position and, consequently, has greater 'meaning load' is the imperative one, in which the whole sentence has greater generalizability for this component as compared to the other two word components. In this type of syntactical structure a command or request is made to a person to perform an act in relation to a particular object, the object thus occupying the grammatical position of an object. Since in this syntactical structure the
specification of an object becomes indispensible for the completion of the act for which the command or the request has been made, the object component of the sentence assumes greatest prominence. This explains why the 'meaning load' of this component is greatest in this type of sentence so that the whole sentence is more generalizable to this component than to the other two word components.

Looking at the overall findings of this experiment, one is led to conclude that the word component having greater susceptibility to the generalization of the whole sentence is not the same for different syntactical forms of sentences; it varies from one form of sentence construction to another. Whichever of the three word component fulfils the main purpose of a given form of sentence construction comes to occupy the central position in that form, and thereby acquires the characteristics of what Chomsky calls the deep structure of the sentence.