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An evaluation of the sensitivity of the Semantic Differential in measuring concept-shifts resulting from transfer of information.

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An Evaluation of the Sensitivity of the Semantic Differential in Measuring Concept-Shifts Resulting from Transfer of Information

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ABSTRACT

The present study was undertaken to determine the sensitivity of the Semantic Differential as an instrument to measure the connotative meanings of words.

It was reasoned that a word would become more meaningful to a subject if he were given more information about the concept involved in that word. The Semantic Differential, administered both before and after the introduction of such information, presumably would illustrate such a change of meaning resulting from the new information by a movement in semantic space (a shift of concept) of the word in question.

Three words commonly used were selected for the study. Two of the words were taught with their special psychological connotations, while the third was not taught and thus served as the control. Forty-nine Ss from an introductory class in psychology comprised the sample. The professor teaching the course also marked his semantic profile for the three words, and his markings served as a Criterion.

It was found that movement in semantic space in the direction of the Criterion always accompanies a change in meaning resulting from effective teaching and learning, but that not all movement in semantic space in the direction of the Criterion is a result of effective teaching and learning.

Highly significant correlations were obtained between the results of the

first test and the second test, indicating the reliability of the instrument. The instrument successfully differentiated the different concepts, but the results of determining the semantic profiles of the same concept before and after the learning period were not significant.

It was further discovered that, while the Ss differ markedly from one another in the manner in which they use semantic space, they are consistent within themselves. That is, each S used approximately the same amount of space to indicate his associations on both tests and for all three concepts.

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CHAPTER I

THE PROBLEM OF MEANING

The abundance of recent literature on various aspects of the problem of meaning is indicative of two things. Firstly, that a renewed interest has been taken in the problem of meaning, with the implicit realization of its importance in all areas of human activity. Secondly, (and this is closely associated to the above) the disciplines concerned with meaning seem confident that they are now equipped to deal somewhat more adequately with the problem. No one would deny that meaning is an immensely complicated affair, residing as it does in the individual and seeming to derive at least some of its complexity from the individual. Phenomena of this kind do not admit readily of measurement. For another thing, meaning often appears to refer to some implicit state or process of the host organism which is inferred from observables, and is the sort of ghostly variable the behaviorists have dismissed from psychology. Nevertheless, Osgood, Suci, and Tannenbaum (1957) feel that "the problemof meaning in behavior is probably no more difficult and certainly not greatly different from the problems of dealing with other intervening variables, like emotion and intelligence."

A. The Meaning of Meaning

At least three main groups of definitions of meaning are discernible, each corresponding to the particular science which does the defining. There are the philosophical, the linguistic, and the psychological definitions, and these three

classes are similar to those distinguished in Ogden and Richards' (1923) schema. Of course, very much overlapping exists within and between these groups.

1. Philosophy and Meaning

There has been much criticism about the contributions which philosophy has or has not made to our understanding of the nature of meaning. The controversy is one which has generated more heat than light. No one can deny the well-founded interest which philosophy has in the problem of meaning, and certain aspects of the problem are answerable only with the insights provided by philosophy. Maritain (1959, p. 84) isolates the problem most succinctly: "If thought or knowledge were a copy or a tracing of the thing, and if both are identically conditioned, how would error be possible?. . . we are compelled to effect a certain disjunction between the thing and the thought, to recognize that the conditions which attach to one do not attach to the other. The way things exist in our thought, so as to be known, is not the same as the way they exist in themselves." It is evident that there is an intelligible in the thing known, and a knower who brings this intelligible into himself. As far as the philosopher is concerned, meaning is a matter of truth or error.

2. Linguistic Meaning

Linguistics is concerned with the study of human speech, including the origin, structure, and modification of language or languages. It includes especially phonetics, morphology, semantics, and general or philosophical grammar. Linguists generally distinguish microlinguistics, or linguistics proper, which

"deals with the structure of messages, the signals in the channel connecting communicators, as events independent of the characteristics of either speakers or hearers", and exolinguistics (sometimes called metalinguistics) which "has been used rather loosely ... to cover all those other aspects of language study which concern relations between the characteristics of messages and the characteristics of the individuals who produce and receive them, including both their behavior and culture." (Osgood, and Sebeok, 1954).

"Semantics" as a noun is a modern word, first appearing in a book by Arsene Darmesteter in 1887. During this period of the so-called neo-grammarians, it was popular to consider language as being divided into psychological and phonetic sectors. The phonetic was considered as being purely physiological and mechanical, and the psychological as containing the meaning of the message. Most semanticists today, however, define their science as the study of the connection between the linguistic feature and the mental process in the act of speaking. Among the American linguists, though, Bloomfield (1933) still defines meaning as "the situation in which the speaker utters it and the response which it calls forth in the hearer."

Finally, there is a Semantics which is a branch of logic, and which aims at the construction of an abstract theory of the relation between signs and what they mean. Semiotics, which is this science, is divided into three parts: (1) pragmatics, which studies the way languages are used; (2) pure semantics, which deals only with fully "formalized" languages and is interested only in the relation between signs in a language and their meaning; and (3) syntax, which

considers signs apart from what they mean. (Morris, 1946). The area of pure semantics is that which is of interest to the psychologist; the only qualification being that "natural" rather than "formal" language is emphasized. (Osgood et al., 1957.)

3. Psychological Meaning

Osgood et al. (1957) say: "The psychologist is typically interested in the role of the organism's behavior system in mediating the relation between signs and significates . . . whenever a sign is received or produced." A great shift of emphasis from the approaches taken by the philosophers and the linguists is seen in Osgood's definition. The use of the phrase "the organism's behavior system" tells us there are many physiological components involved in meaning which interest the psychologist; and the phrase "mediating the relation" tells us that a process or a state occurs in the organisms which can only be called psychological, in the truest sense of the word.

The nervous system obviously plays a major role in an organism's acquisition or dispensing of meaning. The resulting psychological state of an "impinged upon" organism is what is ordinarily thought of as the proper object of psychological investigation. However, psychological theories of meaning differ among themselves as to the nature of this distinctive process or state of the organism.

Starting with the simple observation that "the pattern of stimulation which is the sign is never identical with the pattern of stimulation which is the significate", and seeking then to explain the conditions under which "a stimulus which

is not the significate can become a sign of the significate" (Osgood, 1952), it is possible to distinguish three different psychological theories of meaning.

a. Mentalistic View. At the core of the mentalistic theory we find a distinction made between signs and "ideas" (variously termed expectations, thoughts, engrams) with the latter term usually being unanalyzed. "Something which is not the significate (the word "fire") becomes a sign of that significate (fire) if it gives rise to the idea or thought of that significate." (Osgood, 1952; 1957). This "essential dualism" is always present in a theory when the mediation process (idea, etc.) is undefined with respect to materialistic observables.

b. Substitional View. Pavlovian conditioning principles form the basis of this outlook. The "substitutional view" maintains that the "sign" (the word "fire") becomes associated with the significate (actual fire) as a function of the number of times the sign is associated with the significate. "Whenever something which is not the significate evokes in an organism the same reactions evoked by the significate, it is a sign of that significate."

c. Dispositional View. This view is definitely tending toward the sociological-behaviorist matrix and states that "Any pattern of stimulation which is not the significate (the word "fire") becomes a sign of the significate if it produces in the organism a "disposition" to make any of the responses previously elicited by the significate (actual fire). This definition is not as oversimplified as the substitutional view, but does not specify how "disposition" differs from "idea", as stated in the mentalists' theory.

B. Osgood's "Representational Mediation Process" Hypothesis

The theoretical structure of "representational mediation process" is the cornerstone for the construction of the present form of the Semantic Differential. Indeed, "meaning" is another name for "representational mediation process". In its formulation the theory assumes:

(a) Certain patterns of stimulation invariably evoke the same response in the organism (unconditioned stimuli); and

(b) Certain additional stimuli can acquire this response producing capacity (conditioned stimuli).

A significate, then, "is any pattern of stimulation which in a given situation, regularly and reliably produces a predittable pattern of behavior." (Osgood et al., 1957). A sign, parenthetically, would be any stimulus or pattern of stimuli which has acquired the capacity of the significate, i.e. to evoke the response of the significate. But this definition appears to be no different than the "single stage" conditioning which was criticized as being oversimplified. Osgood's insight here is that "reactions made to signs are seldom identical with those made to the objects signified."

Conditioning experiments have shown that of all the reaction components to a particular stimulus, those that involve the least expenditure of energy on the one hand, and those that are less interfering with ongoing overt behavior on the other, are the more readily associated to contiguous stimulation. So that "whenever some stimulus other than the significate is contiguous with the significate, it will acquire an increment of association with some portion of the total

behavior elicited by the significate as a representational mediation process.

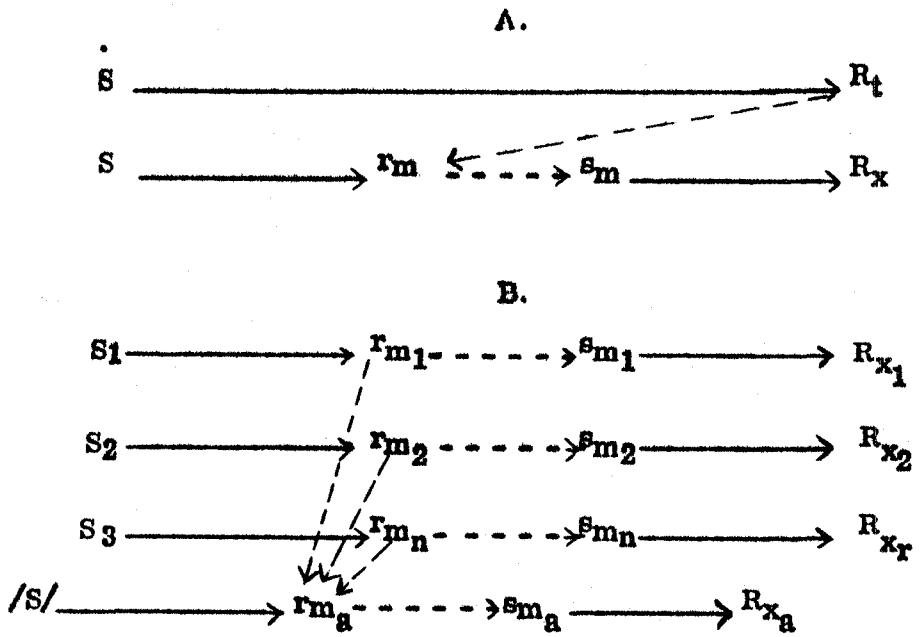


Fig. I. Symbolic account of the development of sign processes.

A. Development of a sign; B. Development of an assign. (Osgood, 1952).

In the diagram of Fig. I (A), the stimulus producing process (r_m --- s_m) is representational because it includes part of the response (R_t) to the Unconditioned stimulus ($\hat{S}$). It is mediational because the self-stimulation (s_m) produced by this "short-circuited reaction" (r_m) can now become associated with a variety of responses (R_x) which are in some way appropriate to the Unconditioned stimulus ($\hat{S}$). The assign paradigm (B) involves the same process, but the "experience" or "behavior" is vicarious; e.g. one reads an account of what an elephant looks like, and then sees pictures of it and so on. Finally one would

be able to identify an elephant promptly and accurately if it appeared before him.

Thus, in this view, "words represent things because they produce in human organisms some replica of the actual behavior toward these things, as a mediation process" (Osgood, 1952).

The formal statement of the above is as follows: "A pattern of stimulation which is not the significate is a sign of that significate if it evokes in the organism a mediating process, this process being some fractional part of the total behavior elicited by the significate and producing responses which would not occur without the previous contiguity of non-significate and significate patterns of stimulation." (Osgood, 1952).

It is important to notice at this point that, within the theoretical framework of the mediation hypothesis, the meaning which different individuals have for the same signs will vary to the extent that their behavior towards the things signified have varied. Variation in meaning should be particularly apparent with assigns, since there are many more variables involved in their structure.

Likewise it should be noted that the underlying nature of such "mediation processes" is not dealt with in the formulation of Osgood. The physiological correlates of such processes seem to be of the utmost importance to establish. They may be purely neural events rather than actual muscular contractions or glandular secretions. If one accepts the peripheral theory of consciousness or cognition, it is a problem not only of interest but of absolute necessity to demonstrate peripheral concomitants of this mediation process.

CHAPTER I I

THE PROBLEM OF MEASUREMENT

A. Early Research Methods

Osgood was not the first one to attempt to measure meaning, nor was he the first to realize its important implications in learning theory. As far back as the turn of the century Ebbinghaus devised his list of nonsense syllables in order to study the learning process independently of the meaning variable. Kent and Rosanoff (1910) compiled their association lists which have long been held to be an index of meaningfulness of certain concepts. Noble (1952) is taken to task by Osgood et al. (1957) for defining meaning as "the grand mean number of acceptable written responses given by all Ss within a 60 sec. period." Osgood says this solution is "as simple as it is ludicrous". The point is that while the number of associations might indicate the "degree of meaningfulness" of a given concept, it tells us nothing of the meaning of the concept. For example, the concept "white" might regularly evoke the association "black", but that does not mean that "white" is equal to "black" in meaning.

1. Semantic Generalization

Experiments have shown that when a reaction conditioned to one stimulus is transferred to another stimulus, the amount of transfer varies directly with the similarity of the two stimuli. Razran (1939) reported that in semantic generalization, the similarity was in the meaning of two stimuli, rather than mere

phonetic similarity. Thus a reaction conditioned to the word "style" transfers more readily to word "fashion" than to the word "stile". Staats and his associates (1957, 1958) also showed that they could alter the meaning of a word by conditioning its association to another word.

2. Transfer and Interference Studies

If there is semantic generalization among meanings, as shown above, one would expect that learning of one list of words should facilitate subsequent learning of another list. Likewise, inhibition in the form of interference should result if the meanings of the lists were antagonistic. Both of these hypotheses, transfer and interference, have been amply tested and verified.

3. Physiological Methods of Measurement

Action potentials in striate musculature, especially in speech mechanisms, provide some evidence of correlation with the meaning variable. But added to the problem of the validity of such measures is also the problem of practicality. The cumbersone apparatus plus the amount of time required for individual testing limits the usefulness of these techniques to the laboratory. (Thorson, 1925; Jacobson, 1932; Max, 1935, 1937).

Razran (1935, 1936) used his own salivary responses to verbal stimuli (the word saliva) in several languages with which he was familiar, and showed that he salivated most to his native language (Russian), next to his most proficient one (English), and least to three slightly known languages (French, Spanish, and Polish).

The Galvanic Skin Response is a successful index of the presence of meaning,

but gives no clue to the nature of the meaning indicated. The alternative method is to employ the time latency index as a "complex indicator", i.e., if the interval between verbal stimulation and association response is greater than average, the stimulus word is posited as being an especially meaningful word to the subject. (Brill, 1946).

4. Perceptual Methods

That meaning (variously termed "motivation", "association", "attitudes" etc.) affects perception has long been recognized. Skinner (1936), Postman and Bruner (1948), McClelland and Atkinson (1948) have amply demonstrated how meaning can and does distort the perceptual field. But, again, the criticism may be applied that while the "mysterious" variable meaning is recognized and manipulated in such studies, nothing is said about the underlying nature of meaning itself.

5. Scaling Methods

Glaze (1928) and Hull (1933) have scaled the "associative strength" of nonsense material in terms of the number of evoked associations, but as has already been pointed out, associative strength (meaningfulness) is not the same as meaning itself. Mosier (1941) performed the most relevant studies of applying scaling procedures to investigations of meaning, but was dealing at best with only one dimension of meaning, that of evaluation.

B. The Semantic Differential

Any attempt to measure meaning must certainly be in terms of one's definition of meaning, and Osgood does so by his Semantic Differential. As a measuring device, the Semantic Differential purports to tap the functioning of representational mediation processes in language behavior and thus serve as an index of these processes. More precisely, what is needed, by a sort of extrapolation procedure, is some clue as to the underlying nature of the mediation process, particularly at the point r_m of the paradigm in Fig. I (A & B).

As late as 1957, Osgood stated that the major gap in his work thus far is that "no explicit statement of the relation between the theoretical conception of meaning as a representational mediation process, and the operations of measurement which constitute the semantic differential technique" has been made. (Osgood et al., 1957).

1. The Logic of Semantic Differentiation

By differentiating a concept is meant the successive allocation of a concept to a point marked X in the semantic space represented by a list of scales which are flanked by a pair of bipolar adjectives. For example,

FATHER

hot	:	:	X	:	:	:	:	cold
	1	2	3	4	5	6	7	
rough	:	:	:	:	X	:	:	smooth
	1	2	3	4	5	6	7	
rounded	:	X	:	:	:	:	:	angular
	1	2	3	4	5	6	7	

thus the concept "father" is judged to be "slightly hot, slightly smooth, and very

rounded". The scale provides measurement of two properties of meaning; the direction of association, and the intensity of association.

2. Semantic Space

Semantic space is postulated as being a space of unknown dimensionality and "Euclidean" in character. Each dimension of this space corresponds to some quality of meaning. For practical purposes, each individual scale, defined by polar adjectives, is assumed to represent one of these dimensions of semantic space. It is further assumed that each scale represents an orthogonal sampling of a particular dimension, and that it is a straight line function passing through the origin of semantic space. The origin corresponds to the midpoint on the scales, position "4" above.

It is readily seen that each scale is not independent of each other scale, i.e. that some scales seem to represent the same dimension or quality of meaning, e.g. what is smooth is generally rounded also. To define semantic space with maximum efficiency would involve the determination of the minimum number of orthogonal dimensions or axes which will exhaust the dimensionality of semantic space.

By factor analytic techniques, having 100 Ss judge 20 concepts against 50 scales, Osgood and Suci (1952) isolated three factors which contributed heavily to the total variance. They termed them: (1) The Evaluative Factor (good-bad), (2) The Potency Factor (strong-weak) and (3) the Activity Factor (active-passive). It was found that less than 50% of total variance can be accounted for; that Factor 1 (Evaluative) accounts for 68% of common variance, and that many of the adjective

pairs are heavily loaded with more than one factor. Several more factor analytic studies were made (Osgood et al., 1957, pp. 39-64). Solomon (1954, 1958), and Tucker (1955) report essentially the same results as Osgood first reported in 1955. Several important developments occurred however. In Osgood's second analysis (1957, p. 45) it was found that Factor 2 (Potency) was the least stable of the three factors, although still significantly correlated with the first results. In Osgood's third analysis (1957, p. 47) in which Roget's Thesaurus was used to provide the adjective pairs, it was discovered that (1) five additional factors could be adequately extracted (Stability, Tautness, Novelty, Receptivity, and Aggressiveness) and (2) that there exists various "modes" of evaluation which are appropriate to different frames of reference or objects of judgment, e.g. moral goodness, dynamic goodness, meek goodness, hedonistic goodness. Thus it would be "good" for a car to be "strong, powerful, active", but it would be "bad" for mother to be designated as such.

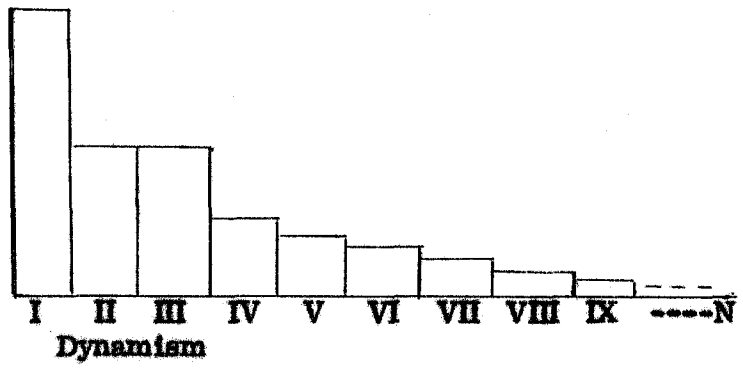


FIGURE 2

Fig. 2. Factors in Order of Extraction. Relative importance of semantic space dimensions.

A pervasive "evaluative factor" in human judgment regularly appears and

accounts for approximately 1/2 to 3/4 of the extractable variance. This finding is confirmed in all the studies reported above. In other words, differentiation among concepts in terms of the evaluative factor is about twice as fine as differentiation in terms of their potency or activity.

3. Bipolar Adjectives

The decision to use bipolar adjectives to define the termini of semantic dimensions grew out of research on synesthesia started by Karwoski and Odbert (1938) and joined by Osgood in 1942.

The findings of Karwoski, Odbert, and Osgood indicated that stimuli from several modalities, visual, auditory etc., may have shared significances or meaning, by a sort of "cross modality stimulus equivalence". (Osgood et al., 1957). For example, a bright color is regularly associated and pictured as equivalent to a high pitch. Likewise, a happy man is said to be high, and a sad man, low. All of these cross modality phenomena are culturally reinforced, as when we learn to associate a deep voice with a big man, but there is also evidence that some transcultural associations exist. For example, good is always up, and bad is always down, even in the most primitive cultures. (Osgood et al., 1957).

4. The Seven Point Scale

Among the normal population, it has been found over and over again that a seven point scale allows for the best results in tests requiring "intensity" judgments. The usual criterion of a good scale is the frequency with which each interval is utilized by the Ss. If all the intervals are used with approximately equal

frequency, the scale may be assumed to provide an adequate sampling of discriminatory points. (Osgood et al., 1957; p. 85). Bopp's study with schizophrenics (1955) showed that schizophrenics used the finer points of discrimination significantly less frequently than do normals. Semans (1957) reported the same results with psychotic candidates for lobotomy. Thus, it is seen that the seven point scale is most appropriate for a normal population, but that modifications might have to be made to conform to the discriminatory abilities of a particular group.

CHAPTER III

AN EVALUATION OF THE SEMANTIC DIFFERENTIAL

It should be noted that with the introduction of the Semantic Differential as a measuring device, Osgood has provided another definition of meaning. It will be remembered that the theoretical definition focuses on the r_m---s_m relation in the sign paradigm, (Ch. II). We must now recognize and distinguish a new, operational definition of meaning: viz., "the meaning of a sign[is]that point in the semantic space specified by a series of differentiating judgments". (Osgood et al., 1957; p. 26).

In terms of this latter definition of meaning, a single judgment on a single bipolar adjectival scale (for a single concept) will indicate (1) the direction of association, e.g. hot or cold, and (2) the intensity of that association, e.g. extremely hot, extremely cold, etc., for that stimulus concept along the dimension which the single scale represents. When scales representing each of the major dimensions of meaning (evaluative, potency, and activity) are used, we end up with three scores whose values may be assumed to represent the coordinates of a point in three dimensional space.

In Fig. 3, the concept A is seen to be Good, Passive, Weak. All the area above the horizontal axis is "Good", below is "Bad". To the right of the vertical axis is the "Weak" area, to the left is "Strong". The back area is "Active", the front is "Passive". The origin represents the midpoints of the various scales, indicating a judgment by the S that the stimulus concept is not associated with

either of the adjective pairs, or associated equally with both adjectives.

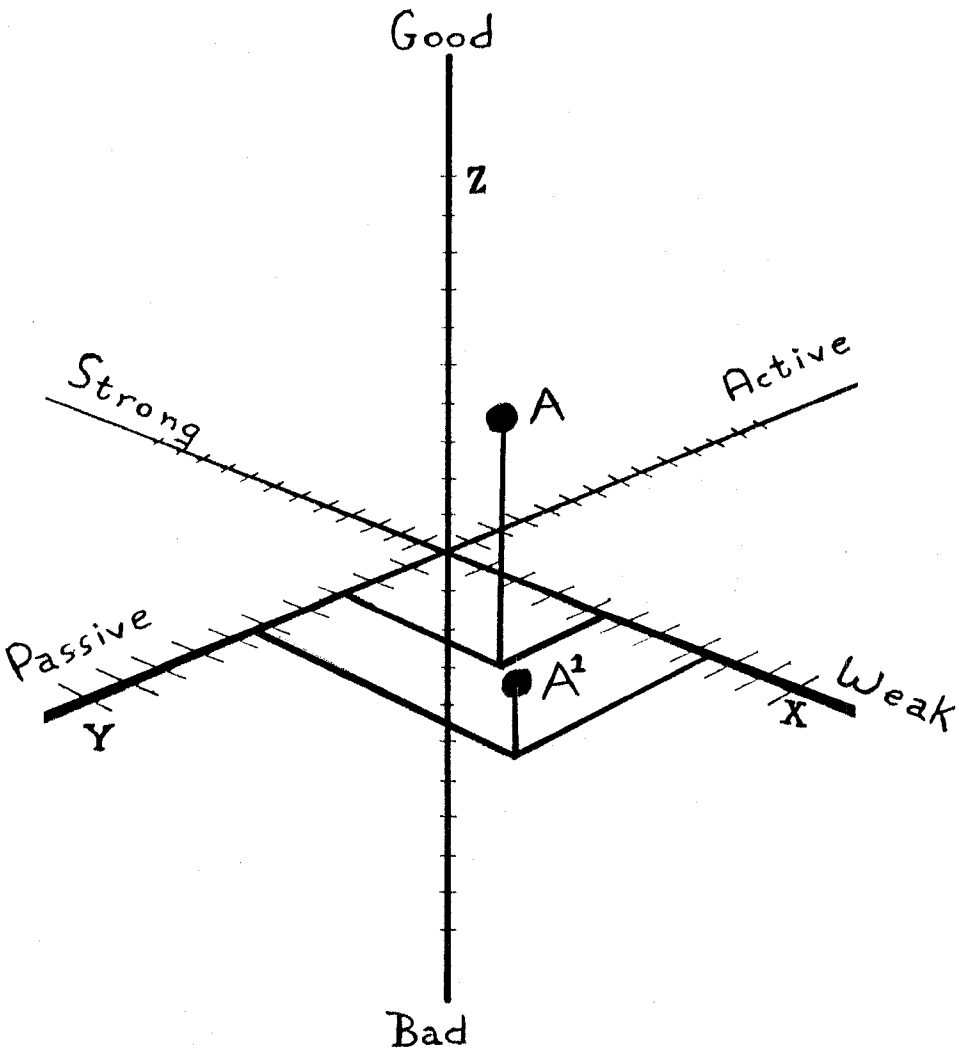


Fig. 3. Semantic Space. Concept A allocated to position A on first test. Concept A shifts to position A^1 on second test.

If on a subsequent test the subject, by a series of "differentiating judgments", allocated the concept A to the position A^1 in semantic space, i.e., more passive, weaker, and less good, we may describe this "shift of concept" as a change of meaning, illustrated by movement in semantic space.

The absolute distance $A-A^1$ provides us with a notion of the magnitude of this shift, but by itself will not tell us in which direction the change of meaning was effected. The distance A-O provides us with a measure of the meaningfulness of the concept, i.e., its distance from non-meaning. Likewise, the same measure A-O will provide us with a measure of the amount of semantic space used by any individual subject to express the meaning which a particular concept has for him.

Any movement in semantic space may be due to one of two causes. The shifts may be random and accidental, or the shifts may result from a change of meaning which the concept has assumed.

A. Transfer of Information Hypothesis

One of the most common ways by which change of meaning is effected is by acquiring more information about the concept in question. Whether or not the Semantic Differential is a sufficiently sensitive instrument to measure such a change, both in magnitude and direction, is the specific question of this paper.

1. Sensitivity

"An instrument is sensitive to the degree that it renders discriminations commensurate with the natural units of the material being studied; ideally it should yield distinctions as fine, or even finer, than those made on common sense grounds". (Osgood et al., 1957, p. 166) A typical semantic scale allows for

seven such discriminations: extremely X, quite X, slightly X, O, slightly Y, quite Y, extremely Y. But these discriminatory adverbs by no means exhaust the discriminatory possibilities provided by the English language.

A practical problem involving the sensitivity of the Semantic Differential would be to test its ability to discriminate (provided, of course, that the subject discriminates) the meaning of synonyms. The instrument has been successfully tested against this criterion. (Osgood et al., 1957, p. 168) A more stringent test of sensitivity might be to test the instrument's ability to show "concept shifts" resulting from a transfer of information (teacher to student) about that concept. This hypothesis has not yet been tested or reported in the literature. Related studies show, however, (Staats et al., 1958) that words may be conditioned to assume the profile of words with which they are paired in association learning experiments. Manis (1959), in studies assessing communications, reports that successful communication seems to involve only the evaluative factor, and when it is statistically extracted from the results, the potency and activity factors are not predictive.

2. Reliability

The reliability of an instrument is generally understood to mean the degree to which the same scores can be reproduced when the same object is measured repeatedly. This criterion is certainly applicable to the Semantic Differential, but not to the extent that it applies in the physical sciences. While a pound of material will weigh a pound today and tomorrow, the meaning of a concept is liable to shift from day to day, and sometimes dramatically so. Reliability, as sought

after by the Semantic Differential, relates rather to the basic notion of the reliability of an instrument used in all sciences, and is closely allied to the notion of significance, or levels of confidence. "If we determine the error of measurement of our instrument, here for single scales or factor scores, under test-retest conditions, we can estimate the probability with which a difference of a given magnitude could have occurred by chance simply on the basis of measurement error." (Osgood et al., 1957) Knowing that a subject chosen at random judging an item drawn at random can be expected to deviate two scale units from one test to another only 5 per cent of the time, we may say that such a shift is significant at the 5% level of confidence.

Table 1

Probability of Obtaining Given Deviations from Test to Retest

Absolute Deviation	% of Responses	Probability of obtaining a Deviation Equal to or Greater than Given Deviation
0	54.0	1.000
1	32.6	.460
2	8.6	.134
3	3.1	.048
4	1.1	.018
5	.4	.006
6	.2	.002

Table 1 is a reproduction of a table constructed by Osgood et al. (1957) using the data collected from his factor analytic work (Osgood & Suci, 1952). This procedure involved 100 Ss judging 20 concepts on 40 different scales. Osgood et al. (1957) state, "If subjects and items in this study are considered to be representative, then statements regarding the probability of obtaining deviations of a certain size can

be made". Similarly, using the same data mentioned above (1952 Factor Analytic Study) a reliability coefficient, test-retest, was computed across the 100 Ss and 40 items. The resulting coefficient was .85. (Osgood et al., 1957, p.127)

3. Validity

An instrument is said to be valid if it measures what it purports to measure. Does the Semantic Differential really measure meaning? This is an exceedingly complicated question, and is not unlike that asked of intelligence tests; do they really measure intelligence? The problem can be sidestepped by defining intelligence as "that which an intelligence test measures", and likewise by defining meaning as "that which the Semantic Differential measures". The only other alternative is to ask "What do we mean by meaning?" and no progress will have been made. If there were an objective criterion of meaning with which the Semantic Differential scores might be correlated, the problem would be solved. But there are no such independent, commonly accepted criteria.

The question of validity then centers about whether the Semantic Differential samples what it purports to sample, namely the representational mediation process, independently of whether one agrees with this definition of meaning.

But, as we have already pointed out, Osgood states ". . . this has been a major gap in our work so far; there has been no explicit statement of the relation between the theoretical conception of meaning as a representational mediation process, and the operations of measurement which constitute the Semantic Differential technique." (Osgood et al., 1957) Nonetheless, we may still assess the

validity (although it will be "inferred validity") of the Semantic Differential technique by looking to the validity of components which comprise the measuring operations.

Thus, we may speak of the validity of the concept of "multidimensional" semantic space; the validity of using bipolar adjectival terminals for each scale; the validity of the seven point scale, the validity of the extracted factors (dimensions) of meaning. In addition to the above discussions, Rowan (1955) established supporting evidence for the validity of two semantic dimensions: the evaluative factor, and a second factor which was equally well described by the terms activity or potency, and which Rowan called the dynamism factor. In this experiment the same subjects were presented with all 120 possible triadic combinations of 10 concepts and in each instance were asked to choose the two most similar concepts of the three given.

In another study, Messick (1957) attempted to determine whether each interval in semantic space (as represented unidimensionally on each scale) were actually equal. In addition, the application of the factor analytic techniques to the assigned scores involves assumptions about the scale origins, i.e., that the zero point is at the centre of the scale. Messick applied the method of "graphical least squares intervals" and found (1) an inequality of intervals within scales but that (2) interval scales are fairly consistent between scales, i.e., the same categories tend to be too large or too small over all scales. Also, the origin falls approximately at the same place on all scales, the zero point being located so that the midpoint of the center category is always slightly off to the left of the scale. Messick (1955) states that "it seems reasonable to conclude that the scaling properties

assumed with the semantic differential have some basis other than mere assumption".

Osgood et al., (1957) also cite a study by Norman Cliff at Princeton (1956) which showed that the adverbial quantifiers slightly, quite, and extremely proved to yield almost perfectly equal increasing degrees of intensity, 0.50, 1.00, and 1.50 respectively.

CHAPTER IV

THE SENSITIVITY OF THE SEMANTIC DIFFERENTIAL

It has already been noted that the sensitivity of the Semantic Differential has been put to the test and that it successfully differentiated the connotative meanings of synonyms. Such a study presupposes the discriminatory abilities of the subjects doing the judging, for if no difference of meaning is recognized by the subjects in regard to the synonyms, there can be no designation of difference on the Semantic Differential.

A. Hypothesis

A more stringent test of the sensitivity of the Semantic Differential is the determination of its ability to illustrate the change of meaning which accrues to a concept, in a test-retest situation, when more information about the concept is provided. If a significant change of meaning, as shown by a shift in semantic space, results, and if this shift is in a predicted direction and in accordance with the introduced variable (more information), one might suppose that the concept-shift was due, at least in part, to the introduced variable. The following study was designed to test this hypothesis. The introduction of the variable is referred to as transfer of information, i.e., from the instructor to the students. The semantic profile of the instructor is known as the Criterion. If learning takes place, the results of the retest situation should be more in accord with the Criterion than were the results of the initial test.

B. Method

Forty-nine Ss from an introductory psychology class were asked to judge three concepts (discipline, nonsense, and opinion) against a set of ten bipolar adjectival scales, as given in Fig. 4.

angular	_____	rounded
weak	_____	strong
rough	_____	smooth
active	_____	passive
small	_____	large
cold	_____	hot
good	_____	bad
tense	_____	relaxed
wet	_____	dry
fresh	_____	stale

Fig. 4. Form of the Semantic Differential.

The instructions given were simple: "If you were forced to say whether "discipline" were angular or rounded, weak or strong and so on, where would you place this concept on the scale? The closer you mark an X to either end of the scale means the more "rounded" or the more "angular" the concept is for you. If you think that neither adjective applies very well, or applies equally well, simply mark an X in the middle of the scale. Are there any questions? Be sure to mark every scale, and work quickly. Usually your first impression is the best one."

A 12 day interval passed between the test and the retest. During this period, two of the three concepts were taught in the context of their special psychological

connotations: discipline now referring specifically to formal discipline in learning theory; and nonsense as referring specifically to nonsense syllables. The third concept, opinion, was not studied in its psychological setting. No reference was made during the instruction period to the fact that the concepts were the ones previously differentiated, and that a new meaning was being given the concepts.

In the retest situation, the Ss were merely asked to mark once more these concepts against the ten bipolar scales, as a reliability check on the instrument. The Ss were told, however, that they should try to mark how they now felt about these concepts, and not try to remember how they had marked them before. Finally, the teacher marked his profile for the three concepts, and his markings will be referred to as the Criterion.

The only modification of the form of the Semantic Differential was that the scales used in this study were on unmarked continua, i.e., the seven point scale was not employed. This was done partially to determine the manner in which the Ss would handle the unstructured semantic space, and with the hope that use of the midpoint of the scale would be discouraged in the event that the adjective-pairs did not seem immediately appropriate.

C. Results

1. Group Results

Each subject (N=49) judged three concepts against ten scales, and the procedure was repeated in the retest situation, resulting in 2940 judgment markings. Table 2 gives the mean scores for the first test ($\frac{\Sigma_1}{N}$) and the retest ($\frac{\Sigma_2}{N}$) for

Table 2

Results Based on Mean Scores

			NONSENSE					DISCIPLINE					OPINION				
Adjective Pairs	F	Loading	$\frac{\Sigma_1}{N}$	$\frac{\Sigma_2}{N}$	C	σ_1	σ_2	$\frac{\Sigma_1}{N}$	$\frac{\Sigma_2}{N}$	C	σ_1	σ_2	$\frac{\Sigma_1}{N}$	$\frac{\Sigma_2}{N}$	C	σ_1	σ_2
1. angular-rounded	III	.43	2.1	2.0*	1.3	1.10	1.12	1.7	1.8*	2.2	1.11	1.11	1.8	1.5#	3.0	1.26	1.07
2. weak-strong	II	.62	1.1	1.5#	0.5	.92	1.06	3.4	3.4	2.7	.54	.61	3.2	3.1*	0.7	.75	.76
3. rough-smooth	II	.36	1.9	1.7*	1.0	1.15	.99	1.8	$2.1^{*}_{\#}$	2.7	1.34	1.22	1.9	2.0*	3.3	1.13	.91
4. active-passive	III	.59	1.3	1.3	3.0	1.22	1.18	.6	$.9^{*}_{\#}$	1.2	.68	.79	.7	1.0*	2.8	.91	.88
5. small-large	II	.62	1.6	1.7	1.1	1.06	.96	2.8	2.9	3.5	.78	.84	2.7	2.6*	1.0	.92	.91
6. cold-hot	III	.46	2.2	2.0*	2.0	.88	.99	2.2	2.0*	2.0	1.05	1.15	2.5	2.4*	1.6	1.04	1.04
7. good-bad	I	.88	2.3	2.1*	2.0	1.22	1.12	.54	.7*	1.3	.63	.81	.8	$1.2^{*}_{\#}$	3.0	.75	.90
8. tense-relaxed	I	.55	3.3	$3.0^{*}_{\#}$	1.6	.83	.97	1.7	1.7	1.1	1.21	1.18	2.0	1.8	3.0	1.25	1.06
9. wet-dry	I	.08	1.8	1.7	2.0	.94	.92	2.5	2.3	3.5	.85	.95	2.2	2.3	2.0	.98	.86
10. fresh-stale	I	.68	1.7	1.8*	3.0	1.10	1.05	1.5	1.5	2.7	1.07	.92	1.0	$1.3^{*}_{\#}$	2.8	.75	.89

* The means of the Retest Scores have moved toward the Criterion.

\# The Shift is significant ($p = .05$).

each of the three concepts. The adjective pairs are given in the order in which they appeared on the Differential form. The F column indicates the factor which the adjective pair represents. The factors are indicated by I (evaluative), II (potency), and III (activity). The Loading column gives the factor loading of the particular adjective pair as determined by Osgood and Suci (1952). The C column represents the Criterion markings, and the standard deviations are given for the first and second tests for each concept (σ_1 and σ_2 respectively).

The scale scores are in terms of inches, as measured from the left terminal of the scale. A score of 2.1 is at the midpoint of the scale. The asterisks indicate those scales whose mean scores under the retest conditions are closer to the Criterion than were the mean scores of the initial tests. Obviously, all these shifts of the mean scores are not significant. But it is interesting to note that the means on six of the ten scales shifted in the direction of the Criterion for both of the experimental concepts, while the mean scores on seven of ten scales shifted in the direction of the Criterion for the control word. Quite clearly, then, we see that movement in the direction of the Criterion, as determined by the mean scores of the group, is not an adequate indication of "change of meaning due to a transfer of information".

Even on those scales where the concept shift was significant ($p = .05$) only one concept (nonsense), on only one scale (good - bad), changed in polarity for the group. All other shifts were within the polarity of association of the first test.

An investigation of the standard deviations fails to yield any significant information. It was thought that the scores of the group in the second test would

fall in a smaller range for the two experimental words than for the control word, whether they resembled the Criterion or not. While this tendency occurred on several scales, the result was not statistically significant.

2. Distance Scores (D-scores)

The values in Tables 3, 4, and 5 are derived from the raw score data of the Semantic Differential. These D-scores "take into account both the profile variation and discrepancies between the means of the profiles, thereby reflecting more fully the information available in the data." (Osgood et al., 1957) The D-score measure is provided by the generalized distance function of solid geometry:

$$D_{il} = \sqrt{\sum_j d_{il}^{\ 2}}$$

where D_{il} is the linear distance between the points in semantic space representing concepts i and l; and d_{il} is the algebraic distance between the coordinates of concept i and concept l on the same dimension or factor j. Summation is over k dimensions.

Various D-scores were computed for every S on each concept judged. D1 indicates how far away each subject was from the Criterion on the initial test. The next score, D2, indicates how far the subject was away from the Criterion in the retest situation. Using the size of the D-scores to determine whether or not the Ss were closer to the Criterion on the retest than in the initial test situation, the results are given below in Table 6.

Table 3

Scores for the Concept NONSENSE

Ss	D1	D2	D3	D4	D5	D6	D7
1.	5.2	4.2	3.1	6.2	5.2	4.2	3.0
2.	4.1	3.8	2.1	4.5	4.5	2.4	3.0
3.	3.3	3.1	2.9	8.4	7.0	4.3	4.1
4.	4.0	4.1	2.1	4.7	4.7	3.6	3.2
5.	2.3	1.4	1.7	4.5	4.6	2.7	2.8
6.	3.4	2.4	1.5	2.3	2.7	1.7	1.4
7.	5.3	4.7	3.1	6.0	5.0	4.1	3.0
8.	3.9	4.0	2.1	2.3	2.7	2.4	2.5
9.	3.3	1.8	3.0	7.0	7.7	4.2	3.8
10.	5.0	4.8	3.0	4.8	5.8	4.3	4.2
11.	4.6	6.3	2.6	9.1	6.9	4.7	5.5
12.	3.8	3.8	0.7	6.4	6.2	4.3	3.8
13.	4.4	4.8	3.7	4.1	3.2	3.1	3.0
14.	3.1	3.7	4.3	7.8	7.7	4.2	3.4
15.	2.9	4.3	3.1	5.4	7.4	3.7	4.0
16.	4.1	2.9	3.0	6.1	4.3	3.1	3.1
17.	4.3	4.5	2.1	3.4	4.5	3.4	2.6
18.	4.5	4.3	2.7	5.1	6.3	3.1	2.6
19.	3.3	3.6	1.7	4.8	4.6	3.6	2.2
20.	3.8	5.1	1.8	6.7	6.3	3.0	4.1
21.	4.3	5.1	3.9	5.6	7.6	4.3	2.9
22.	6.7	6.4	2.9	6.6	6.0	4.5	4.7
23.	3.3	3.1	4.4	6.5	4.1	3.1	4.1
24.	3.5	3.3	1.5	6.1	5.5	3.3	3.1
25.	6.0	5.8	1.2	2.6	3.1	4.3	4.3
26.	4.4	4.1	1.5	3.6	4.0	3.5	2.7
27.	4.1	4.7	4.3	6.4	7.6	4.3	4.1
28.	4.7	6.0	2.4	5.3	4.1	3.7	4.7
29.	5.0	5.1	2.4	2.4	4.2	3.4	3.4
30.	5.5	4.0	3.0	4.5	5.3	3.6	2.5
31.	3.8	4.0	2.2	3.1	2.3	1.8	3.0
32.	2.7	3.2	1.8	5.4	4.1	2.7	2.3
33.	3.6	3.1	3.3	5.1	4.3	3.1	3.3
34.	4.7	4.7	2.6	6.4	6.7	3.7	4.0
35.	4.5	3.5	2.5	6.1	3.8	3.3	2.2
36.	5.3	3.9	4.2	7.1	9.2	4.4	3.6
37.	5.2	5.6	4.4	5.5	2.5	4.2	4.1

Table 3 (cont'd.)

Ss	D1	D2	D3	D4	D5	D6	D7
38.	4.3	3.0	2.1	8.4	9.8	4.5	4.1
39.	5.1	6.8	6.2	7.8	7.4	5.8	5.4
40.	4.3	4.0	3.5	5.8	4.3	3.3	2.8
41.	5.7	4.8	3.6	7.6	4.3	4.4	3.9
42.	4.7	4.9	4.1	6.0	6.2	4.0	4.1
43.	7.6	7.6	5.1	8.3	5.3	5.7	5.4
44.	4.0	2.6	2.5	7.4	6.7	3.6	2.1
45.	4.7	4.7	7.3	9.1	10.0	5.7	5.4
46.	3.2	3.2	1.6	6.1	4.8	3.5	3.1
47.	4.5	5.3	8.0	6.7	6.4	4.1	5.7
48.	3.0	2.2	2.0	3.5	3.6	1.5	2.6
49.	3.2	3.1	1.3	2.4	2.2	2.5	1.5

D1 - The distance between the initial test and the Criterion

D2 - The distance between the retest and the Criterion

D3 - The distance between the initial test and the retest

D4 - The distance between the concepts Nonsense and Discipline

D5 - The distance between the concepts Nonsense and Opinion

D6 - The distance between the concept Nonsense and the midpoint of the scale, initial test

D7 - The distance between the concept Nonsense and the midpoint of the scale, retest.

Table 4

Scores for the Concept DISCIPLINE

Ss	D1	D2	D3	D4	D5	D6	D7
1.	3.7	3.9	2.7	5.6		4.2	4.2
2.	3.5	3.0	3.3	3.3		4.2	3.8
3.	3.4	2.7	1.8	2.8		4.5	4.4
4.	3.2	3.6	2.6	3.0		3.4	3.6
5.	3.0	2.0	1.6	2.8		2.4	2.1
6.	2.9	3.3	1.6	2.1		2.1	1.5
7.	4.6	3.8	2.9	3.4		4.1	3.6
8.	3.2	4.3	3.7	3.1		2.6	4.4
9.	4.1	3.6	2.6	3.1		3.6	4.1
10.	3.1	3.6	2.5	2.9		3.7	3.8
11.	3.7	4.1	0.5	6.2		5.5	5.9
12.	3.7	3.4	3.0	2.3		3.8	4.1
13.	3.7	3.6	1.5	4.1		3.4	3.4
14.	3.6	2.6	2.7	4.1		4.3	3.7
15.	3.3	3.8	1.3	7.5		4.6	4.8
16.	3.7	4.0	1.4	3.1		3.7	4.4
17.	4.0	3.7	2.1	1.7		3.4	3.3
18.	3.7	2.4	2.2	4.5		4.1	2.6
19.	3.7	2.8	2.4	1.7		3.7	3.4
20.	4.7	5.3	4.1	2.4		5.5	5.5
21.	3.7	3.4	2.5	4.5		4.3	4.1
22.	3.5	6.9	8.4	3.1		4.5	4.4
23.	3.8	3.8	3.5	3.7		5.3	3.8
24.	1.7	2.1	2.6	2.9		3.3	3.4
25.	4.5	3.7	1.7	1.7		4.7	4.4
26.	3.9	3.3	1.1	2.6		3.8	3.1
27.	4.7	5.0	1.7	3.7		4.2	4.5
28.	5.1	4.6	3.1	5.6		4.7	4.0
29.	3.1	4.4	1.7	4.4		2.2	3.1
30.	3.2	3.4	1.9	1.7		3.1	3.9
31.	4.0	3.4	1.1	3.0		3.6	2.8
32.	3.6	2.8	2.6	1.7		3.2	1.9
33.	3.5	2.3	3.3	4.7		4.6	3.2
34.	2.3	3.8	3.1	3.1		3.7	4.4
35.	4.0	3.5	3.0	4.1		3.7	3.7
36.	4.0	3.3	1.7	2.9		4.1	3.6
37.	3.1	2.8	1.8	5.9		3.0	3.6

Table 4 (cont'd.)

Ss	D1	D2	D3	D4	D5	D6	D7
38.	4.2	3.9	4.6	5.0		4.4	4.1
39.	4.7	4.4	4.1	6.2		6.1	5.8
40.	5.3	3.1	3.6	3.4		4.7	2.8
41.	4.3	3.0	3.2	5.0		5.3	3.6
42.	4.7	4.6	3.0	3.6		4.5	5.0
43.	6.1	4.4	6.4	8.3		6.0	5.7
44.	3.9	4.3	0.9	2.8		4.0	4.2
45.	4.2	3.1	2.7	4.8		4.6	3.3
46.	2.8	3.3	2.3	2.6		3.7	3.0
47.	4.5	5.4	5.8	5.4		4.5	3.8
48.	3.3	4.1	1.2	0.7		2.7	3.4
49.	1.7	3.8	1.4	1.7		1.8	2.7

D1 - The distance between the initial test and the Criterion

D2 - The distance between the retest and the Criterion

D3 - The distance between the initial test and the retest

D4 - The distance between the concepts Discipline and Opinion

D5 - The distance between the concepts Discipline and Nonsense (see Table 3, D4).

D6 - The distance between the concept Discipline and the midpoint of the scale, initial test

D7 - The distance between the concept Discipline and the midpoint of the scale, retest.

Table 5

Scores for the Concept OPINION

Ss	D1	D2	D3	D4	D5	D6	D7
1.	5.0	5.0	3.3			3.4	3.1
2.	6.7	6.2	2.8			4.1	3.6
3.	5.1	5.6	3.0			3.1	3.3
4.	5.9	5.8	3.1			3.6	4.0
5.	4.6	4.3	1.4			2.6	2.2
6.	4.4	3.3	2.1			2.6	1.2
7.	5.5	6.6	5.0			4.0	5.1
8.	3.0	3.0	1.7			1.7	1.9
9.	6.7	7.6	3.3			4.2	5.0
10.	5.7	5.0	3.5			3.4	3.7
11.	7.6	8.0	5.3			5.4	5.7
12.	5.8	5.4	1.4			3.6	2.9
13.	6.2	4.9	2.9			4.1	2.8
14.	7.0	4.7	5.1			4.8	2.8
15.	6.2	5.0	1.5			4.8	3.8
16.	5.0	4.1	3.1			3.1	4.0
17.	6.0	4.4	1.8			4.1	2.6
18.	6.5	5.8	1.6			3.8	3.1
19.	5.7	5.2	1.4			3.5	2.6
20.	7.5	7.8	3.6			5.2	5.5
21.	5.3	4.0	3.0			3.6	2.1
22.	7.8	7.2	2.9			5.0	4.7
23.	6.2	6.3	3.6			3.9	4.0
24.	5.9	5.1	1.8			3.4	2.9
25.	7.4	6.7	2.5			5.5	4.8
26.	5.0	4.6	1.6			2.6	2.6
27.	6.0	6.7	3.3			4.4	4.6
28.	5.4	4.5	4.1			3.7	2.6
29.	3.4	3.4	3.1			2.4	2.2
30.	6.7	5.3	1.8			4.0	2.6
31.	4.4	3.8	1.2			2.1	1.2
32.	5.1	5.0	1.4			2.1	2.4
33.	6.0	4.2	3.2			4.0	2.3
34.	7.0	6.3	5.3			4.4	4.8
35.	4.5	4.3	2.5			2.5	2.2
36.	7.3	5.9	2.7			5.3	4.2
37.	7.3	6.7	2.1			4.9	4.2

Table 5 (cont'd.)

Ss	D1	D2	D3	D4	D5	D6	D7
38.	7.8	6.4	2.9			5.5	3.9
39.	7.7	8.2	4.0			5.5	5.2
40.	3.8	3.8	3.8			3.8	2.8
41.	6.2	6.2	5.2			4.1	4.2
42.	6.0	5.9	1.4			4.3	3.7
43.	6.7	7.8	5.1			5.7	5.7
44.	6.4	5.7	1.8			4.0	3.1
45.	6.7	6.7	2.8			4.7	4.3
46.	4.1	4.1	1.7			2.5	1.7
47.	6.4	4.6	5.0			4.1	3.6
48.	4.4	5.8	2.2			2.8	4.3
49.	2.7	4.1	2.2			1.2	1.5

D1 - The distance between the initial test and the Criterion

D2 - The distance between the retest and the Criterion

D3 - The distance between the initial test and the retest

D4 - The distance between the concepts Opinion and Nonsense (see Table 3, D5).

D5 - The distance between the concepts Opinion and Discipline (see Table 4, D4).

D6 - The distance between the concept Opinion and the midpoint of the scale, initial test

D7 - The distance between the concept Opinion and the midpoint of the scale, retest

Table 6

Changes in D-Scores in Respect to the Criterion

Concept	Moved Closer	Stayed Same	Moved Away
Nonsense	25	5	19
Discipline	28	1	20
Opinion	31	7	11

The results presented above confirm those based on Table 2, which was presented on p. 28. It will be noticed that the concept Opinion, which was the control word and was not taught, actually showed a more frequent shift in the direction of the Criterion than did the two experimental words. However, this difference in frequency of shift is not significant, since the $\chi^2 = 2.52$, with a p value of .30.

In Table 7 are given the means and standard deviations for D_1 and D_2. The average D_1 and D_2 scores for the concept Nonsense and the concept Discipline are considerably smaller than the D_1 and D_2 scores for the concept Opinion.

Table 7

Means and Standard Deviations of D_1 & D_2

Concept	Mean 1	Mean 2	Sigma 1	Sigma 2
Nonsense	4.28	4.19	1.09	1.45
Discipline	3.72	3.66	1.02	1.09
Opinion	5.84	5.46	1.38	1.56

The average D1 scores for the concept Opinion are so large that it would be difficult for them to move any further away from the Criterion on the retest than they were on the initial test.

Table 3, D4, gives a measure of the discriminatory ability of the Semantic Differential. The aforesaid score indicates the distance in semantic space which separates the concept Nonsense from the concept Discipline. Likewise, D5 (Table 3); and D4 (Table 4) provide discriminatory scores for the concepts Nonsense vs. Opinion, and Opinion vs. Discipline respectively. It should be noted that the D-scores (D5, Table 3 and D4, Table 4) mentioned above are larger than any of the others. This is to be expected, for an instrument which could not differentiate different concepts could not be expected to differentiate a change produced in the same concept by providing more information about that concept.

D6 and D7 for each concept is the "amount of space" used in the initial test and retest situations respectively. This value was obtained by taking the algebraic distance from the midpoint of the scale to the designated mark of the S as the d value, squaring and summing over the 10 scales and taking the square root of the sum of the squared distances.

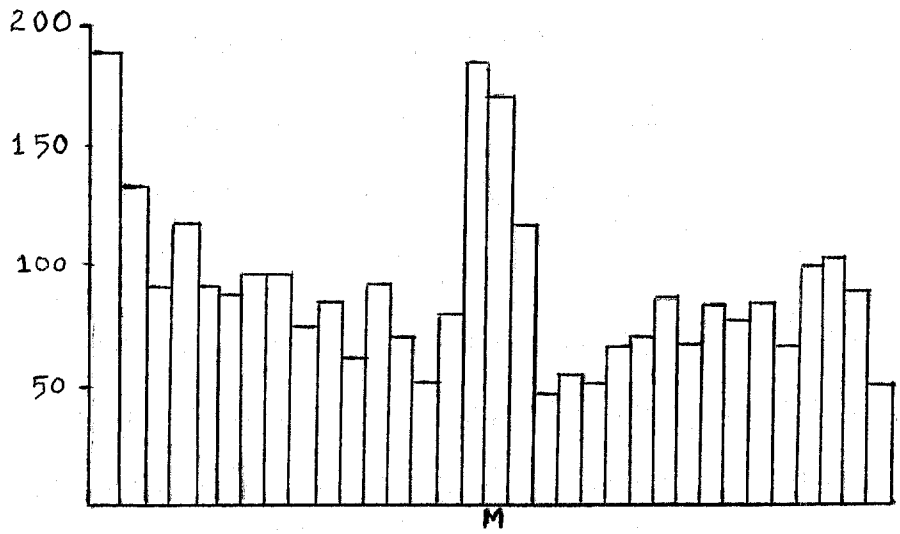
This "use of space" may be an index of the "meaningfulness" of the concept for each S, provided we assume that each subject uses space in the same way.

But common sense recognizes the possibility that one S may use 1/8" to indicate a certain degree of intensity of association, while another subject may use 5/8" to indicate the same degree of intensity of association. Tables 3, 4 and

5 give evidence that this is the case. While subjects vary among themselves as to their use of space, they are fairly consistent within themselves. It seems as though a personality variable is important here, which causes each S to modify the scale to his use.

3. Frequency

Finally, a frequency tabulation was compiled to see how often each of the intervals on the unmarked scale was utilized. Figure 5 shows the combined markings (test and retest) for all subjects and all concepts.



Semantic scale with 33 divisions

Fig. 5. A Histogram of Judgment Distribution.

The heavily weighed left side of the scale can not be due entirely to the order of the polar adjectives, because they were randomized with respect to polarity. It is tentatively postulated that the Ss were biased to the left side of the scale, possibly because the reading habits of our culture condition one to start at the left side of the page and read to the right. There is some doubt, then, whether one

may assume that the subject moves immediately to the center of the scale, and then decides whether to move to the left or right, depending on his association to the stimulus concept. We are suggesting that the more natural thing would be for the subject to start at the left terminal and move toward the right terminal to designate his association. This postulate is also in conformity with the findings of Messick (1957), who found that the functional midpoint of the semantic scale is slightly off to the left of the actual midpoint.

CHAPTER V

CONCLUSIONS AND SUMMARY

The transfer of information hypothesis states that a change in meaning of a concept can be effected by providing more information about that concept. In the present study, this change of meaning was effected in the classroom situation, with the instructor's Differential Profile serving as Criterion. It was reasoned that a change in the meaning of a concept for a S would result in him indicating such a change by allocating the concept to a different point in semantic space. Such an allocation of a concept is achieved by performing a series of differentiating judgments about that concept on a given set of bipolar adjectival scales.

Three words were selected which are used daily in ordinary conversation, but which have a special meaning when taken in their psychological sense. Only two of the words were taught with their special meanings, and the third word served as a control. The teaching period was a twelve day interval between the initial test and the retest. No reference was made during the teaching period to the fact that Ss were now learning a new meaning for the concepts which they had previously differentiated. It was hypothesized that if effective learning took place during this twelve day interval, the profiles of the second test would be more in accord with the Criterion than were the profiles of the initial test.

It was found that shifts of the concepts in the direction of the Criterion is

not a fundamental property of the learning process, since shifts in semantic space took place more frequently with the control word than with the experimental words. More precisely, change of meaning as effected in the learning process may be indicated by a concept shift in the direction of the Criterion, although not all such shifts are a result of the learning process.

The data were also examined for possible sex differences in performances, but none were found that were significant. Neither was there a significant relation between the final grades of Ss and their performance on this experiment.

The frequency distribution (Fig. 5) was tabulated to include every judgment made by all Ss on the three concepts for both the tests. The frequency matrix (49 Ss x 10 judgments x 3 concepts x 2 tests) is made up of 2940 cells. Figure 5 illustrates the manner in which these scores are distributed, and provides corroboration for the findings reported by Messick (1957) that the finer points of discrimination, i.e. closer to the center of the scale, are used with less frequency than are the extremities of the scale. Likewise, as Messick also reported, the actual, functional midpoint of the scale is slightly off to the left of the real midpoint. It is tentatively suggested that this latter phenomenon is due to such cultural determinants as reading from the left to the right, which would cause the subject first to view the adjective on the left terminal of the scale, and then use this adjective as his anchor point as he moves along the scale to the right.

The numerical values of the D-scores are to be interpreted as representing a distance function. The distance in question refers to length of the line which connects two points in semantic space. Thus, for the concept Nonsense, D1 refers to

the distance in semantic space which separates the concept Nonsense from the Criterion markings for that same concept. The greater the value of the D-score, the further removed are the two points in semantic space.

An important relationship emerged from the analysis of the D-scores. The results of the second test were found to correlate very highly with the results of the first test. The test-retest reliability coefficients (D1 - D2) for the concepts Nonsense, Discipline, and Opinion were .65, .85, and .86 respectively.

A second major consideration is that Ss differ markedly from one another in the way they used semantic space, some Ss using less space to indicate a certain degree of association than do other Ss. Each S was rather consistent, moreover, with himself in the manner in which he used space. Table 8 gives the correlations

Table 8

Correlations Showing Consistency in Use of Semantic Space

		NONSENSE		DISCIPLINE		OPINION	
		D6	D7	D6	D7	D6	D7
(1)	D6	-	.78	.71	.56	.63	.56
	D7		-	.70	.63	.79	.65
(2)	D6			-	.64	.84	.52
	D7				-	.52	.59
(3)	D6					-	.79
	D7						-

All r's are significant beyond the .01 level of confidence.

between the D6 and D7 scores for each of the three concepts. The D6 and D7

scores for each of the three concepts. The D6 and D7 scores were obtained by taking the algebraic distance from midpoint of the scale to the point where the subject marked his judgment. These distances were squared, summed over the ten scales, and the square root taken of the sum of square distances. This procedure was repeated for each subject for each of the three concepts, and for both tests.

The highly significant correlations in Table 8, between D-scores which are representative of the amount of space used from test to test (Nonsense D6 - Nonsense D7, etc.), and of the amount of space used to designate the meaning of different concepts (Nonsense D6 - Discipline D6, etc.) indicate that a personality variable is operative which determines the manner in which each subject uses space.

Summary

This study was undertaken to test whether the Semantic Differential could measure the change of meaning which accrues to a concept when more "information" is given about that concept. The information in the present study consisted in teaching the psychological connotation of three words that regularly appear in ordinary conversation. Presumably, the instructor doing the teaching has a different meaning for the words in question than have the students attending his lectures. To the extent that the students understand what he is explaining about the concepts in question, their own meaning for the concepts will change. If the students' concepts change in the direction of the teacher's Criterion, then the teaching may be said to be effective.

The Semantic Differential would show such a change in meaning by a shift of position in semantic space for that concept, again presumably, in the direction of the Criterion. It was found, however, that while shifts in space in the direction of the Criterion always accompany effective teaching and learning, not all shifts in the direction of the Criterion can be said to be due to effective teaching and learning. This is made evident from the fact that the control word, which was not taught in its psychological setting, nevertheless shifted toward the Criterion with greater frequency than did the experimental words which were taught.

A significant phenomenon did emerge from the study. It was found that Ss varied considerably among themselves as to the manner in which they used space to indicate the intensity of their associations for the concepts. But each S tended to use space consistently in the same way, even when he was judging different concepts. For example, if a S used a total of 26 inches on all 10 scales (in terms of absolute deviation from the midpoint of the scales) to indicate the meaning which the concept Nonsense has for him, he will use approximately 26 inches to indicate the meaning which the concept Discipline has for him, and likewise with the concept Opinion. Further research as to the underlying nature of this apparent personality variable is desirable.

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