Central Washington University
ScholarWorks@CWU

All Master's Theses

Master's Theses

1968

Concept Identification as a Function of three Semantic Dimensions

Richard Eugene Edwards
Central Washington University

Follow this and additional works at: https://digitalcommons.cwu.edu/etd

Part of the Cognition and Perception Commons

CONCEPT IDENTIFICATION AS A FUNCTION OF

THREE SEMANTIC DIMENSIONS

A Thesis

Presented to

the Graduate Faculty

Central Washington State College

In Partial Fulfillment

of the Requirements for the Degree

Master of Science

by

Richard Eugene Edwards

August 1968

APPROVED FOR THE GRADUATE FACULTY

_____

Max Zwanziger, COMMITTEE CHAIRMAN

_____

Larry M. Sparks

_____

Robert L. Hudson

ACKNOWLEDGMENTS

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Concept identification may be defined as the process of differen-
tiating two or more stimuli on the basis of some common feature or at-
tribute they possess. The mastery of a concept is inferred from a $\underline{S}$'s
ability to categorize a set of stimuli and/or to provide an adequate
label for the concept (Bourne, 1966). This ability to categorize vari-
ous stimuli not only facilitates communication between individuals, but
reduces the complexity of impinging stimuli with which the organism
deals. In view of the large body of data dealing with physical stimuli
and the relative importance of verbal skills in our culture, it is sur-
prising that so little research has been done with meaningful verbal
materials.

Only a few studies are available which incorporate meaningful
verbal stimuli into the concept identification framework. Of these,
even a smaller number have utilized the readily available sources of
stimuli which have evolved from work on the semantic differential. In
one of the earliest studies, Haygood (1966) demonstrated the feasibility
of using semantically scaled stimuli within a concept identification
task. In that study the stimuli, drawn from an atlas prepared by Jenkins,
Russell, and Suci (1958), consisted of words from the evaluative and
potency dimensions. Two lists of words were printed on 3 x 5 inch cards,
each containing 80 words drawn from either end of the semantic scale.

Twenty-four S̲s̲ were randomly assigned to each dimension and were further
subdivided into Concept and No Concept conditions. In the Concept con-
dition, the stimuli were presented one at a time for S̲s̲ to categorize as
either type X (mean semantic scale value between 5 and 7) or not X (mean
semantic scale value between 1 and 3). After each response, S̲ received
informative feedback on the correctness of his choice. In the No Concept
condition, the categories were scrambled so that an equal number of words
from both ends of the semantic scale were in each category. In other
words, the semantically scaled stimuli were irrelevant to the concept
identification task and the only available method to correctly catego-
rize the words was through rote memorization. A significant difference
between Concept and No Concept conditions was obtained, with S̲s̲ in the
Concept condition having superior performance. Although more errors were
made on the potency dimension, a significant difference in difficulty be-
tween dimensions was not observed.

Zwanziger (1968), investigated the effects of three levels of
scalar separation, three levels of irrelevancy, three levels of redun-
dancy, and two levels of response complexity of semantic stimuli on
various performance measures. The stimuli were selected from an atlas
prepared by Heise (1965) and the atlas of Jenkins et al. With method-
ology similar to that of Haygood, Zwanziger observed that increasing the
scalar separation between stimuli resulted in a linear reduction in trials
to criterion and a reduction both in time to completion and number of
errors. While the addition of redundant dimensions facilitated learn-
ing, the addition of irrelevant dimensions beyond one showed no further

performance decrements. Increasing the task complexity from two to four
response categories resulted in a performance decrement.

Finally, a study by Taylor and Haygood (1968) investigated the
effects of category separation on a concept identification task involv-
ing all three of the primary semantic dimensions. Four conditions of
scalar separation were employed which ranged from a completely over-
lapping condition to a condition having five scale units between cate-
gory midpoints. The results were consistent with those reported by
Zwanziger. That is, performance improved continuously as scalar separa-
tion increased. In addition, a significant difference in difficulty was
observed between the evaluative and potency dimensions, with $\underline{S}$s in the
evaluative condition having fewer errors. No information was provided
for the activity dimension as the investigators had difficulty securing
adequate stimuli to fulfill all of the experimental conditions.

These studies then, largely account for the work that has been
done in this area. There is, however, no data available concerning the
differential effects on performance of the three primary semantic dimen-
sions. In nearly all of the factor analytic studies discussed by Osgood,
Suci, and Tannenbaum (1957), the evaluative factor has been the first to
evolve from the analyses and generally accounts for at least one-half of
the extractable variance. The second and third factors to appear, each
accounting for approximately one-half of the variance not attributable
to the evaluative factor, are the potency and activity factors respec-
tively. Because this finding has been so reliable both within our own

culture and in cross-cultural comparisons, it has been inferred that the
magnitude of the variance accounted for by each semantic dimension re-
flects both the degree to which we are capable of making discriminations
relevant to a particular dimension and the frequency with which those
discriminations are made (Donahoe, 1961).

It is the purpose of the present study to determine the differ-
ential effects of the three primary semantic dimensions on the ability
of Ss to solve a concept identification problem. It was hypothesized
that the performance level, as measured by a criterion of learning ten
successive responses containing no more than one error, time to comple-
tion, and the total number of errors, will be higher for Ss working on
the evaluative dimension than for Ss working on the potency or activity
dimensions. Two additional hypotheses were formulated in an attempt to
answer the following questions: 1) Is the ability to identify concepts
a function of verbal or mathematical ability?; and 2) Will those who dis-
play a high level of verbal or mathematical ability reach the criterion
of learning more rapidly?

It was hypothesized that: 1) Ss who were functioning at a lower
level of verbal or mathematical ability as measured by the Washington
Pre-College Aptitude Test would have more difficulty in identifying the
concepts than those who displayed superior ability in these areas, and
2) Ss who possessed a high level of verbal or quantitative ability as
measured by the Washington Pre-College Aptitude Test would reach the
criterion of learning more rapidly than those functioning at a lower level.

CHAPTER II

METHOD

Hull's (1920) classic reception paradigm, having been used most
frequently in studies of conceptual behavior, was selected as the frame-
work through which the present investigation would be conducted. The
following aspects characterized the paradigm: 1) E related a set of
general instructions to each S concerning the nature of the problem;
2) the stimuli were presented successively in a random order; and 3) S
received informative feedback after each response. After the stimuli
had all been presented, S was asked to write his impression of what the
concept actually was.

Selection of Stimuli

Three lists of stimulus words corresponding to one of three ex-
perimental conditions were required. The words were drawn from the atlas
of Jenkins et al. (1958) and the atlas of semantic profiles compiled by
Heise (1965). Each list was composed of 40 words, half of which were
taken from one end of a bipolar semantic scale. On the evaluative di-
mension, for example, 20 words were selected from the extreme "good"
end of the scale and 20 words were selected from the extreme "bad" end
of the scale. The word selection criteria for the Jenkins list was the
same for all of the semantic dimensions. That is, a word was not sel-
ected unless it had a mean scale rating equal to or less than three, or
equal to or greater than five, on a scale ranging from one to seven with

a value of four representing the neutral point of the semantic scale.

A more complex procedure was used for determining the criteria for words drawn from the Heise list. Because Heise reported factorized standard scores, it was possible to find the critical values for each dimension which fell one standard deviation above and below the mean of the distribution of ratings. These values separated the extreme upper and lower 16 percent of the distribution and were used as the criteria for word selection. For the evaluative, potency, and activity dimensions these values were $\pm$ 1.32, $\pm$ 1.40, and $\pm$ .97 respectively. The scale used by Heise, unlike that of Jenkins, ranged from minus three to plus three with a value of zero representing the neutral point on the semantic scale.

In addition to possessing an extreme semantic rating on the dominant dimension, each stimulus word had to have a neutral rating on the other two primary dimensions. For instance, when the evaluative factor was the dominant dimension and the words were drawn from the Jenkins list, a "good" word had to be rated equal to or less than a mean scale value of three and a "bad" word had to be rated equal to or greater than a mean scale value of five while being rated somewhere between three and five on the activity and potency dimensions. Thus, the dominant dimension functioned as the only relevant attribute by which a concept could be identified.

The stimulus words were selected through a three step procedure. First, the words that had ratings extreme enough on the dominant dimension were recorded, along with the mean scale value reported for each of

the three dimensions. Secondly, any word which fell outside of the neutral range on the two subordinate dimensions was discarded. Finally, the stimuli were selected from the remaining words which most nearly approximated the conditions of balance (equal deviations from the scalar zero point both within and between conditions) and clarity (the most extreme deviations from the critical cut-off point while retaining neutrality on the subordinate dimensions). Tables 1 and 2 show the mean scalar values and SD's for the stimulus words used in each condition. Inspection of the tables reveals that the stimuli were well within the restrictions established by the selection criteria. See Appendix A for the actual word lists and source for each condition.

Each of the three lists contained 40 different words which were presented three times, each block of 40 being arranged in a different random order. An arbitrary label of "T" or "S" was assigned to the high and low extremity words within each condition. The symbols "T" and "S" were chosen as labels for opposite ends of the semantic dimensions because they seemed to be fairly neutral in meaning. Symbols such as "1" and "2" or "A" and "B" were avoided because one member of each pair is usually identified as being better than or superior to the other.

The stimulus words were typed in the center of 3 x 5 inch cards and the cards were numbered from 1 to 120. Twelve sets of cards were made, four sets for each condition. Two holes were punched in the top of the cards and they were placed on three inch metal rings.

TABLE 1

MEANS AND STANDARD DEVIATIONS FOR WORDS

DRAWN FROM HEISE

Experimental Conditions		Dimensions					
		Evaluative		Activity		Potency	
	N	$\overline{X}$	SD	$\overline{X}$	SD	$\overline{X}$	SD
		High Extremity					
Evaluative	12	1.62	.33	.23	.54	-.09	.75
Activity	12	.10	.51	1.65	.27	.10	.53
Potency	11	.02	.63	.54	.53	1.74	.24
		Low Extremity					
Evaluative	16	-2.64	.63	.17	.56	-.19	.47
Activity	11	-.01	.37	-2.04	.54	.11	.26
Potency	10	.75	.35	-.11	.55	-2.05	.50

TABLE 2

MEANS AND STANDARD DEVIATIONS FOR WORDS DRAWN FROM

JENKINS, RUSSELL, AND SUCI

Experimental Conditions		Dimensions					
		Evaluative		Activity		Potency	
	N	$\bar{X}$	SD	$\bar{X}$	SD	$\bar{X}$	SD
High Extremity							
Evaluative	8	2.12	.49	3.98	.51	4.30	.54
Activity	8	3.71	.65	1.93	.45	3.58	.53
Potency	9	3.95	.44	4.32	.59	1.78	.47
Low Extremity							
Evaluative	4	5.48	.47	3.94	.39	3.93	.30
Activity	9	4.26	.69	5.38	.41	4.16	.78
Potency	10	3.26	.46	4.20	.48	5.62	.57

Apparatus

The apparatus consisted of three items: twelve sets of 3 x 5 inch cards (described above); special marking pens; and twelve response boards with corresponding answer sheets. Twelve refillable Sheaffer cartridge gliderite pens were used for marking the answer sheets. The pens were chosen because it was nearly impossible for S to touch the answer sheet with the tip of a pen without leaving a mark on the paper. This precaution was to detect those few people who might insist upon responding more than once to the stimulus material. If more than two or three stray marks were found on an answer sheet, the data was discarded.

The answer sheets (see Appendix B) were designed with four pairs of columns, each column headed by "T" or "S" and having 30 response positions. The response positions were numbered 1 to 120 to correspond to the numbers typed on the stimulus cards. Two answer sheets were placed on each answer board to ensure that S could not detect the holes in the response board. Each answer sheet had name, sex, and age blanks at the top and the following notice:

DON'T FORGET:

1. Use firm downward pressure on your pen.
2. Do not turn back to previous cards.
3. Write your impression of the differences between the categories when you are through with your cards.

Twelve response boards were constructed of one-eighth inch Masonite hardboard. Each board was eight and one-half inches wide by fifteen inches long and had one-eighth inch holes countersunk under the appro-

priate response positions for each condition. Whenever a correct re-
sponse was made, the S̲s pen would pierce a hole through the answer sheet
and thus provide immediate feedback. Two pegs were placed in the right
hand side of the boards over which the answer sheets could be placed in
order to align the response sheets in the correct response positions re-
lative to the holes. Three one-eighth inch holes were countersunk in
the upper left hand corner so that each S̲ could "get the feel" of punch-
ing holes through a piece of paper before the experiment began.

Subjects

A total of 120 S̲s were used. The S̲s were all volunteers from a
large section of general psychology and two sections of Psychology of
Adjustment at Central Washington State College. A sign-up sheet was
circulated in each classroom on which prospective S̲s were asked to write
their name and telephone number beside a date and time that was conve-
nient for them to participate in the experiment. E̲ called each S̲ the
night before the experiment and reminded them of their appointments.
The S̲s were predominantly females of freshmen or sophomore standing.

Procedure

Prior to the S̲s arrival at the experimental setting, the response
boards and sets of stimulus cards were placed in a random order on every
other desk. That is, every other desk had a resonse board with the cor-
responding set of cards on a desk immediately to its left. The S̲s were
instructed to seat themselves wherever there was a response board. Groups
ranging in size from seven to twelve were tested in classrooms which had

been scheduled for each experimental session. When all of the Ss had

arrived, they were presented with a set of written instructions ex-

plaining the nature of the task. Appendix C contains a copy of these

instructions. After reading the instructions, the Ss were allowed to

ask questions concerning the task they were to perform. The pens were

then distributed and the following verbal instructions were given:

> Please fill in the name, sex, and age blanks at the
> top of your answer sheet.

> You will notice three small holes in the upper left
> hand corner of your answer board. Take the small piece
> of paper that is on your desk; place it over the holes
> and practice punching holes through the paper. This is
> to give you an idea of how hard you will have to push in
> order to pierce the paper. If you have to press much
> harder than this during the experiment, you will probably
> have made a wrong choice and you should go on to the next
> word.

> Respond only once to each word. After each response,
> go on to the next word and do not turn back to an earlier
> one. If there are any stray marks on your paper it will
> have to be thrown out.

> This is not an I.Q. test nor is it a measure of your
> intellectual ability. Since everyone has a different
> task and since some tasks are much harder than others,
> some of you will be here quite a while after most of the
> others have finished. Just because you are the last to
> finish, does not mean that you are a dullard, you may have
> had a much harder task than everyone else.

If there were no further questions, the following last minute

reminder was given:

> Be sure to use a firm downward pressure on your pen
> so that if you have made a correct response your pen will
> pierce the paper. Don't forget to raise your hand as
> soon as you have categorized the last word of the deck.
> Now, take the deck of cards on the desk to your left and
> begin working.

The starting and finishing times for each S were recorded by E's wristwatch. When all of the words had been categorized, the Ss were asked to write what they thought was the basis of the concept. This was done on a sheet of paper attached to the back of the answer boards. As the Ss handed in their materials, they were asked to refrain from discussing the experiment with others and were thanked for their participation.

CHAPTER III

RESULTS

A total of 122 Ss were tested. Of these, two Ss were dropped
because they had responded more than once to several of the items. The
analysis then, was based upon data collected from 120 Ss.

The following performance measures were analyzed to test for the
effects of three experimental conditions: 1) the total number of errors
on each block of 40 trials; 2) the total number of trials necessary to
reach a criterion of nine out of ten correct responses; 3) the total
elapsed time to completion of the task; and 4) the accuracy of the Ss
statements as to what the basis of the concept actually was. Table 3
shows the means and SD's of these response measures for each of the con-
ditions as well as the means and SD's of the verbal and quantitative
composite scores of the Washington Pre-College Aptitude Test. See
Appendix D for a list of raw data for all Ss in each of the conditions.

Errors

An analysis of variance, including an analysis for linear and
quadratic trend, was performed on the data. Table 4 shows the results
of the first stage of this analysis.

As can be seen, there was a significant difference in the total
number of errors between dimensions; the mean number of errors per trial
block averaged over the three dimensions differed significantly; and
there was a significant interaction between dimensions and trial blocks.

TABLE 3

MEANS, STANDARD DEVIATIONS, AND WASHINGTON PRE-COLLEGE

APTITUDE SCORES FOR ALL GROUPS

Performance Measures	Dimensions								
	Evaluative			Activity			Potency		
	N	$\overline{X}$	SD	N	$\overline{X}$	SD	N	$\overline{X}$	SD
Total Errors	40	2.54	15.56	40	8.75	30.20	40	8.98	29.76
Trials to Criterion	40	18.60	23.48	40	39.70	29.20	40	40.40	26.53
Time to Completion	40	9.35	3.17	40	11.77	3.51	40	12.35	3.53
Accuracy of Statements	40	3.70	1.65	40	3.32	1.94	40	2.42	1.68
Washington Pre-College Verbal Composite Score	36	50.27	7.94	35	50.42	9.75	36	50.16	8.25
Washington Pre-College Quantitative Composite Score	36	49.00	7.69	35	48.02	6.70	36	48.44	6.40

TABLE 4

TREND ANALYSIS FOR MEAN NUMBER OF ERRORS UNDER

THREE EXPERIMENTAL CONDITIONS

Source	df	MS	F
Dimensions (A)	2	1603.84	19.30*
Error (a)	117	83.07	
Trial Blocks (B)	2	951.26	103.06*
A X B	4	64.23	6.95*
Error (b)	234	9.23	

* $p < .001$

All of these differences were reliable at p < .001. Figure 1 illustrates the acquisition curves.

An analysis of the simple effects of the dimension by trials interaction is summarized in Table 5. Inspection of the table reveals the following information: 1) there was a significant difference, p < .05, in the number of errors between the three dimensions on the first block of trials; 2) there were significant differences, p < .001, in the number of errors between the three dimensions on both the second and third block of trials; and 3) there were significant differences, p < .001, in the number of errors between blocks within each of the three dimensions.

Duncan's multiple range test indicated a significant reduction in errors, p < .02, occurred between the first and second and between the first and third trial blocks for both the evaluative and potency conditions. The reduction of errors between the second and third trial blocks was insignificant. On the activity dimension, there was a significant reduction in errors, p < .02, between all three trial blocks. Fruther, within each block of trials there was a significant difference, p < .02, in the number of errors between the evaluative and activity dimensions and between the evaluative and potency dimensions, but not between the potency and activity dimensions.

Table 6 shows the linear and quadratic components of trend for the trials and dimensions by trials interaction sum of squares of Table 4. Both the linear and quadratic components of trend for the trials sum
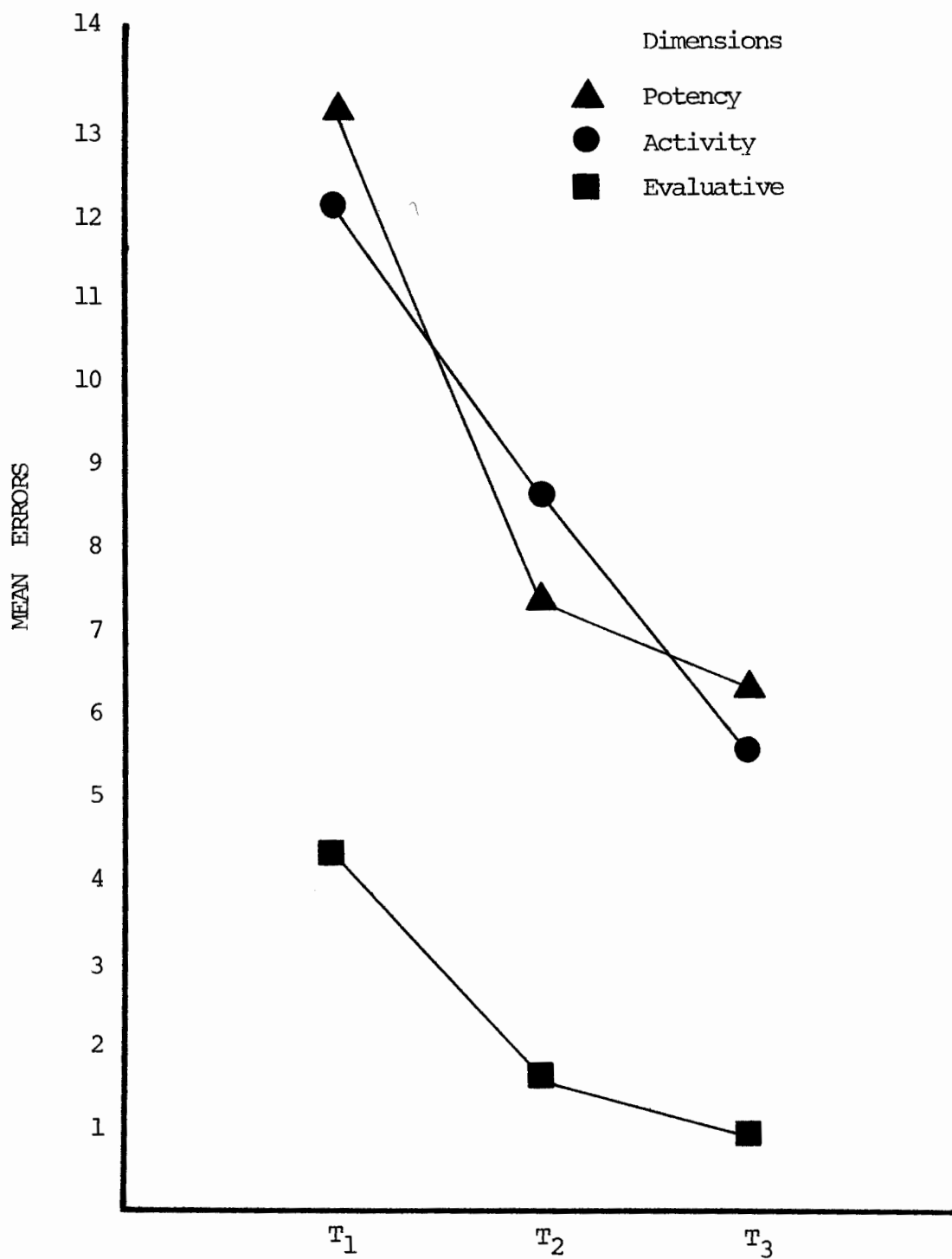
Fig. 1. Mean number of errors for first, second, and third
         presentation of stimulus words.

TABLE 5

ANALYSIS OF SIMPLE EFFECTS FOR DIMENSIONS BY TRIALS

INTERACTION FROM TREND ANALYSIS OF ERRORS

Source	df	MS	F
Trial Block 1	2	102.06	3.01*
Trial Block 2	2	413.56	12.22**
Trial Block 3	2	564.10	16.66**
Error (a+b)	351	33.84	
Evaluative	2	930.77	100.84**
Activity	2	525.47	56.93**
Potency	2	276.06	29.90**
Error (b)	234	9.23	

* $p < .05$

** $p < .001$

of squares were significant, p < .001, indicating that there were signi-
ficant linear and quadratic reductions in the number of errors across
trial blocks. For the dimensions by trials interaction sum of squares,
the linear component of trend was significant beyond the p < .001 level
and the quadratic component was significant beyond the p < .05 level.
This indicates that the slope of the line describing the linear reduc-
tion of errors across the trial blocks was significantly different for
the three experimental conditions. The significant quadratic component
indicates that the rate of change of the slope describing the quadratic
reduction of errors was not the same for the three conditions. It should
be noted, however, that although both the linear and quadratic components
of trend were significant, the linear component accounted for the major-
ity of the variance.

Further analysis revealed that there were significant differences,
p < .001, between the slopes of the lines describing the linear reduc-
tion of errors for all three conditions. There were also significant
differences, p < .01, for the rate of change of the slopes describing the
quadratic reduction of errors between the activity and potency dimensions
and between the evaluative and potency dimensions. These differences were
reflected in Figure 1.

A X^2 test revealed that the percentage of males and females in
the sample deviated significantly, p < .01, from what would be expected
to occur by chance based upon the percentage of males and females in the
population from which the sample was drawn. Although female Ss, in

TABLE 6

LINEAR AND QUADRATIC COMPONENTS OF THE TREND ANALYSIS OF ERRORS

Source	df	MS	F
Linear Components:			
B	1	1776.70	192.49**
A X B	2	96.51	10.45**
Error (b)	234	9.23	
Quadratic Components:			
B	1	125.83	13.63**
A X B	2	31.94	3.46*
Error (b)	234	9.23	

* $p < .05$

** $p < .001$

general, tended to have fewer errors, the difference for mean number of errors between males and females was found to be insignificant as indicated by Table 7.

Trials to Criterion

The analysis of variance for the mean number of trials to criterion (TTC) is summarized in Table 8. Inspection of the table reveals that a significant difference, $p < .01$, in TTC was found between the three conditions. Duncan's multiple range test revealed that Ss had significantly fewer TTC under the evaluative condition than they did under the activity or the potency conditions. No difference was found between the activity and potency conditions.

An analysis of variance of sex differences for TTC is summarized in Table 9. A significant difference, $p < .05$, between males and females was obtained, with the female Ss requiring fewer trials to reach the criterion of learning. Bartlett's test for homogeneity of variance was not appropriate because the frequency distributions for both males and females were extremely skewed.

Completion Time

Table 10 shows the results of an analysis of variance on the total time to completion for the three conditions. The difference between conditions, significant at $p < .01$, when analyzed by Duncan's multiple range test, revealed that significantly less time was required for Ss working on the evaluative condition than for either the activity or potency conditions. The difference between the activity and potency conditions was not significant.

TABLE 7

ANALYSIS OF VARIANCE OF SEX DIFFERENCES FOR

MEAN NUMBER OF ERRORS

Source	df	MS	F
SS_b	1	1037.61	3.24
SS_w	118	319.88	

* $p > .05$

TABLE 8

ANALYSIS OF VARIANCE FOR MEAN NUMBER OF TRIALS TO CRITERION

Source	df	MS	F
SS_b	2	6139.60	8.50*
SS_w	117	722.13	

* $p < .01$

TABLE 9

ANALYSIS OF VARIANCE OF SEX DIFFERENCES FOR

TRIALS TO CRITERION

Source	df	MS	F
SS_b	1	3323.18	4.19*
SS_w	118	791.91	

* $p < .05$

TABLE 10

ANALYSIS OF VARIANCE OF TIME TO COMPLETION

Source	df	MS	F
SS_b	2	101.41	8.52*
SS_w	117	11.89	

* $p < .01$

TABLE 11

ANALYSIS OF VARIANCE OF SEX DIFFERENCES FOR

MEAN TIME TO COMPLETION

Source	df	MS	F
SS_b	1	.51	—
SS_w	118	13.50	

The analysis of variance for sex differences in mean time to completion yielded an insignificant F as shown in Table 11.

Accuracy of Statements

Before the relationship between TTC and accuracy of the Ss written statements could be determined, a concept identification score (CIS) had to be assigned to each statement. These scores ranged from one to five, were a score of one indicated, a statement was entirely incorrect and a score of five indicated that the correct identification of a concept. Four graduate students rated all the statements in order to get a measure of interrater reliability. These statements are shown in Appendix E. The CISs assigned by each rater are shown in Appendix F. Statements numbered 1 to 40 represent those of Ss in the evaluative condition while those numbered from 41 to 80 and from 81 to 120 represent Ss of the activity and potency conditions respectively.

The intraclass correlation was used to estimate the reliability of the CIS. Since the average reliability of the four raters was $r_{kk}=.948$, only one judges ratings were used in determining the degree of relation between TTC and the CIS.

The CIS were dichotomized with scores of four and five being in one group and scores of one, two, and three being in the other. Since the point biserial correlation is not restricted by the assumption of an underlying normal distribution on the dichotomous variable, and since a plot of the CIS deviated considerably from a normal distribution, the point biserial correlation was chosen as the appropriate measure of

relationship between TTC and CIS. The correlations were -.47, -.48, and
-.30 for the evaluative, activity, and potency dimensions respectively.
The correlations for both the evaluative and activity dimensions were
significant, $p < .01$, but the correlation for the potency dimension was
not significantly different from a population correlation of zero. The
negative sign and magnitude of the correlations indicates that a high
CIS was moderately related to a low number of TTC. This magnitude of
relationship is consistent with that found previously (Hull, 1920;
Smoke, 1932; and Zwanziger, 1968).

An analysis of variance of the CIS assigned to the three condi-
tions is summarized in Table 12. Inspection of the table reveals a
significant difference, $p < .01$, between the conditions. The only signi-
ficant difference, $p < .01$, when analyzed by Duncan's multiple range test,
occurred between the evaluative and potency conditions. That is, $\underline{S}$s in
the evaluative condition received consistently higher CIS than $\underline{S}$s in the
potency condition. The differences between the activity and evaluative
conditions and between the activity and potency conditions were not
significant.

Interrelationship of Measures

All of the performance measures show a very high degree of inter-
relatedness. Table 13 shows the relationships between the mean number
of TTC, the mean time to completion, the mean number of errors, and the
CIS for each of the experimental conditions. As can be seen, there was
a perfect positive correlation between these performance measures as

TABLE 12

ANALYSIS OF VARIANCE OF CONCEPT IDENTIFICATION SCORES

Source	df	MS	F
SS_b	2	17.17	5.45*
SS_w	117	3.15	

* $p < .01$

TABLE 13

MEAN PERFORMANCE MEASURES FOR THREE EXPERIMENTAL CONDITIONS

Experimental Conditions	Performance Measures				
	Rank	TTC	Time	Errors	CIS
Evaluative	1	18.60	9.35	2.54	3.70
Activity	2	39.70	11.77	8.75	3.32
Potency	3	40.40	12.35	8.98	2.42

measured by the Spearman rho. This degree of relationship is consistent with the findings of other investigators (Bourne, 1957; and Zwanziger, 1968).

Additional evidence of interrelatedness is found in the analysis of variance results. Generally speaking, responses to the more difficult conditions were characterized by: 1) a greater number of errors; 2) more trials to reach the criterion of learning; 3) more time to complete the task; and 4) lower CIS.

Verbal and quantitative composite scores from the Washington Pre-College Test were gathered for 107 of the original 120 Ss. The correlational analysis is summarized in Table 14. The point biserial correlation coefficients between the CIS and verbal composite scores and between the CIS and quantitative composite scores were insignificant. The magnitude of these correlations indicates that the ability to identify verbal concepts was not a function of verbal fluency or mathematical ability as measured by the Washington Pre-College Test.

The Pearson product-moment correlation coefficients between TTC and the verbal and quantitative composite scores for the evaluative and activity dimensions were insignificant. On the potency dimension, however, the coefficient of -.51 between TTC and the verbal composite was significant at $p < .01$ and the coefficient of -.36 between TTC and quantitative composite was significant at $p < .05$.

TABLE 14

RELATIONSHIP BETWEEN RESPONSE MEASURES AND

WASHINGTON PRE-COLLEGE SCORES

| Performance Measures | Dimensions | | | | | |
| | Evaluative | | Activity | | Potency | |
	Verb.	Quant.	Verb.	Quant.	Verb.	Quant.
CIS	-.03	.00	.00	.25	.11	-.17
TTC	-.20	-.02	-.28	-.30	-.51**	-.36*

*   p < .05

**   p < .01

CHAPTER IV

DISCUSSION

The results of the present experiment were consistent with the findings of previous concept identification studies employing semantically scaled stimuli. The major finding, that of the differential effects on concept attainment of the three primary semantic dimensions, lent support to the finding reported by Taylor and Haygood (1968) that concept mastery was easier when stimuli were drawn from the evaluative dimension than from the potency dimension. The same tendency, although not significant, was found by Haygood (1966). In addition, the present study provides evidence suggesting that concept attainment was more difficult when stimuli were drawn from the activity dimension than from the evaluative dimension. These results, in conjunction with the fact that no differences in difficulty were found between the activity and potency conditions, were consistent with expectations based upon the factor analytic studies by Osgood, Suci, and Tannenbaum (1957). It will be recalled that the evaluative factor was first to evolve from these analyses and generally accounted for at least one-half of the extractable variance. The second and third factors to appear, each accounting for almost one-half of the variance not attributable to the evaluative factor, were the potency and activity factors respectively.

Since the degree of scalar separation was equated for the stimuli of the three conditions, it was believed that any observed differences

in concept difficulty would be due to dimensional salience. Thus, based upon the factor analytic studies, it was expected that the evaluative condition would be easier than either the activity or the potency conditions. Ease of concept identification then, was a function of the particular semantic dimension from which the stimuli were drawn. The relative magnitude of variance accounted for by each stimulus dimension was directly related to S's ability to make discriminations relevant to that dimension.

The high degree of interrelatedness among performance measures was compatible with findings of previous studies using both verbal and nonverbal stimulus materials (Bourne, 1957; and Zwanziger, 1968). Since the response measures were highly interrelated and since only two answer sheets had to be discarded because of improper responding, it was assumed that the Ss were adequately motivated to do well on the task. The fact that nearly all of the Ss within each of the experimental conditions were able to reach the criterion of learning provides further justification for the continued use of semantically scaled stimuli within the concept identification framework.

The significant sex difference for TTC was an unexpected finding. The significance of this comparison can be explained, however, by reference to the raw data in Appendix D. It will be noticed that the majority of male Ss were either in the activity or the potency conditions. These conditions, being more difficult for all Ss, were probably responsible for the significant sex differences in this case.

Finally, the moderate degree of relationship found between S̲s ability to solve a concept identification problem and his ability to verbalize an adequate description of the concept was similar to the magnitudes of relationship reported previously (Hull, 1920; Smoke, 1932; and Zwanziger, 1968). Zwanziger speculated that a lack of language skills may be responsible for the inability of S̲s to state the rule which they used in solving a concept problem.

In an attempt to investigate this hypothesis, several correlation coefficients were computed between TTC, CIS, and the verbal and quantitative composite scores from a general aptitude test. Generally speaking, the coefficients were larger under the potency condition and for the correlations between TTC and aptitude scores. It is believed that the insignificant coefficients were primarily due to a lack of variation in the performance measures of the evaluative condition and the CIS. That is, S̲s of the evaluative condition required significantly fewer TTC and made a significantly smaller number of errors so that the variance of their response measures was considerably less than that of the other conditions. Furthermore, it can easily be seen that the maximum range of variance between CIS was five while a considerably larger variation occurred between the TTC scores within each condition. Finally, the range of variation between the aptitude scores was much more similar to that between the TTC scores than to that between the CIS. Thus, the lack of variability under these situations was presumed to be an artifact of the present experimental conditions which functioned to restrict the

amount of covariation possible, and therefore, reduced the magnitude of the correlation coefficients. With this in mind, it is not surprising that the only significant coefficients were obtained between TTC and the verbal and quantitative composits under the potency condition.

Perhaps a significant correlation coefficient would have been obtained between TTC and aptitude socres of Ss under the evaluative and activity conditions if their experimental tasks had been more difficult. This could easily be tested by manipulating the scalar separation, number of irrelevancies, or task complexity, for the three conditions. As the tasks became more difficult, both the variability in TTC scores between Ss and the correlation coefficients between TTC and aptitude test scores should increase. In this way, a more accurate measure of relationship between ability to identify concepts and verbal or quantitative skills could be obtained.

The significant interaction between stimulus conditions and trial blocks was an unexpected finding. A possible interpretation of this interaction might be that Ss of the evaluative and potency conditions utilized a greater proportion of the extractable information relevant to the problem solution by the time they had reached the end of the second trial block. This would account for the greater initial reduction of errors relative to the reductions over the last trial block within the evaluative and potency conditions and for the more gradual reduction of errors on the activity dimension. The problem with this interpretation lies in identifying the variable(s) common to both the

evaluative and potency stimuli which were responsible for the similarity in their performance curves.

Since the stimuli of the three conditions were equated for scalar separation, the difficulty level of the conditions should have been similar. Inspection of Table 3 reveals that the Ss of each condition received nearly identical verbal and quantitative aptitude scores. This rules against an explanation of the interaction being caused by differential ability among the Ss.

As is usually the case, the answer to this question must await further research.

CHAPTER V

SUMMARY

Despite the importance of verbal and conceptual skills in our culture, little research has been done using verbal stimulus materials within the concept identification framework. Though the semantic differential technique locates words on several dimensions of meaning, few investigators have utilized such semantically scaled materials as stimulus events.

It was the purpose of this study to assess the differential effects of the three primary semantic dimensions on the ability of Ss to solve a concept identification problem. In addition, an attempt was made to answer the following questions: 1) Is S's ability to verbalize the key concept a function of verbal or mathematical ability?; and 2) Is verbal or mathematical ability related to the speed with which concepts are learned? To do this, stimuli of known dimensionality were presented, through the reception paradigm, to 120 Ss. Verbal and quantitative aptitude test scores were then correlated with S's ability to provide a written statement identifying the concept.

The results showed the following: 1) concept identification was easier when stimuli were drawn from the evaluative dimension than from the activity or potency dimensions, there being no difference between the latter two dimensions; 2) verbal and quantitative ability was not related to the accuracy of concept identification statements; 3) verbal

and quantitative ability was moderately related to the rate of concept mastery for the potency dimension, but not for the activity or evaluative dimensions; and 4) a moderate degree of relationship was found between the rate of concept acquisition and ability to provide an accurate description of the concept.

The findings of the present experiment then, supported the hypothesis that the ease of concept identification would be a function of the particular semantic dimension from which the stimuli were drawn and provided further evidence for the feasibility of using semantically scaled stimuli within the concept identification framework.

REFERENCES

REFERENCES

Bourne, L. E., Jr. Effects of delay of information feedback and task complexity on the identification of concepts. Journal of Experimental Psychology. 1957, 54, 201-207.

Bourne, L. E., Jr. Human conceptual behavior. Boston: Allyn and Bacon, Inc., 1966.

Donahoe, J. W. Changes in meaning as a function of age. Journal of Genetic Psychology. 1961, 99, 23-28.

Haygood, R. C. The use of semantic differential dimensions in concept learning. Psychonomic Science. 1966, 5, 305-306.

Heise, D. R. Semantic differential profiles for 1,000 most frequent English words. Psychological Monographs. 1965, 79, (8, Whole No. 601).

Hull, C. L. Quantitative aspects of the evolution of concepts. Psychological Monographs. 1920, 28, (1, Whole No. 123). Cited by L. E. Bourne, Jr., Human Conceptual Behavior. Boston: Allyn and Bacon, Inc., 1966, p. 5.

Jenkins, J. J., Russell, W. A., and Suci, G. J. An atlas of semantic profiles for 360 words. American Journal of Psychology. 1958, 61, 688-699.

Osgood, C. E., Suci, G. J., and Tannenbaum, P. H. The measurement of meaning. Urbana: University of Illinois Press, 1957.

Smoke, K. L. An objective study of concept formation. Psychological Monographs. 1932, No. 191. Cited by M. D. Zwanziger, Concept identification of semantically scaled verbal stimuli. (Doctoral dissertation, University of Utah) Ann Arbor, Mich.: University Microfilms, 1968. No. 67-17,567.

Taylor, C. L., and Haygood, R. C. Effects of degree of category separation on semantic concept identification. Journal of Experimental Psychology. 1968, 76, 356-359.

Zwanziger, M. D. Concept identification of semantically scaled verbal stimuli. (Doctoral dissertation, University of Utah) Ann Arbor, Mich.: University Microfilms, 1968. No. 67-17,567.

APPENDIX A

STIMULUS WORDS FOR THE EVALUATIVE CONDITION

Stimulus Words	High Extremity		
	Evaluative	Activity	Potency
Adorned[a]	2.63	4.10	4.67
Art[a]	2.20	3.77	4.73
Barn[a]	1.97	3.63	3.43
Candy[a]	2.50	4.27	4.83
Church	2.40	−0.48	−0.77
Even[a]	2.83	4.63	4.13
Faith[a]	1.40	2.93	4.73
Farm	1.48	0.56	0.01
Fresh	1.60	−0.38	−0.68
Gentleman	1.42	0.92	0.58
Good	1.57	−0.36	−0.71
Home	1.48	0.84	−1.17
House[a]	1.77	4.13	4.23
Knowledge	1.50	0.98	1.21
Lamp[a]	1.70	4.40	3.70
Quality	1.35	−0.18	−0.34
Religious	2.07	0.02	−0.79
Satisfy	1.66	0.04	0.09
Unite	1.51	−0.07	0.19
Wise	1.49	0.88	1.26

a   Words drawn from the atlas of Jenkins, Russell, and Suci (1958).

STIMULUS WORDS FOR THE EVALUATIVE CONDITION

Stimulus Words	Low Extremity		
	Evaluative	Activity	Potency
Bad	-3.35	-0.79	0.50
Break	-2.44	0.73	-0.97
Burn	-2.47	0.74	-0.52
Clumsy[a]	5.13	4.20	3.57
Debt	-3.08	-0.39	0.01
Difficult	-2.11	0.13	0.88
Disease	-3.46	0.70	0.15
Enemy	-3.33	0.33	0.30
Fall	-2.06	0.22	-0.33
Fear	-1.82	0.07	-0.54
Hate	-3.11	0.11	-0.61
Kill	-3.29	0.98	-0.27
Last	-2.08	-0.93	-0.68
Leper[a]	5.53	4.40	4.03
Lizard[a]	5.03	3.60	4.17
Missing	-2.12	0.11	-0.48
Problem	-1.60	-0.43	-0.21
Rancid[a]	6.23	3.57	3.97
Terrible	-3.26	0.33	-0.26
Trouble	-2.75	0.86	-0.08

a Words drawn from the atlas of Jenkins, Russell, and Suci (1958).

STIMULUS WORDS FOR THE ACTIVITY CONDITION

Stimulus Words	High Extremity		
	Evaluative	Activity	Potency
Action	-0.37	1.43	0.23
Ball	0.43	1.40	1.06
Carry	-0.38	1.20	-0.62
Club	0.62	1.78	-0.14
Fast	-0.37	1.65	0.82
Fervid[a]	3.67	2.43	3.20
Flaming[a]	4.03	1.37	3.77
Foot[a]	3.10	1.97	4.00
Game	0.81	1.51	0.66
Grow	0.79	1.68	-0.19
Hasty[a]	4.70	1.83	3.47
Hot[a]	3.67	2.17	4.20
Hurried[a]	4.37	1.70	3.00
Party	0.61	2.10	-0.71
Play	0.29	1.85	-0.39
Pull	-0.44	1.64	0.32
Quick	-0.12	1.73	0.10
Rompin[a]	3.47	2.63	4.20
Swift[a]	2.73	1.37	2.83
Warn	-0.64	1.88	0.07

a   Words drawn from the atlas of Jenkins, Russell, and Suci (1958).

STIMULUS WORDS FOR THE ACTIVITY CONDITION

Stimulus Words	Low Extremity		
	Evaluative	Activity	Potency
Bottom[a]	4.63	5.00	2.90
Box	0.07	−1.38	0.62
Contain	0.20	−1.48	0.54
Dim[a]	4.20	5.17	4.97
Gray	−0.12	−1.60	0.15
Lagging[a]	5.57	5.90	4.43
Lie	−0.03	−3.16	−0.02
Lingering[a]	3.97	5.43	4.97
Listen	0.48	−2.09	0.03
Low	−0.25	−2.44	0.02
Obscure[a]	4.50	5.03	3.27
Plain[a]	3.50	5.23	3.47
Remain	−0.56	−1.96	−0.17
Sit	−0.15	−1.53	−0.10
Silence	0.63	−2.74	−0.06
Slack[a]	4.90	5.53	5.10
Slow	−0.66	−2.09	−0.17
Snail[a]	3.47	5.73	4.20
Somber[a]	3.63	5.47	4.17
Wall	0.24	−1.99	0.43

a   Words drawn from the atlas of Jenkins, Russell, and Suci (1958).

STIMULUS WORDS FOR THE POTENCY CONDITION

Stimulus Words	High Extremity		
	Evaluative	Activity	Potency
Army	-0.60	0.93	1.77
Admiral	0.58	0.72	1.49
Block[a]	3.67	4.17	1.57
Boulder[a]	4.17	4.97	1.13
Box[a]	3.63	4.10	1.97
Control	0.89	0.75	1.69
Develop	0.35	0.64	1.44
Duty	-1.00	-0.28	2.03
Escape	-0.84	0.95	1.80
Hard[a]	4.13	3.20	1.37
Heavy[a]	4.10	4.17	2.13
Judge	-0.65	0.63	1.80
Long[a]	3.87	4.83	2.67
Machinery	0.07	0.92	1.60
Material	0.59	-0.77	1.92
Prevent	0.49	0.82	1.63
Rigid[a]	4.33	4.03	1.43
Science	0.40	0.69	2.03
Stiff[a]	4.53	4.40	1.60
Trunk[a]	3.17	5.07	2.17

a   Words drawn from the atlas of Jenkins, Russell, and Suci (1958).

STIMULUS WORDS FOR THE POTENCY CONDITION

Stimulus Words	Low Extremity		
	Evaluative	Activity	Potency
Art	0.76	−0.34	−1.61
Born	1.01	−0.82	−1.71
Curled[a]	3.30	4.07	5.33
Downy[a]	2.87	4.67	6.20
Easy[a]	3.40	4.40	5.97
Feather[a]	2.87	4.73	6.73
Glad	1.19	0.29	−2.39
Gradual[a]	2.77	4.53	5.00
Hope	0.64	−0.58	−1.50
Little	0.11	−0.04	−1.88
Pig[a]	3.10	4.50	5.63
Pliable[a]	3.47	3.90	5.67
Poet	0.93	−0.84	−2.39
Round[a]	3.10	4.13	5.53
Small[a]	3.50	4.00	4.87
Sing	0.65	0.78	−2.38
Voice	1.08	−0.02	−1.77
Wet[a]	4.27	3.10	5.30
Wife	0.97	−0.32	−3.12
Younger	0.18	0.74	−1.82

a Words drawn from the atlas of Jenkins, Russell, and Suci (1958).

APPENDIX B

NAME_____ SEX_____ AGE _____

DON'T FORGET:

1. Use firm downward pressure on your pen.
2. Do not turn back to previous cards.
3. Write your impression of the differences between the categories when you are through with your cards.

	S	T		S	T		S	T		S	T
1	0	0	31	0	0	61	0	0	91	0	0
2	0	0	32	0	0	62	0	0	92	0	0
3	0	0	33	0	0	63	0	0	93	0	0
4	0	0	34	0	0	64	0	0	94	0	0
5	0	0	35	0	0	65	0	0	95	0	0
6	0	0	36	0	0	66	0	0	96	0	0
7	0	0	37	0	0	67	0	0	97	0	0
8	0	0	38	0	0	68	0	0	98	0	0
9	0	0	39	0	0	69	0	0	99	0	0
10	0	0	40	0	0	70	0	0	100	0	0
11	0	0	41	0	0	71	0	0	101	0	0
12	0	0	42	0	0	72	0	0	102	0	0
13	0	0	43	0	0	73	0	0	103	0	0
14	0	0	44	0	0	74	0	0	104	0	0
15	0	0	45	0	0	75	0	0	105	0	0
16	0	0	46	0	0	76	0	0	106	0	0
17	0	0	47	0	0	77	0	0	107	0	0
18	0	0	48	0	0	78	0	0	108	0	0
19	0	0	49	0	0	79	0	0	109	0	0
20	0	0	50	0	0	80	0	0	110	0	0
21	0	0	51	0	0	81	0	0	111	0	0
22	0	0	52	0	0	82	0	0	112	0	0
23	0	0	53	0	0	83	0	0	113	0	0
24	0	0	54	0	0	84	0	0	114	0	0
25	0	0	55	0	0	85	0	0	115	0	0
26	0	0	56	0	0	86	0	0	116	0	0
27	0	0	57	0	0	87	0	0	117	0	0
28	0	0	58	0	0	88	0	0	118	0	0
29	0	0	59	0	0	89	0	0	119	0	0
30	0	0	60	0	0	90	0	0	120	0	0

APPENDIX C

Instructions for Experiment

Please do not write or
mark on this paper.

This is an experiment concerned with how well people learn to
categorize words. It requires your participation in a relatively un-
complicated task which you may find interesting. To carry out the
task you will be working with a set of cards, an answer board and a
ballpoint pen. All three of these are important so carefully read the
following instructions.

The set of cards you will be using is actually made up of two
lists of words which have been mixed together at random. Your job is
to discover which words belong to list S and which to list T. You will
see that each card has one word typed on it. Your job is to go through
a set of cards, one at a time, and decide which words belong to list S
and which to list T. At first, you will be guessing whether a word is
an "S" or a "T", but in a short while you will recognize the difference
between them and from then on you will be able to categorize all the
remaining words correctly. As an example of what you are to do, con-
sider the following words and the decisions made about them:

	S	T
Lettuce	X	
Puppy		X
Potato	X	
Bear		X
Horse		X
Bush	X	
Grass	X	
Cat		X
Leaf	X	
Fur		X

As you can see, the words marked S have to do with plans, whereas the
words marked T have to do with animals.

The words you will be using will be more difficult to differenti-
ate than those of the example. Your words have been taken from lists
dealing with topics less obvious than plant or animal. Another hint:
The differences between words of list S and list T have nothing to do
with the grammatical properties of the words. That is, the words cannot
be correctly categorized on the basis of noun-verb differences, word
length, or similar things. Also, half the words in a set are "S's" and
half are "T's".

Once you have read the word and decided to which list it belongs, record your decision on the answer board sheet. There are several things about the answer sheet to remember:

1. Be sure your answer sheet goes with your set of cards.
2. Fill out the name, sex and age blanks at the top of the sheet.
3. Notice: Each card is numbered - always make sure you are in the right answer space before marking your sheet.
4. When marking your answer you must use the ballpoint pen provided for you. It is very important that you use a firm downward pressure on your pen and fill in the entire answer space. This is important because when you make a correct response, your pen will go through the paper into a hole beneath the circle. If you have made an incorrect decision, nothing will happen--you will simply make a mark on the sheet. In this way you will know immediately if your decision was or was not correct.

Once you have recorded your decision, turn to the next card, read the word, make your decision, record it, turn to the next card and so on until you have gone through the entire set. Never turn back to a card once you have passed it. In other words, no fair looking back to see how you categorized a previous word. Recall that once you have discovered the differences between the two lists you should be able to get all the following words categorized correctly.

To go through the set of cards will take about a half an hour-- but, there is no time limit so go at your own speed. When you have finished all the cards in your set, write, on the sheet of paper attached to the back of your answer board, what you feel to be the difference between the words of list S and list T. Then, return the material to me.

If you have any questions, ask them now.

APPENDIX D

RAW DATA FOR SUBJECTS IN THE EVALUATIVE CONDITION

Subject Number	Raw Data						
				Errors			
	Age	Sex	TTC	1	2	3	Time
1	19	f	21	14	0	1	15 min.
2	18	f	10	1	1	1	6 min.
3	18	f	10	1	0	3	13 min.
4	20	f	14	3	0	0	5 min.
5	18	m	17	4	0	0	7 min.
6	19	f	21	7	0	0	11 min.
7	20	m	17	7	0	1	7 min.
8	19	f	10	1	0	0	9 min.
9	19	m	13	3	0	0	10 min.
10	18	f	10	2	1	3	8 min.
11	18	f	10	1	1	0	6 min.
12	18	f	10	1	0	1	6 min.
13	19	f	11	3	0	0	12 min.
14	18	f	12	3	2	2	9 min.
15	18	f	10	2	0	0	9 min.
16	18	f	19	5	0	0	4 min.
17	18	f	10	0	0	0	11 min.
18	18	f	10	1	0	0	7 min.
19	19	f	120	18	20	16	14 min.
20	18	f	11	3	2	1	14 min.
21	19	f	14	4	2	0	13 min.
22	19	f	11	3	1	0	13 min.
23	19	f	12	3	0	1	8 min.
24	18	m	11	2	0	0	7 min.
25	18	f	10	1	0	0	5 min.
26	19	f	14	15	5	0	12 min.
27	19	f	11	4	0	0	6 min.
28	19	f	22	10	1	1	9 min.
29	19	f	11	2	0	0	9 min.
30	19	f	18	3	1	0	11 min.
31	19	f	11	2	0	0	8 min.
32	18	f	10	0	1	0	7 min.
33	18	f	10	1	0	0	6 min.
34	19	f	18	5	0	0	11 min.
35	18	f	12	3	0	0	6 min.
36	19	f	120	24	27	24	15 min.
37	19	m	10	0	6	1	13 min.
38	18	f	20	6	0	0	16 min.
39	19	f	19	2	1	0	9 min.
40	18	f	14	5	0	2	7 min.

RAW DATA FOR SUBJECTS IN THE ACTIVITY CONDITION

Subject Number	Raw Data						
				Errors			
	Age	Sex	TTC	1	2	3	Time
41	18	f	23	8	6	6	16 min.
42	19	f	82	18	16	17	12 min.
43	18	m	72	14	13	10	7 min.
44	18	f	50	17	15	16	17 min.
45	18	m	20	13	10	4	8 min.
46	18	f	28	7	4	4	16 min.
47	19	f	62	17	12	2	8 min.
48	21	m	13	5	2	1	13 min.
49	18	f	50	15	9	3	11 min.
50	18	f	27	10	4	1	13 min.
51	18	f	25	9	2	3	24 min.
52	19	f	38	14	27	19	9 min.
53	20	f	23	13	1	1	14 min.
54	18	m	39	14	2	1	14 min.
55	19	m	28	6	2	0	13 min.
56	19	f	61	16	5	0	13 min.
57	18	m	62	15	9	3	12 min.
58	18	f	44	20	0	2	8 min.
59	18	f	12	6	1	0	13 min.
60	18	m	33	17	7	5	10 min.
61	20	m	12	8	2	1	6 min.
62	18	f	105	24	18	13	16 min.
63	18	f	31	12	19	4	9 min.
64	20	f	13	8	5	4	14 min.
65	18	f	82	13	15	7	13 min.
66	18	f	10	11	20	15	8 min.
67	18	f	76	17	18	9	11 min.
68	19	f	10	5	3	0	9 min.
69	18	f	17	6	0	0	10 min.
70	18	f	12	2	0	0	10 min.
71	19	m	79	23	14	21	13 min.
72	19	m	120	18	22	22	9 min.
73	18	f	22	8	2	1	10 min.
74	18	f	22	11	3	1	12 min.
75	20	f	10	4	2	1	9 min.
76	19	f	11	11	18	15	18 min.
77	18	f	94	19	18	11	7 min.
78	18	f	21	9	2	2	11 min.
79	19	m	39	16	15	0	11 min.
80	21	f	10	3	1	0	14 min.

RAW DATA FOR SUBJECTS IN THE POTENCY CONDITION

Subject Number	Raw Data						
				Errors			
	Age	Sex	TTC	1	2	3	Time
81	18	m	47	22	9	4	15 min.
82	18	m	93	22	19	16	16 min.
83	18	f	43	16	10	5	17 min.
84	18	m	120	20	21	26	20 min.
85	19	m	17	11	2	3	8 min.
86	18	f	88	20	15	9	15 min.
87	18	f	29	20	21	18	13 min.
88	18	f	40	18	6	8	17 min.
89	18	f	27	8	5	2	11 min.
90	18	f	20	5	1	3	11 min.
91	18	f	60	15	9	10	12 min.
92	19	f	19	9	2	1	12 min.
93	19	m	25	15	15	11	18 min.
94	19	f	19	7	2	3	11 min.
95	19	m	68	15	11	15	15 min.
96	18	f	15	14	13	10	10 min.
97	19	f	21	9	3	5	11 min.
98	18	f	14	4	1	0	11 min.
99	18	f	50	14	10	12	10 min.
100	18	m	16	4	0	1	7 min.
101	19	f	33	14	4	1	8 min.
102	18	m	39	14	4	1	9 min.
103	18	f	23	4	2	1	9 min.
104	19	f	120	19	15	17	8 min.
105	25	m	35	18	4	5	7 min.
106	19	m	43	14	4	2	12 min.
107	18	f	15	9	3	6	13 min.
108	18	f	21	9	1	0	12 min.
109	19	f	50	18	7	3	13 min.
110	19	f	24	8	7	2	9 min.
111	19	f	48	16	13	16	15 min.
112	18	m	64	19	7	2	11 min.
113	19	f	39	14	3	4	19 min.
114	18	f	13	4	2	0	15 min.
115	18	f	42	15	7	8	6 min.
116	19	f	54	17	8	4	14 min.
117	18	f	24	16	12	6	11 min.
118	18	f	34	12	2	1	16 min.
119	19	f	50	18	10	9	18 min.
120	19	f	14	5	5	2	9 min.

APPENDIX E

CONCEPT IDENTIFICATION STATEMENTS

1. The S group had words connoting a positive quality while the T group had a negative connotation. Words in the S group such as music, quality, gentlemen, etc. had a favorable connotation with me, while those in the T group such as disease, burn, etc. had an unfavorable connotation.

2. The difference was a basic--good or bad. Some words were associated with nice or pleasing things and the other T, was associated with unpleasant things.

3. S words dealt mainly with goodness--an idea of being right and just. T words dealt with the badness, the other side (opposite) of S words. Something bad, unclean could be connected with them.

4. S = good things--things I related to with a positive attitude.
   T = negative--things I react negatively to.

5. The difference was in our conception of what is essentially good and bad. We think right away that a lizard or a disease is bad and associate them as such. Church, music, and unity are associated with good thoughts.

6. S words signified a good meaning as opposed to the T words which had a bad meaning. Good-bad; wise, knowledge, gentlemen as opposed to terrible, rancid, disease.

7. Group S were "pleasant" words in our society--ideals of christianity or Puritan ethic--things to seek out. Group T were "unpleasant" words in the same sense--things to shy away from in our culture.

8. The words in list S are all words that mean something good at least to the American way of thinking. In list T are all of the things that people try to stay away from or those things which are usually thought of as being bad.

9. The words in the S group meant that they were good. Words in the T group meant bad or sometimes hate.

10. I think that the difference between the two is the S is good and T is bad.

11. The words in the S group were what a person would call desirable qualities. They were all things that would be acceptable. In the T group, the words were of a nature of distaste. They were un-

pleasant words, words associated with bad or undesirable qualities or things.

12. The words in the T group all dealt with ideas or concepts which society seems to shun away from such as leper, hate, trouble. The words in the S group all dealt with ideas or concepts which society likes such as good, gentlemen or church. The words were entirely different and were on the grounds of T evil--S good.

13. T words expressed that which is good or satisfying. S words expressed that which seemed bad or uneasy.

14. The first set is all the things that I am familiar with in every-day life. I understand them. The other words are words that seem unpleasurable or that I may not understand, as leper, since I have never been a leper.

15. The words in the first list had a good connotation. For example, religion, church, right, graceful. The words in the T list, though, were things that were distasteful. This included lizards, break, last, and problem. The words in the first list appealed to me and those in the second generally did not.

16. The difference that separates group T from group S is that group S is connected with pleasant or positive words and the other group (T) is associated with negative or undesirable words--for example

S	T
home	hate
good	bad

17. Column S: things which have represented good qualities of people and life in general. Column T: things which typify persons with unwanted traits or things of unwanted behavior.

18. The words in the S group had to do with either abstract words or concrete things that had a connotation of being good, right, or something that one would normally have no fear of. They leave one with a sort of "comfortable" feeling as opposed to feeling uneasy. The words in the T group had a connotation of something bad or fearful such as the names of animals. Also the adjectives could be used to describe an unpleasant situation. They arouse a feeling of defense against what they stand for.

19. The words are compared with how people see the different things in life such as your thoughts on religion and what enemies are. It is more of the new views than of maybe 5 or 10 years ago.

20. The difference to me seems to be between words that connote some-
    thing good or that bring about unpleasant thoughts or that is right
    compared to things that are bad, or aren't good and that makes one
    think of unpleasant things in relation to the word.

21. S words had favorable connotations and expressed good ideas and
    actions which are favored in society. T words had unplesant con-
    notations and expressed evil ideas and actions which are frowned
    on by society.

22. S words were associated with pleasant or good things, T words with
    unpleasant or bad things.

23. The S words seemed to be those that had a positive connotation or
    at least a neutral one. They called forth pleasant images and
    feelings or else very little emotion at all. The T words seemed
    to have very definite negative meanings, reminding one of something
    bad or unpleasant.

24. S indicated positive thoughts--happy, success, sunlight, pleasant
    situations. T indicated negative or unpleasant thoughts--fear,
    unpleasant things, leper.

25. The differences of the words were: S words associated with good-
    ness or positive connotations. T negative words with meanings
    associated with what is bad.

26. The S words seem to be those which have pleasant connotations and
    the T words those which have unpleasant connotations.

27. The difference between group T and S was that one group, S, was
    composed of desirables--usually having to do with moral, cultural
    and ethical words whereas the T group was the opposite--undesirables.

28. The S's were words that implied good feelings or responses.
    The T's were words that implied bad feelings or responses.

29. These words seem to have the two opposing ideas of good vs. evil
    and of good and bad.

30. To me the words belonging in the S column related to something
    socially accepted as a way of life. (positive) Home, faith, etc.
    The second column was made up of words which seemed to take on a
    negative connotation, or less acceptable situations and less liked.
    To break, bad, lizard (people don't usually like or are afraid of
    them), etc.

31. The words in the S group were words associated with good, beautiful or something like utopia. The T group were words associated with the concept of bad, somethings we look down upon and fear.

32. The S group represented concepts and physical things that could be categorized as good. The T group are those things generally thought to be bad or unpleasant (lizard) in some manner.

33. The difference between the S and T groups was that the words falling under the T group denoted evil and fault and those under the S group goodness and innocence.

34. S: all words that I have good associations with. T: words I have bad associations with.

35. In the S group, the words had a quality of "goodness" or appeal but in the T group the words seem to represent something unappealing or some sort of trouble.

36. The word association to me, at first, was vague but as I continued, I came to the conclusion that the column under S was action words and column T named places - nouns.

37. The words in the T group are unpleasant words in that they express a wrong or harmful doing. Those in the S are pleasant words.

38. I think that the T was for things bad, etc. The S side was good, nice things.

39. Column S are words related to those things in which man finds security and happiness. Column T are words that relate to man's fear and discomfort.

40. The words in the S group would be classified in a group as "good" words. The words in the T group would be classified more as "bad" words.

41. The words in the S group seemed to be words showing action, while the T group was made up of passive words.

42. The words in the T group had a concrete meaning, whereas the ones in the S group were abstract in meaning. Many of the words that were nouns had a specific meaning like the word ball, whereas many of the words like soft or dim could have various implications.

43. Group S had violent words; "flaming", "fire", etc. Group T had more serious words, thoughtful words like "somber", etc.

44. I haven't the foggiest.

45. In my opinion, the words in the S group represented exciting, fast moving things or action whereas the T group represented the non-exciting, mild nonaggressive way.

46. The words in the S seemed more active, to show more action. The words in the T group seemed more passive. A lot of them were inanimate objects like box, chair, etc.

47. The words in the S group had to do with anything active, exciting, or fun to do. Every word in the group caused motion. The words in the T group were more or less quiet words. They involved no action whatsoever, everything was somewhat slowed down.

48. This group of words had to do with relations between objects, actions, descriptions; being classified as words either in the fast category or the slower category not always literally, but in connotation also.

49. The words in group S had to do with action, movement, and sports. Some of the words were sports equipment, fire, engine. The words in T had to do with movement of a different kind—sitting, chair, and associations like that. I also thought of light—they used words like bright, dim, and grey.

50. List S seems to contain words associated with action or describing a strong emotion while list T has words associated with calm, quiet, in other words, nonaction words.

51. The S group words involved with action, movement, and communication. The T group were more "silent" words requiring less action—they seemed kind of slow, and some were opposites of words marked in the S group.

52. The differences in the words were mainly that one would be a describing word (soft), the next a definite name (party) or one would be action (lie).

53. If one were to draw a line dividing the words into two categories, I would place all the S words in a red category denoting action or anything that can bring action—the words could represent excitement. The next category T gray, denotes not action, but silence—quiet, peace—little or no action. But many of the words did not actually portray action taking place, i.e., dim, but it evoked a response which quieted the emotions.

54. S words: these words were mostly action words. They denote movement, activity, severity. T words: these words were more conservative. They denote passiveness, easyness, slowness.

55. The difference was perhaps the feeling the word gave you. The words in the S group were related to more intense motion than were the T group.

56. The S words all related to action, dangerous, motion: fire engine, play, game (or things which include action). The T words related to little or no action, "resting" meanings such as lie, lagging--nothing of significant motion.

57. Seemingly the difference was between something doing with action or non-action. Motion and motionless.

58. Anything that showed action was S-or high emotion. The things that were slow or showed no action were T= in a remaining state of condition.

59. The T's were words that had anything to do with being still, quiet, subdued, etc. S's were action words or which showed stronger emotions.

60. I think the difference was that the T words showed some sort of action or movement whereas the other words, the S words, show lack of action or pertained to objects incapable of movement.

61. Quick action.

62. The S words were followed by words that could pertain to them--would modify them. They seemed to be related to more violet situations and the T words were related to more tranquil situations.

63. T seemed to include words of a passive, quiet, conservative, sedentary nature. S seemed to include bold careless action words.

64. The words in list S were words of action, mostly about fire. The words in list T were words of no action--reminded me of something that would take place at a funeral--silence, etc.

65. S words seemed to all involve some applying of an energy for movement. T words were different from S words and I didn't notice any constant relation between them.

66. Some were games and some were house articles. Some were toys and some words meaning stay and dim. Some were animal and some were action words.

67. The most common or evident thing in these words is that the calm words and the abstract words were classified in list T. The other words were fast concrete words classified under S.

68. List S: the words had to do with movement, fast movement words which were warm or exciting. List T: words which indicated slow movement or no movement words which were cold or unmoving.

69. S's more action or aggression. T's more stable or slower.

70. The words in group S had to do with some kind of action. The ones in group T were more inactive words--they were "quiet" words.

71. There would be a few words in sequence that would have similar dealings (such as words dealing with position) then the sequence would change to words dealing with something else. The variation of the words with each dealing were sometimes hard to find. Often the words could be associated in one way, but the answer would not punch through to be true, so the word had to be accepted in a different way.

72. The words in group T had to do with actions. Either in doing the action or the effect of the action. The words in group S had to do with a group or organization. They also pertained to significant action in the group.

73. The words in the S group are involving some form of action usually quick action. The words in the T group involve very little action and some involve none at all. They are stationary words and things in the T group while in the S group the words are concerned with some kind of motion. The S group words are associated to "fast" and the T group words are associated to "slow".

74. The S group was more active and intense while the T group was not as colorful with not as much movement.

75. In the S group the words expressed action either within the word or a word such as flame that expresses a warm color. In the T group the words expressed a relaxed action or slow moving.

76. I honestly couldn't find any differences. At first I thought it might be that one category was an object and the other wasn't but that didn't prove to be true. Then I thought it could be that one had to do something with fire, but I couldn't find the real category.

77. The cards seem to have some relevance with action and inanimate objects, however, not all the answers were constant in those terms-- I'm not sure.

78. The words in group S related to speed, action, and movement. The words in group T related to much more sedate, quiet things. T seemed to denote slower, more unimpulsive things.

79. S group showed relation between games, action, movement. T group showed relation between opposite as S--slow, no action, permanent things, dull.

80. The words in the S group had to do with speed and forcefulness, while the words in the T group were concerned with slowness and were somber.

81. I think the S group would be compared to a control factor. It was the authoritive condition, hard, like and army, judge, etc. The T group was the variable factor. It seemed that everything on it could be changed easily. They weren't solid conditions. Puppies into dogs, younger into older, woman is always changing, youngster into adult and so on.

82. The ones in S seem to be related to humans and conditions and actions of them. In T things such as art and food which man name.

83. The S group is primarily to do with nature and not easily defined or solid. Primarily inborn. The T group deals with tangible solid things that have been learned, catagorized, or labeled or developed by man for necessities.

84. I really feel stupid. It seemed like every time I find some relationship it wouldn't follow threw. I couldn't find a relationship.

85. S was to me a man, strong in stature. A mans world. T showed a delicate person, a woman perhaps, or a child.

86. The difference between column S and T is: S relates to all the jobs and characteristics related to a woman.

87. The difference between the T group and the S group, was that the T group dealt with non-animate things, where it was the opposite in the S group.

88. S: words of solid material - have nothing to do with feelings, etc.
    T: soft, meaningful words, pertained to feelings.

89. The words in the T group seemed to be more gentle having an idea of softness and warmth behind them. The words in the S group seemed to be more harsh having an idea of roughness behind them.

90.   The words of the T group were soft, pleasant, almost romantic.
      The words of the S group were not quite so appealing, they were
      harsher words.

91.   The T words seem to have solid objects or descriptions, they relate
      to each other in uses like block, material science. The S words
      are descriptions.

92.   The words in the S group were hard, immovable type things and the
      T group were soft pretty-like things.

93.   The S words to me seemed to be related to war or a life in the
      service and the T group seemed to be more related to civilian life
      or home life.

94.   The words in the S group dealt with harder, colder things. Words
      in the T group dealt with warmer, more emotional things. T appeal-
      ed more to the emotions than S.

95.   S had to do with hard or solid objects and things, while T had to
      do with soft, pliable, or feminine things or objects.

96.   The words in the T group consist of nouns and adjectives of living
      things, while the S group consists of nouns and adjectives that
      apply to non-living things.

97.   The ones in the S column have the connotation of a male - stronger
      words. The ones in the T column are words associated with the
      female. It's not only words that have to do with their jobs but
      also more fiminine or masculine sounding words.

98.   The main difference between the two lists was the kinds of feeling
      the different lists created in me. The S column created a good
      feeling. In column S I associated the words with a rigid, strict,
      unemotional, materialistic feeling whereas column T seemed to be
      flighty, free and emotional.

99.   The T group dealt with motherly and wife situations while the S
      group's concern was in more scientific and logic things.

100. It's kinda a funny experiment, I had a little trouble at first but
      soon they became so easy a person most likely would get bored with
      punching those little holes. The reason I say it was funny cause
      after I caught on I didn't miss many but I still didn't quite under-
      stand what was the actual difference. It seemed more like a reflex
      than actually saying "Now what is the difference between science
      and wife?" As close as I can say the reason I marked one a certain
      way and another different was that one seemed masculine and the other

feminine. Not meaning that a poet is undersexed and not a man, but poet seems less masculine than admiral, etc.

101. Hard-soft.

102. The T side seemed to do with home life while the other with a harder life outside the home.

103. S words represent coarse, objective, solid, cold thoughts, where T words held soft, warm, free, aesthetic connotations. (Machinery, army, statue vs. wife, puppies, poet)

104. The difference was: S was not alive, a texture. T was a human, a feeling.

105. My test had to do with the difference between authority and pleasantness. Words such as army was authority words such as woman was pleasant.

106. The T words seemed to all have a softer, nicer meaning to them. Words such as poet or born. This was contrasted by the S words whose meanings were harsh and more materialistic such as machinery or judge.

107. S seemed to have to do with the service. T was a family or the art of being in a family. Art of anything.

108. S: stiff, hard type objects. T: round type objects, soft, or words such as hope which are associated with happy feelings.

109. T: pleasant things in life; family. S: careless, anything unpleasant. Those outside the family. Society.

110. The S words were those words people generally associate with man, whereas the T words were those words associated with a woman. S words were harsh sounding. T words were soft sounding.

111. I couldn't find any strong differences unless it would be something physical and living vs. emotions and unliving objects.

112. S: These were things that could be associated with dull things, rough things, inanimate objects. T: Associated with different kinds of people and words describing them. The main difference is that S associates with inanimate objects and words that would describe them and T associates with animate objects (people) and words describing them.

113. The S words seemed to be harsh, more realistic ideas. The T words were ideas of more aesthetic things in life.

114. The T words were pleasant words connecting home, family, and happy things which bring back memories and stimulate nice thoughts. The S words were more harsh and brought thoughts of war and power. They also gave a depressed feeling.

115. T: pleasant, easy (family, little etc.) S: rugged, hard (boulder, army etc.)

116. It was hard to determine but I think it was that the S's were masculine in gender and the T's were feminine.

117. One of the categories applies to humans - or animals, the other applied to machinery and other things in life.

118. I believe S had to do with paternalistic qualities: such as duty, war etc. They were qualities some of which had neurotic tendencies such as escape. T's were aesthetic qualities and those dealing with life, security, and happiness.

119. T group are moveable objects. S group are non-moveable objects. (I don't think I ever figured it out right.)

120. The S group delt with rigid, un-moving objects often times dealing with or connected with authority, whereas the T group delt with casual "homey" objects and ideas, objects of leisure and pleasure.

APPENDIX F

RATINGS OF CONCEPT MASTERY

Subject Number	Raters			
	1	2	3	4
1	3	5	4	4
2	5	5	4	5
3	5	5	4	5
4	4	4	5	5
5	5	5	5	5
6	5	5	5	5
7	3	5	3	5
8	5	5	4	5
9	5	5	4	5
10	5	5	5	5
11	3	4	5	5
12	4	5	4	5
13	5	5	5	5
14	2	2	3	2
15	4	4	3	5
16	4	4	4	5
17	3	4	3	4
18	5	4	3	5
19	1	1	1	1
20	5	5	5	5
21	4	5	4	5
22	5	5	5	5
23	4	5	4	4
24	4	4	4	5
25	5	5	5	5
26	3	5	4	5
27	4	4	4	4
28	5	5	4	5
29	5	5	5	5
30	4	4	3	5
31	5	5	5	5
32	5	5	5	5
33	4	5	3	5
34	5	5	5	5
35	4	4	3	5
36	1	1	1	1
37	4	5	2	5
38	5	5	5	5
39	2	4	2	4
40	5	5	5	5

RATINGS OF CONCEPT MASTERY

Subject Number	Raters			
	1	2	3	4
41	5	5	5	5
42	1	2	1	1
43	2	2	2	4
44	1	1	1	1
45	4	4	4	5
46	5	5	5	5
47	5	5	4	5
48	5	5	3	5
49	3	3	2	3
50	5	5	3	5
51	5	4	2	5
52	1	2	2	1
53	5	4	4	5
54	5	5	5	5
55	4	3	1	3
56	5	4	4	5
57	5	5	4	5
58	5	4	3	5
59	5	4	4	5
60	5	5	4	5
61	2	2	3	5
62	3	3	4	5
63	5	5	3	5
64	5	4	2	5
65	2	3	2	3
66	2	2	1	1
67	5	3	5	4
68	5	5	4	5
69	5	5	4	5
70	5	4	5	5
71	1	1	1	1
72	2	1	2	3
73	5	5	4	5
74	4	4	3	4
75	5	4	3	5
76	1	1	1	1
77	2	3	2	2
78	5	5	3	5
79	5	5	2	5
80	5	5	3	5

RATINGS OF CONCEPT MASTERY

Subject Number	Raters			
	1	2	3	4
81	2	2	2	4
82	1	1	1	1
83	2	1	1	3
84	1	1	1	1
85	4	4	2	4
86	2	2	1	3
87	1	1	1	1
88	4	3	1	5
89	5	5	3	4
90	5	5	4	4
91	2	1	1	3
92	5	5	5	5
93	1	3	2	3
94	4	4	3	4
95	5	5	3	5
96	1	1	1	1
97	4	4	1	4
98	2	3	1	2
99	2	2	1	2
100	3	2	2	3
101	5	5	5	5
102	2	2	2	3
103	5	4	3	5
104	1	2	1	1
105	3	2	2	1
106	4	4	3	4
107	1	2	1	3
108	5	5	4	5
109	1	2	2	1
110	5	4	2	4
111	1	2	1	1
112	1	1	1	1
113	2	3	1	1
114	2	3	2	2
115	3	3	3	4
116	1	3	1	3
117	1	1	1	1
118	2	2	1	1
119	1	1	1	1
120	3	2	2	2