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## Intentional and Incidental Concept Formation as a Function of Conceptual Structure, Information, Intelligence, and Authoritarianism

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Intentional and Incidental Concept Formation as  
a Function of Conceptual Structure,  
Information, Intelligence, and  
Authoritarianism

by

David J. Marx

A Thesis Submitted to the Faculty of the Graduate School  
of Loyola University in Partial Fulfillment of  
the Requirements for the Degree of  
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## Vita

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## Abstract

3 groups of 48 female high school students were presented with varying amounts of input stimuli (6, 8, or 10 nouns) in an intentional concept-formation task, and were later tested for recall of incidental stimuli and identification of incidental concepts. Subjects within each group were divided into 3rds for information-processing ability from Schroder's Paragraph Completion Test, for authoritarianism from the California F Scale, and for intelligence from the SRA High School Placement Test. Analysis on each dependent variable included: (a) 3 two-way analyses of variance for information and conceptual level, or authoritarianism, or intelligence, (b) 2 analyses of covariance between input and cognitive complexity or authoritarianism with intelligence as covariate, and (c) 2 analyses of covariance for input and authoritarianism or intelligence with complexity as covariate. Major results were: (a) no significant effects for integrative complexity, (b) low authoritarian persons performed better than other persons on the incidental task, with no differences on the intentional task, (c) intelligence had an effect on both types of learning, (d) a curvilinear relationship exists between quantity of relevant information and performance on the intentional task, and (e) added irrelevant material decreased incidental concept formation. The validity of Schroder's test was questioned; the suggestions that cognitive style affects processing of incidental stimuli, and that excessive input loads may cause a "jamming" of information systems were proposed.

Intentional and Incidental Concept Formation as  
a Function of Conceptual Structure,  
Information, Intelligence, and  
Authoritarianism

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The phenomenon of incidental learning involves the basic principles of selective discrimination and the immediate storage of environmental information. Experimental exploration in this area has concentrated mainly on individual capabilities and response dispositions while ignoring the principles of response integration and associative strength. Specifically, conditions limiting an individual's response in a learning situation and the analysis of memory without the mobilization of instrumental acts have received widespread attention. Extensive explanations employ the concepts of differential cue-producing responses (Postman, 1964) and the omission of appropriate representational responses during stimulus presentation (Deese, 1964).

The distinction between intentional and incidental learning lacks precise formulation due to the vagueness of

the operational definition for incidental learning. Initially, early investigators (Postman & Senders, 1946; Underwood & Schulz, 1960) explained differences on the basis of set or an apparent state of subject preparedness. However, McGuigan (1958) discovered that "incidental" subjects often maintained an awareness of irrelevant cues through self-instructions or from characteristics of the presented material (McGeoch & Irion, 1952). In addition, Altra (1960) openly questioned the existence of "learning without awareness". As a result, operational procedures sustained revisions with Postman (1964) eventually concluding that incidental learning occurs by means of instructional stimuli only. Consequently, intentional learning is that type of learning occurring when subjects are explicitly instructed to note or memorize relevant stimuli. In contrast, incidental learning is operationally defined as that learning which occurs without specific designations to learn predetermined material.

A thorough analysis of experimental evidence disclosed that several methodological difficulties exist in this area of investigation. Despite these complications, current research attempts to formulate appropriate explanatory concepts and to discover the functional properties of relevant variables. With regard to the former purpose, Tresselt and Mayzner (1960) and Mechanic (1962) supported Postman's hypothesis that incidental learning increases with the number of differential

responses evoked by the stimulus. In the same realm, Mechanic (1962) proposed that performance of the intentional task interferes with incidental learning because of task competition; and Miller and Lakso (1964) and Wray (1967) suggested that attention on material affects incidental learning with further clarification by Gutjahr (1958) that retention is not dependent upon intention to learn but upon sensory attention. Furthermore, Eagle and Leiter (1964) stated that intention to learn was only significant in that it generated adequate learning operations; and Quartermain and Scott (1960) concluded that relevance of material to the achievement of specified goals determines the type of stimuli incidentally learned.

Silverstein (1964) discovered that associations emitted by intentional subjects were less conventional than those of incidental participants, while Dornbush and Winnick (1967) found that intentional learners actually employ more representational responses. In addition, Postman and Phillips (1954), Goldstein and Solomon (1955), Postman and Adams (1960), and Tatz (1960) have suggested that intentional and incidental learning are mediated by identical symbolic processes. Schneider and Kintz (1967) defined this process more precisely as one involving instruction stimuli, an orienting task, and attention. In contrast, Rosenberg (1962) disconfirmed the hypothesis that incidental learning occurs through generalization of instructional stimuli or set (Dey, 1965); while Mayzner and Tresselt

(1962) demonstrated the effectiveness of high associative strength and small S-R distance upon recall in "incidental" tasks.

Mechanic (1962) and Mechanic and D'Andrea (1966) disclosed that incidental learning increased as a function of the hypothesized number of pronounced replies demanded by the orienting task; and Mechanic and Mechanic (1967) proposed equivalence between incidental and intentional learning when the task elicited pronouncing responses. Mechanic also described incidental learning as a more "selective" process in that such learners respond to fewer stimuli. Burnstein (1960) likewise discussed both types of learning as a function of selection processes.

Finally, Restle and Emmerich (1966) stated that short-term memory was the product of active recoding and Scandura and Roughead (1966) revealed that the quantity of recalled nouns was dependent upon recoding cues. Sommers (1967) supported the limited capacity hypothesis (Murdock, 1965) for both conditions of learning. This position states that individuals possess a limited capacity for immediate recall of information learned in a specified time period. This result may occur due to limitations placed on the rate of processing information.

Another aim of recent research is to examine the functional properties of various factors, particularly subject variables, upon incidental learning. Amster (1966) concluded that

older children perform better than younger children and that irrelevant cues inhibit learning. Contrary to past experimentation, Greenwald and Sakumura (1967) disclosed that an individual's attitude does not affect the learning of propagandistic information in an incidental nor an intentional learning situation. Cohen (1966) noted that incidental learning was related to sex difference and to certain personality traits; while Paradowski (1967) established that curiosity significantly increased both types of learning.

Plenderleith and Postman (1956) indicated that (1) the ability of the individual to attend to multiple phases of the information input and (2) the availability of differential responses to presented stimuli possess a direct relationship to success in incidental learning. Wide intersubject variations in this learning condition exist since several individuals fail to employ their differentiating and integrating abilities upon input material. Hence only readily available differential responses are often emitted (McLaughlin, 1965) with personal response habits mainly designating the pattern of selectivity (Postman, Adams, & Phillips, 1955). Mechanic (1962) and Laughlin (1967) revealed no significant relationship between intelligence and amount of incidental learning. Silverman and Blitz (1956) confirmed the postulation that increased motivation decreases incidental learning with Easterbrook (1959) explaining these results on the basis of restricted cue utilization.

Finally, Laughlin (1967) indicated that creativity and incidental learning involve the identical process consisting of the formation, retention, and utilization of remote associations. Laughlin, Doherty, and Dunn (1968) replicated these findings with the additional discovery that both types of learning increased as a function of intelligence with high school students as subjects. Consequently, the purpose of the present report was to analyze the role of intelligence and other subject and task characteristics in intentional and incidental learning. Specifically, the effects of the cognitive structure of the individual and his level of authoritarianism with varying amounts of input load upon an intentional and incidental concept formation task were examined.

According to the theoretical exposition posited by Schroder, Driver, and Streufert (1967), individuals process information through divergent systems under different situations and each person employs individualistic processing approaches under identical conditions. These differences exist since each person possesses a different conceptual structure, a system of mediating links denoting the method employed in the acquisition, storage, processing, and transmission of information. These authors are not interested in the content of material, but with the organization of input data. Consequently, the integrative complexity of the conceptual structure refers to the number of unique dimensions along which input information is

differentiated and the number and interrelatedness of combinatory schemata employed in the organization of environmental and self-generated information.

Individuals maintaining a low integrative index employ few dimensions of information and demonstrate a relatively static hierarchical form of integration among few or fixed schemata or rules. In addition, a concrete structure demands comparative certainty, possesses a determinate character, and eliminates conflicts of choice. All rules of integration are subject to precise designations and all elements of ambiguity are immediately eliminated. Low conceptual-level individuals are less adaptable to environmental needs and exhibit the tendency to refer a stimulus to the same category once a decision has been formulated (Schroder et al., 1967). These persons also demonstrate low comprehension capabilities (Brown, 1965), an omission of information for less critical elements of the environment (Suedfeld & Streufert, 1966), and a lack of search for novel information (Suedfeld & Streufert, 1966) or for information in general with imposed explicit costs (Stager & Kennedy, 1965). Lastly, low conceptual level members manifest less activity in their "searching behavior" (Karlins & Lamm, 1967) and a tendency to simplify and structure their environment (Stager, 1967).

In contrast, highly complex individuals effectively adapt to complex, variable environments; delineate between several



systematically related alternatives; and develop through current conditions superordinate schemata for information organization (Schroder & Harvey, 1963). Comprehension and the ability to cope with diversity and conflict is high together with the desire for assimilating additional information (Schroder et al., 1967). Tolerance for ambiguity and uncertainty with minimum attempts at reduction (Sieber & Lanzetta, 1964) and extensive evaluation and integration of discrepant information characterize abstract individuals. In the same realm, high conceptual structures permit multiple discriminations of input along several dimensions and the incorporation of various perspectives when processing discrepant units of information (Karlins & Lamm, 1967).

Research has demonstrated that conceptually complex subjects are more information oriented; and therefore, process more information in any situation (Schroder, Driver, & Streufert, 1965). Streufert and Schroder (1965) substantiated Schroder and his associates' postulated inverted U curve for the handling of information (Schroder et al., 1967) with additional clarification by Streufert and Driver (1965) and Streufert and Schroder (1965) that different cognitive structures display varying levels of this basic function. Streufert, Suedfeld, and Driver (1965) showed that increased information loads did not significantly affect searching behavior; and Suedfeld and Hagen (1966) found that highly integrative individuals process

complex information more effectively than low-level individuals. Employing these concepts, our initial predictions were that conceptually complex subjects would perform better on the incidental concept formation task than low-complex subjects; and that since both levels of complexity display similar abilities in processing relevant cues, no significant differences should occur in the amount of intentional learning.

Ignoring the environmental properties of information diversity and rate of information change, experimentation has demonstrated that degree of information load rates as a prime factor in the prediction of task performance. This is exemplified by the fact that overly simple levels of input fail to present sufficient units of information for integration, while excessive loads inhibit such activity. In the area of concept identification, Denny and Gamlin (1965) disclosed that concept-formation proficiency is highly dependent upon input factors while other researchers (Garner, 1962) have indicated that the form and the amount of redundant information significantly affect an individual's level of performance.

The prominence of stimulus redundancy was originally established in the area of communication by Newman and Gerstman (1952) and Chapanis (1954). Research by Rappaport (1957) illustrated that relevant stimulus redundancy even facilitated the discrimination of visual forms with simultaneous background noise; and Bourne and Haygood (1961) discovered the same effect

want redundancy in a concept-formation task eliminating elements of irrelevant information. This conclusion underpins the hypothesis when Haygood and Bourne (1964) replicated these findings in the presence of irrelevant information; and further demonstrated that increasing amounts of irrelevant information progressively degraded performance.

This latter hypothesis has received several confirmations (e.g., Bourne, & Brown, 1955; Bourne, 1957; Bourne & Pendleton, 1967; Keele & Archer, 1967) and further clarifications.

Keane and Archer (1962) noted that problem difficulty increased linearly as irrelevant dimensions increased and therefore that the quantity of errors and time to achieve criterion performance similarly increase (Rasmussen & Archer, 1961). Byers and Jackson (1968) stated that the addition of irrelevant information increased complexity but produced only nonsignificant performance decrements. Trabasso (1963) predicted that removal of irrelevant cues would assist learning and Wolfgang (1967) questioned the assumption that learning rate decreases with increased quantities of irrelevant input except when partners are permitted free interaction. Kirloskar and Parameswaran (1967) indicated that irrelevant factors may have differential effects on concept formation; and Haygood and Stevenson (1967) demonstrated that the usual rate of linear decrement is greater as complexity increases. Finally, Simon and Jackson (1968) replicated the observation response with an observation stimulus

and found that the relevant observation stimulus aided performance, while irrelevant material retarded learning.

Bourne and Haygood (1959) explained these findings by noting that learning rate depends on the quantity of both relevant and irrelevant information. Redundant relevant material assists concept identification by providing the individual access to an increased supply of cues to identify stimuli correctly. In contrast, redundant irrelevant information increases the saliency of irrelevant cues and consequently retards individual attainments. Walker and Bourne (1961) clarified the two uses of the concept "redundancy" by emphasizing that one demands that the subject employ additional information in the classification of material, while the other permits the participant to use any one of several relevant dimensions to categorize stimuli.

By incorporating this latter usage with the comment by Winnick and Wasserman (1959) that variation in irrelevant material affects incidental learning and through extension of conclusions concerning stimulus dimensions to the actual amount of exemplars of a concept, the predictions for this report were formulated. Since instructions focused the subject's attention on the intentional task, examples of this concept were considered as relevant information and all other stimuli as irrelevant material. Consequently, the hypothesis was that as the list of relevant intentional nouns increased, performance would

increase. In contrast, the prediction for incidental learning was a linear decrement in performance for the same lists since in the incidental concept-formation task, all intentional concept words would be processed as irrelevant information.

Regarding the third variable, authoritarianism has been explained in terms of cognitive style. Adorno and his associates (1950) postulated that high authoritarianism may be characterized by rigidity in thinking. This suggests that representative individuals will function less effectively when certain cognitive shifts are required, when novel cognitive material is displayed, and when ambiguity exists in the task situation (Brown, 1965). In the initial position, Rokeach (1948) found a positive relationship between authoritarianism and inability to shift from an established "set" in solving a numerical problem. Brown (1953) managed to repeat these results for ego-involved subjects; and Jackson, Messick, and Solley (1957) discovered an identical association; however, they explained their results as reflecting acquiescence both in the F scores and the measures of rigidity.

Research analyzing the relationship between authoritarianism and tolerance of ambiguity has not been conclusive (Davids, 1956; Kenny and Ginsberg, 1958); however, Milton's (1957) experiment clearly differentiated between the two entities of "intolerance of ambiguity" and "rigidity" in a novel perceptual task. White and Harvey (1965) attempted to

demonstrate that individuals scoring high on the F Scale are generally more concrete; and consequently, less tolerant of uncertainty and ambiguity. Harvey (1963) summarized his research on authoritarianism (Harvey & Rutherford, 1958; Harvey & Beverly, 1961; Harvey, 1962) and generally concluded that high authoritative people form concepts of novel stimuli more quickly in comparison to low authoritative persons, that "highs" ward off changes in their formulated concepts, and demonstrate less discrimination on concepts of central significance to the individual.

In recent experimentation, several investigators have noted that generally individuals scoring high on the California F Scale demonstrate characteristics of a simple cognitive structure. Likewise, subjects rating low on the Authoritarianism Scale display rather complex information-processing behavior. However, as indicated by Schroder and his associates (1967), this relationship has not been conclusively explicated; and therefore, one of the goals of this project was to reanalyze the correspondence between these two entities. Similarly, the hypothesis was that low authoritative individuals would perform better on the incidental-learning task than persons ranking high on the Authoritarianism Scale and that no differences would occur on the intentional concept-formation task.

Finally, the investigators predicted that performance on incidental concept formation would not be related to degrees

of intelligence but that differences would be significant with analysis of covariance employing level of cognitive complexity as the covariate. No interactions between authoritarianism and information load were hypothesized. However, predictions for an interaction between degree of cognitive structure and information input were formulated.

#### Method

Subjects. The subjects were 144 female seniors from Aquinas High School, a non-coeducational institution. Three groups of 48 participants were randomly composed and were randomly assigned to one of three experimental treatments. Regular homeroom teachers administered the California F Scale and Schroder's Paragraph Completion Test in one session to eliminate testing bias; and the experimenter, introduced simply as from Loyola University, administered the concept-formation task on a different day in the same homeroom. Subjects were not aware that the two sessions were related.

Task. The stimuli employed in the intentional and incidental concept-learning tasks were adopted from Underwood and Richardson's (1956) article. These authors attempted to develop standardized test materials for incorporation in verbal concept-formation studies by determining the frequency of response tendencies to common verbal stimuli. All stimuli were

nouns; and all responses were restricted to sense impressions only, for example, cold, small, or sharp. The percentage of college participants replying with a particular one-word association to a singly-presented stimulus was considered an index of the associative strength of the response to the stimulus noun.

For the first level of input complexity, the task materials were identical to those employed by Laughlin (1967). Ten sets of six nouns each were composed with four words in each set exemplifying the same concept, designated for the intentional concept-formation task. This meant that all four words emitted the same associative response in a high percentage of subjects in the Underwood and Richardson study. For example, subjects responded with the term sharp when presented with the four words knife, hatchet, fang, and tack. Thus these nouns were considered exemplars of the concept sharp. The other two words in each set also represented a concept. This concept was totally unrelated to the first one and was designated for the incidental concept-formation task.

For the second level of information input (eight words per list) and for the third level of input complexity (ten words per list), additional intentional concept words, acquired from Underwood and Richardson, were randomly inserted into the basic list of six nouns used for the first level. All task words were randomly arranged within each set; and all ten sets were



randomly arranged for each trial. Sequences, however, remained constant over the various levels of information; and all incidental concept words were identical for all three conditions. The ten sets of six, eight, and ten stimulus words (four, six, or eight for the intentional concept-formation task and the two words for the incidental concept-formation task) are presented in table 1.

Table 1

Stimulus Words for Intentional and Incidental  
Concept-Learning Tasks

Set	Intentional Concept	Incidental Concept	Set	Intentional Concept	Incidental Concept
1	(Smelly) <u>First Level</u> ammonia(88) manure(83) garbage(80) skunk(78)	(Cold) frost(54) icicle(45)	6	(Round) <u>First Level</u> globe(95) wheel(94) spool(74) baseball(70)	(Sour) vinegar(68) sauerkraut(41)
	<u>Second Level</u> formaldehyde(81) sewer(61)			<u>Second Level</u> barrel(72) button(61)	
	<u>Third Level</u> ether(70) turpentine(67)			<u>Third Level</u> dome(70) balloon(55)	
2	(Green) <u>First Level</u> spinach(90) grass(88) ivy(83) lawn(77)	(Spicy) ginger(40) clove(32)	7	(Dark) <u>First Level</u> night(90) dungeon(67) closet(64) tunnel(54)	(Slimy) eel(68) lizard(51)
	<u>Second Level</u> moss(52) pine tree(25)			<u>Second Level</u> cave(66) alley(49)	
	<u>Third Level</u> grasshopper(55) seaweed(49)			<u>Third Level</u> hallway(16) forest(14)	
3	(Red) <u>First Level</u> blush(96) beet(87) cherry(77) apple(67)	(Hard) stone(63) knuckle(62)	8	(Sharp) <u>First Level</u> knife(84) hatchet(77) fang(75) tack(64)	(Black) coal(85) telephone(65)

	<u>Second Level</u> blood(91) tomato(83)		<u>Second Level</u> fishhook(70) spear(68)	
	<u>Third Level</u> cranberry(69) lips(59)		<u>Third Level</u> pin(55) dagger(70)	
4	(Small)	(Yellow)	9	(White) (Soft)
	<u>First Level</u> atom(87) flea(86) germ(84) gnat(76)	canary(82) dandelion(85)		<u>First Level</u> milk(83) teeth(72) snow(71) ivory(65)
	<u>Second Level</u> crumb(79) minnow(62)		<u>Second Level</u> chalk(80) napkin(62)	pillow(87) velvet(67)
	<u>Third Level</u> village(74) mouse(54)		<u>Third Level</u> cauliflower(64) pearl(37)	
5	(Shiny)	(Brown)	10	(Large) (Sweet)
	<u>First Level</u> jewel(67) diamond(65) aluminum(59) badge(32)	tobacco(83) chocolate(61)		<u>First Level</u> ocean(33) mansion(83) elephant(83) auditorium(84)
	<u>Second Level</u> rhinestone(67) buckle(32)		<u>Second Level</u> stadium(78) city(72)	sugar(82) honey(49)
	<u>Third Level</u> armor(25) bracelet(25)		<u>Third Level</u> whale(77) boulder(46)	

Note.- Numbers in parentheses represent the percentage of subjects classifying each stimulus word in the designated category (Underwood & Richardson, 1956).

Procedure and instructions. Subjects were initially administered the California F Scale (Adorno et al., 1950) and Schroder's Paragraph Completion Test (Schroder and Streufert, 1963) in groups ranging from 30 to 45 students. The instructions for the cognitive complexity test were:

Below are listed six sentence stems. Your task is to write two or three sentences in response to each stem. You will have approximately  $1\frac{1}{2}$  minutes to write on each stem. (Actually subjects received 120 seconds for each stem.)

Please work rapidly.

After completion of this task, subjects were given ten minutes to finish the authoritarianism test. The instructions at the beginning of the questionnaire were:

Here are some statements with which many people agree and many other people disagree. Will you show how much you agree or disagree with each statement by placing a number in front of each statement. The numbers mean the following:

- +3 strong support, agreement
- +2 moderate support, agreement
- +1 slight support, agreement
- 1 slight opposition, disagreement
- 2 moderate opposition, disagreement
- 3 strong opposition, disagreement

Be sure to use a plus or minus sign in front of your number to show whether you are agreeing or disagreeing with the statement. The number itself will show how strongly you agree or disagree. Work fast-----just give your first reaction.

Upon completion, the test booklets were collected and students were permitted to resume their normal activity.

One to two weeks later the concept-formation task was administered to three groups of 48 students. Each subject received a test booklet and instructions to learn only the intentional concept. However, since all stimuli were presented verbally, the incidental and the intentional concept words were delivered together. Specifically, the instructions on the booklet were:

Six (eight, ten) words will be pronounced aloud. Four (six, eight) of these six (eight, ten) words will go together in some way. These four (six, eight) words exemplify a concept. Listen carefully to all six (eight, ten) words, and then figure out the concept or the way in which four (six, eight) of the six (eight, ten) words are related. Then write the concept word in the blank. For example, consider the

following six (eight, ten) words: "mathematics, physics, house, sociology, history, gymnasium" (philosophy, chemistry; english, religion). The four (six, eight) words that go together in some way are "mathematics", "physics", "sociology", and "history" ("philosophy", "chemistry"; "english", "religion") because they are all "subjects". Thus, the concept is "subjects", and you would write "subjects" in the blank provided. Do not turn each page until you are instructed to do so.

Subjects were asked to read the instructions while the experimenter delivered them verbally. All instructions were identical for the three experimental groups except for the indicated adjustments necessitated by the variation in the amount of presented stimuli.

All ten sets of task words were read four times to each group in a steady monotone with ten seconds between each set and approximately fifteen seconds between each trial. Each subject was required to write her responses for all sets of one trial on a separate page. After the last trial, the directions on the last page were:

Now, the four (six, eight) words that exemplified each concept are given below.

For each of the four (six, eight) words try to recall the other two words that were not part of the concept. These two words, however, were also like each other in some way, and thus exemplified another concept. Write the two other words and the concept they exemplified below in the blanks provided.

A new random order of concept words and sets was employed in the incidental concept-formation task. Subjects were allowed eight minutes to complete this task; after which, the booklets were collected and students requested to remain silent regarding the details of the experiment. Intelligence scores on the SRA High School Placement Test were acquired from school files.

### Results

Within each of the three information levels (six, eight, or ten stimulus words), the 48 subjects were initially rank-ordered on conceptual complexity and subsequently divided into high, medium, and low thirds. This resulted in a 3 x 3 factorial design with the variables being: (a) information input (six, eight, or ten) and (b) cognitive complexity (high, medium, or low). Means for the high, medium, and low cognitive groups were 5.48, 4.17, and 2.98, respectively. In addition, subjects within each level were ranked on authoritarianism and

divided into thirds. This resulted in another 3 x 3 factorial design with the variables: (a) information level (first, second, or third), and (b) authoritarianism (high, medium, or low). Means for the three authoritative groups were 113.58 (high), 93.58 (medium), and 68.44 (low). Finally, the same subjects were rank-ordered on intelligence and a comparable procedure used to acquire the high, medium, and low levels. The means for these three groups were 125.08, 114.31, and 103.29, respectively. This permitted a 3 x 3 factorial analysis with variables: (a) information, and (b) intelligence (high, medium, or low).

The three dependent variables were the number of correct intentional and incidental concepts formed and the number of incidental concept words recalled. Statistical analysis on each set of data included: (a) two-way analysis of variance for information and cognitive complexity, (b) analysis of covariance for information and cognitive complexity with intelligence as covariate, (c) two-way analysis of variance for information and authoritarianism, (d) two analyses of covariance for authoritarianism and information with intelligence as covariate in one case and cognitive complexity as covariate in the other, (e) two-way analysis of variance for information and intelligence, and (f) analysis of covariance for information and intelligence with cognitive complexity as covariate.



### Intentional Concept Formation

The mean number of correct intentional concepts for groups differentiated on cognitive complexity, authoritarianism, information input, and intelligence are presented in Table 2. Summary tables for analyses of variance and covariance for groups divided on cognitive complexity are given in Table 3. A summary of the analysis of variance for groups differing on authoritarianism is presented in Table 4 with the summary tables for the analyses of covariance for groups differentiated on authoritarianism located in Table 5. Table 6 presents the summary tables for analyses of variance and covariance for the high, medium, and low intelligence groups.

Means for intentional concept formation for the high, medium, and low cognitive complexity groups were 32.04, 30.33, and 29.38 with the overall analyses of variance and covariance resulting in nonsignificant differences. In contrast, the means for the first, second, and third level of information were 27.79, 32.98, and 30.98. Analysis of variance revealed a significant effect for input load at the .001 level,  $F(2, 135) = 8.09$ . The linear component of the overall trend was significant at the .025 level,  $F(1, 135) = 5.95$ , as was the quadratic component,  $F(1, 135) = 10.08$ ,  $p < .005$ . However, it was noted that the linear component accounted for only 37% of the variance while the quadratic component accounted for 63% of the difference. These differences remained significant at the .001 level

with analysis of covariance employing intelligence as the covariate,  $F(2, 134) = 8.46$ . The adjusted means for the three groups were 27.83, 32.91, and 30.91. Duncan's multiple-range test showed that the second level differed significantly from the first level ( $p < .001$ ), and that the third level scored higher than the first level ( $p < .05$ ). The second level did not differ significantly from the third level.

Means for the high, medium, and low authoritative groups were 32.83, 29.77, and 29.15. Overall analysis of variance was not significant nor were the analyses of covariance using intelligence and cognitive complexity as the covariates. Results for information on the analyses of variance and covariance (covariate: intelligence) were identical to those discussed above. On the analysis of covariance using cognitive complexity as covariate, information input had a significant effect at the .001 level,  $F(2, 134) = 8.11$ . The adjusted means for the three levels were 27.82, 33.02, and 30.90. Duncan multiple-range test indicated: (a) the second level differed from the first level ( $p < .001$ ), (b) the third level differed from the first level ( $p < .05$ ), and (c) no difference between the second and third levels.

Finally, the means for the high, medium, and low intelligence groups were 32.83, 29.77, and 29.15. Overall analysis of variance resulted in a significant difference at the .01 level,  $F(2, 135) = 4.92$ . The differences remained significant

with analysis of covariance (covariate: cognitive complexity),  $F(2, 134) = 4.69, p < .01$ . A comparison of the adjusted means showed that the high intelligence group ( $M = 32.78$ ) differed significantly from the low group ( $M = 29.19$ ) at the .01 level; that the medium intelligence group ( $M = 29.77$ ) differed from the high group ( $p < .05$ ); and that there was no difference between the low and medium groups.

In summary, the effect of information input remained significant on all analyses, while cognitive complexity and authoritarianism had no effect on results. Groups differentiated on intelligence differed significantly and this difference remained with cognitive complexity as a covariate. Further, none of the interactions on intentional concepts were significant.

Table 2

Mean Intentional Concept Formation for Groups Differentiated  
on Cognitive Complexity, Authoritarianism, and  
Intelligence with Varying Amounts  
of Information Input

<u>Cognitive Complexity</u>			<u>Information Input</u>			
Level	Mean	Adjusted <u>M</u> (IQ as covariate)	Level	Mean	Adjusted <u>M</u> (IQ as covariate)	Adjusted <u>M</u> (CC as covariate)
High	32.04	31.75	First	27.79	27.83	27.82
Medium	30.33	29.98	Second	32.98	32.91	33.02
Low	29.38	30.02	Third	30.98	30.91	30.90
<u>Intelligence</u>			<u>Authoritarianism</u>			
Level	Mean	Adjusted <u>M</u> (CC as covariate)	Level	Mean	Adjusted <u>M</u> (IQ as covariate)	Adjusted <u>M</u> (CC as covariate)
High	32.83	32.78	High	29.94	30.52	30.04
Medium	29.77	29.77	Medium	30.12	30.03	30.19
Low	29.15	29.19	Low	31.69	31.20	31.52

Note.-Maximum intentional concept formation is 40.00.  
The following abbreviations are used: IQ = intelligence; CC =  
cognitive complexity.

Table 3

Analyses of Variance and Covariance for Intentional  
 Concept Formation for Groups Differentiated  
 on Conceptual Complexity with Three  
 Levels of Information

	Analysis of Variance				Analysis of Covariance			
<u>Source</u>	<u>df</u>	<u>SS</u>	<u>MS</u>	<u>F</u>	<u>df</u>	<u>SS</u>	<u>MS</u>	<u>F</u>
Information(I)	2	657.13	328.56	8.09*	2	632.83	316.42	8.46*
Conceptual Complexity(C)	2	175.17	87.58	2.16	2	98.62	49.31	1.32
I x C	4	118.83	29.71	.73	4	111.31	27.83	.74
Error (wg)	135	5483.88	40.62		134	5009.50	37.38	
Total	143	6435.01			142	5852.26		

\* $p < .001$ .

Table 4  
 Analysis of Variance for Intentional Concept Formation  
 for Groups Differentiated on Authoritarianism  
 with Three Levels of Information Input

<u>Source</u>	<u>df</u>	<u>SS</u>	<u>MS</u>	<u>F</u>
Information Input (I)	2	657.12	328.56	8.16*
Authoritarianism (A)	2	88.62	44.31	1.10
A x I	4	252.51	63.13	1.57
Error (wg)	135	5436.75	40.27	
Total	143	6435.00		

\* $p < .001$ .

Table 5

Analyses of Covariance for Intentional Concept Formation  
for Groups Differentiated on Authoritarianism  
with Varying Amounts of Information

<u>Source</u>	Covariate: Intelligence				Covariate: Cognitive Complexity			
	<u>df</u>	<u>SS</u>	<u>MS</u>	<u>F</u>	<u>df</u>	<u>SS</u>	<u>MS</u>	<u>F</u>
Information (I)	2	633.72	316.86	8.48*	2	654.70	327.35	8.11*
Author.(A) <sup>a</sup>	2	32.26	16.13	.43	2	65.77	32.88	.81
A x I	4	179.19	44.79	1.20	4	259.78	64.95	1.61
Error (wg)	134	5009.64	37.38		134	5410.72	40.38	
Total	142	5854.81			142	6390.97		

<sup>a</sup>Abbreviated form for authoritarianism.

\*p <.001.

Table 6  
 Analyses of Variance and Covariance for Intentional  
 Concept Formation for Groups Differentiated  
 on Intelligence with Three Levels  
 of Information Input

	Analysis of Variance				Analysis of Covariance			
<u>Source</u>	<u>df</u>	<u>SS</u>	<u>MS</u>	<u>F</u>	<u>df</u>	<u>SS</u>	<u>MS</u>	<u>F</u>
Information Input (A)	2	657.12	328.56	8.64**	2	655.08	327.54	8.58**
Intelligence (B)	2	373.88	186.94	4.92*	2	358.54	179.27	4.69*
A x B	4	269.38	67.34	1.77	4	264.81	66.20	1.73
Error (wg)	135	5134.62	38.03		134	5117.17	38.19	
Total	143	6435.00			142	6395.60		

\* $p < .01$ .

\*\* $p < .001$ .



### Incidental Concept Formation

The means on incidental concept formation for groups differentiated on cognitive complexity, authoritarianism, intelligence, and information are presented in Table 7. Summary tables for analyses of variance and covariance for groups distinguished on cognitive complexity are given in Table 9. Table 10 contains the summary table for analysis of variance for high, medium, and low authoritarianism groups with summary tables for analyses of covariance for these same groups located in Table 11. A summary of the analyses of variance and covariance for groups differing on intelligence are presented in Table 12.

Means for the high, medium, and low cognitive groups on the number of correct incidental concepts formed were 1.92, 1.96, and 1.04, respectively. Analysis of variance revealed that the effect of cognitive complexity was significant at the .05 level. However, this difference did not remain significant with analysis of covariance employing intelligence as the covariate. For information input, the first level had a mean of 2.38, the second level 1.44, and the third level 1.10. Overall analysis of variance resulted in a significant difference at the .005 level,  $F(2, 135) = 5.80$  which remained significant with analysis of covariance,  $F(2, 134) = 6.84$ ,  $p < .005$ . The adjusted means for these three groups were: high = 2.39, medium = 1.41, and low = 1.11. The results of Duncan multiple-

range comparisons demonstrated that the first level differed significantly from the third level ( $p < .001$ ), that the first level scored higher than the second level at the .01 level, and that there was no difference between the second and third levels.

Means for the high, medium and low authoritarianism groups were 1.25, 1.35, and 2.31. Analysis of variance showed that the effect of authoritarianism was significant at the .01 level,  $F(2, 135) = 4.72$ . These differences remained significant with analysis of covariance (covariate: intelligence),  $F(2, 134) = 2.79$ ,  $p \approx .06$ ; and analysis of covariance with cognitive complexity as the covariate,  $F(2, 134) = 4.16$ ,  $p < .025$ . In the first instance, the adjusted means for the three authoritative groups were 1.48, 1.31, and 2.12. Comparisons indicated that there were no differences between the medium and high authoritative groups nor between the low and high groups but that the low group differed significantly from the medium group at the .05 level. The adjusted means for the high, medium, and low authoritarianism groups when cognitive complexity was used as covariate were 1.28, 1.37, and 2.26, respectively. Duncan's multiple-range test revealed that the low group differed from both the high and the medium groups at the .05 level and that there was no difference between the medium and high groups.

Results for information input on the analyses of variance and covariance with intelligence as covariate were basically

identical to those discussed above. On analysis of covariance employing cognitive complexity as covariate, the effect of input was significant at the .005 level,  $F(2, 134) = 6.04$ . The adjusted means for these three levels were 2.38, 1.44, and 1.09. Comparisons showed that the first level differed from the third level at the .005 level, that the difference between the first and second levels was significant at the .05 level, and that the second and third levels did not differ significantly.

The mean for the high intelligence group was 2.56, for the medium group 1.56, and for the low group .79. Overall analysis of variance resulted in significant difference at the .001 level,  $F(2, 135) = 12.31$ . With analysis of covariance (covariate: cognitive complexity), the difference remained significant at the same level,  $F(2, 134) = 11.87$ . Duncan's test performed on the adjusted means indicated that the low intelligence group ( $\bar{M} = .81$ ) differed from the high group ( $\bar{M} = 2.54$ ) at the .001 level, that the high group differed from the medium group ( $\bar{M} = 1.56$ ),  $p < .01$ , and that the medium group scored significantly higher than the low group at the .05 level. Since the interaction between intelligence and information was significant at the .05 level in the analysis of variance and covariance, Table 8 contains the individual cell means. Comparisons demonstrated that the first level-high intelligence group differed significantly from all other groups ( $p < .001$ ) and that no other differences were significant.

In summary, the effect of information input upon incidental concept formation was significant in all analyses; while the difference between cognitive complexity groups was initially significant but did not remain with intelligence as a covariate. Groups differentiated on the basis of authoritarianism were significantly different even when intelligence and cognitive complexity were employed as covariates. Finally, the effect of intelligence was significant and this difference remained with cognitive complexity as a covariate. The only significant interaction in the entire experiment was between intelligence and information but this only indicated that low input and high intelligence affected performance.

Table 7

Mean Incidental Concept Formation for Groups Differentiated  
on Cognitive Complexity, Authoritarianism, and  
Intelligence with Varying Amounts  
of Information Input

<u>Cognitive Complexity</u>			<u>Information Input</u>			
Level	Mean	Adjusted <u>M</u> (IQ as covariate)	Level	Mean	Adjusted <u>M</u> (IQ as covariate)	Adjusted <u>M</u> (CC as covariate)
High	1.92	1.81	First	2.38	2.39	2.38
Medium	1.96	1.82	Second	1.44	1.41	1.44
Low	1.04	1.29	Third	1.10	1.11	1.09
<u>Intelligence</u>			<u>Authoritarianism</u>			
Level	Mean	Adjusted <u>M</u> (CC as covariate)	Level	Mean	Adjusted <u>M</u> (IQ as covariate)	Adjusted <u>M</u> (CC as covariate)
High	2.56	2.54	High	1.25	1.48	1.28
Medium	1.56	1.56	Medium	1.35	1.31	1.37
Low	.79	.81	Low	2.31	2.12	2.26

Note.-Maximum incidental concept formation is 10.00.

Table 8

Individual Cell Means from the Two-Way Analysis  
for Incidental Concept Formation

	<u>Intelligence</u>					
	High		Medium		Low	
Information Input	Mean	Adjusted <u>M</u> (CC as covariate)	Mean	Adjusted <u>M</u> (CC as covariate)	Mean	Adjusted <u>M</u> (CC as covariate)
First Level	4.19	4.19	2.00	2.02	.94	.94
Second Level	1.81	1.81	1.69	1.68	.81	.85
Third Level	1.69	1.66	1.00	.99	.62	.61

Table 9  
 Analyses of Variance and Covariance for Incidental  
 Concept Formation for Groups Differentiated  
 on Conceptual Complexity with Three  
 Levels of Information

<u>Source</u>	Analysis of Variance				Analysis of Covariance			
	<u>df</u>	<u>SS</u>	<u>MS</u>	<u>F</u>	<u>df</u>	<u>SS</u>	<u>MS</u>	<u>F</u>
Information (I)	2	41.68	20.84	5.80**	2	42.77	21.38	6.84**
Conceptual Complexity (C)	2	25.72	12.86	3.58*	2	9.12	4.56	1.46
I x C	4	10.69	2.67	.74	4	5.63	1.41	.45
Error (wg)	135	485.12	3.59		134	418.67	3.12	
Total	143	563.22			142	476.19		

\* $p < .05$ .

\*\* $p < .005$ .

Table 10  
 Analysis of Variance for Incidental Concept Formation  
 for Groups Differentiated on Authoritarianism  
 with Varying Levels of Information

<u>Source</u>	<u>df</u>	<u>SS</u>	<u>MS</u>	<u>F</u>
Information (I)	2	41.68	20.84	5.97**
Authoritarianism (A)	2	32.93	16.46	4.72*
A x I	4	16.99	4.25	1.22
Error (wg)	135	471.62	3.49	
Total	143	563.22		

\* $p < .01$ .  
 \*\* $p < .005$ .



Table 11

Analyses of Covariance for Incidental Concept Formation for  
Groups Differentiated on Authoritarianism with  
Three Levels of Information Input

<u>Source</u>	Covariate: Intelligence				Covariate: Cognitive Complexity			
	<u>df</u>	<u>SS</u>	<u>MS</u>	<u>F</u>	<u>df</u>	<u>SS</u>	<u>MS</u>	<u>F</u>
Information (I)	2	42.74	21.37	7.01****	2	42.44	21.22	6.04***
Author.(A) <sup>a</sup>	2	17.03	8.52	2.79*	2	29.26	14.63	4.16**
A x I	4	7.29	1.82	.60	4	17.34	4.34	1.23
Error (wg)	134	409.35	3.05		134	470.77	3.51	
Total	142	476.41			142	559.81		

<sup>a</sup>Abbreviated form for authoritarianism.

\*p  $\approx$  .06.

\*\*p < .025.

\*\*\*p < .005.

\*\*\*\*p < .001.

Table 12  
 Analyses of Variance and Covariance for Incidental  
 Concept Formation for Groups Differentiated  
 on Intelligence with Varying Levels  
 of Information Input

<u>Source</u>	Analysis of Variance				Analysis of Covariance			
	<u>df</u>	<u>SS</u>	<u>MS</u>	<u>F</u>	<u>df</u>	<u>SS</u>	<u>MS</u>	<u>F</u>
Information Input (A)	2	41.68	20.84	6.78**	2	42.84	21.42	6.95***
Intelligence (B)	2	75.68	37.84	12.31***	2	73.23	36.62	11.87***
A x B	4	30.99	7.75	2.52*	4	31.23	7.81	2.53*
Error (wg)	135	414.88	3.07		134	413.27	3.08	
Total	143	563.22			142	560.57		

\*p <.05.

\*\*p <.005.

\*\*\*p <.001.

### Incidental Concept Words

The mean number of incidental concept words recalled by groups differentiated on cognitive complexity, authoritarianism, information, and intelligence are given in Table 13. Table 14 contains the summary tables for the analyses of variance and covariance performed on various cognitive groups. A summary of the analysis of variance for groups differing on authoritarianism is given in Table 15; while Table 16 presents the summary tables for the analyses of covariance for these groups. Lastly, summary tables for analyses of variance and covariance for groups distinguished on the basis of intelligence are located in Table 17.

The means for the high, medium and low cognitive groups were 5.23, 5.27, and 3.52, respectively. Analysis of variance demonstrated that cognitive structure had a significant effect at the .025 level,  $F(2, 135) = 3.95$ . However, this significance was lost with analysis of covariance employing intelligence as a covariate. In contrast, the effect of information was significant at the .005 level with analysis of variance,  $F(2, 135) = 6.44$ , and at the .001 level with analysis of covariance (covariate: intelligence),  $F(2, 134) = 7.12$ . The means for the three levels of input were 6.00, 4.56, and 3.46; and the adjusted means were 6.02 (first), 4.52 (second), and 3.47 (third). Multiple comparisons revealed that there was no difference between the second and third levels, but that

the difference between the first and the third levels was significant ( $p < .001$ ), and between the first and second levels at the .05 level.

The mean for the high authoritarianism group was 3.96, for the medium group 4.06, and for the low level 6.00. Overall analysis of variance was significant ( $F(2, 135) = 5.36$ ,  $p < .005$ ) as were the analyses of covariance with intelligence as covariate ( $F(2, 134) = 3.57$ ,  $p < .05$ ) and with cognitive complexity as covariate ( $F(2, 134) = 4.76$ ,  $p < .01$ ). The adjusted means in the first instance (intelligence as covariate) were 4.30, 4.01, and 5.71 for the three groups. Duncan's multiple-range test showed that the low group differed significantly from both the high and the medium groups at the .05 level and that there was no difference between the medium and the high group. With cognitive complexity as covariate, the adjusted means were 4.02, 4.10, and 5.90. The resultant comparisons were similar to those for intelligence as covariate.

Results for information input on the analyses of variance and covariance (covariate: intelligence) were identical to those discussed previously. On analysis of covariance with cognitive complexity as the covariate, the effect of input was significant at the .005 level,  $F(2, 134) = 6.66$ . The adjusted means for the three levels were: first = 6.01, second = 4.57, and third = 3.44. Comparisons indicated that the first level differed from the third level at the .001 level, that the first

level performed better than the second level ( $p < .05$ ), and that there was no difference between the second and third levels.

For groups differentiated on the basis of intelligence, the high group had a mean of 5.98, the medium 4.69, and the low 3.35. Overall analysis of variance resulted in a significant difference at the .001 level,  $F(2, 135) = 7.42$ . This significant difference was maintained with analysis of covariance employing cognitive complexity as the covariate,  $F(2, 134) = 7.10$ ,  $p < .001$ . Duncan multiple-range comparisons on adjusted means revealed that the high group ( $M = 5.95$ ) differed significantly from the low group ( $M = 3.38$ ) at the .001 level, and that the medium group ( $M = 4.69$ ) differed from neither the low nor the high group.

In summary, the effect of information was significant in all analyses, while all interactions involving recalled incidental words were nonsignificant. Groups differentiated on cognitive complexity were initially significant; however, this difference did not remain with intelligence as a covariate. High, medium, and low authoritative groups differed significantly even when intelligence and cognitive complexity were employed as covariates. Finally, the effect of intelligence was significant and this difference was maintained with cognitive complexity as a covariate.

Table 13

Mean Quantity of Incidental Concept Words Recalled for  
Groups Differentiated on Cognitive Complexity,  
Authoritarianism, and Intelligence with  
Varying Levels of Information Input

<u>Cognitive Complexity</u>			<u>Information Input</u>			
Level	Mean	Adjusted $\bar{M}$ (IQ as covariate)	Level	Mean	Adjusted $\bar{M}$ (IQ as covariate)	Adjusted $\bar{M}$ (CC as covariate)
High	5.23	5.05	First	6.00	6.02	6.01
Medium	5.27	5.06	Second	4.56	4.52	4.57
Low	3.52	3.91	Third	3.46	3.47	3.44
<u>Intelligence</u>			<u>Authoritarianism</u>			
Level	Mean	Adjusted $\bar{M}$ (CC as covariate)	Level	Mean	Adjusted $\bar{M}$ (IQ as covariate)	Adjusted $\bar{M}$ (CC as covariate)
High	5.98	5.95	High	3.96	4.30	4.02
Medium	4.69	4.69	Medium	4.06	4.01	4.10
Low	3.35	3.38	Low	6.00	5.71	5.90

Note.-Maximum incidental concept words is 20.00.

Table 14

Analyses of Variance and Covariance for Quantity of Incidental  
Concept Words Recalled for Groups Differentiated on  
Conceptual Complexity with Varying Amounts  
of Information

	Analysis of Variance				Analysis of Covariance			
<u>Source</u>	<u>df</u>	<u>SS</u>	<u>MS</u>	<u>F</u>	<u>df</u>	<u>SS</u>	<u>MS</u>	<u>F</u>
Information (I)	2	155.93	77.96	6.44**	2	157.67	78.84	7.12***
Conceptual Complexity (C)	2	95.72	47.86	3.95*	2	44.18	22.09	1.99
I x C	4	42.07	10.52	.87	4	31.07	7.77	.70
Error (wg)	135	1633.94	12.10		134	1484.32	11.08	
Total	143	1927.66			142	1717.24		

\* $p < .025$ .

\*\* $p < .005$ .

\*\*\* $p < .001$ .

Table 15  
 Analysis of Variance for Quantity of Incidental Concept  
 Words Recalled for Groups Differentiated on  
 Authoritarianism with Three Levels  
 of Information Input

<u>Source</u>	<u>df</u>	<u>SS</u>	<u>MS</u>	<u>F</u>
Information Input (I)	2	155.93	77.96	6.58*
Authoritarianism (A)	2	126.93	63.46	5.36*
A x I	4	44.99	11.25	.95
Error (wg)	135	1599.81	11.85	
Total	143	1927.66		

\* $p < .005$ .



Table 16  
 Analyses of Covariance for Quantity of Incidental Concept  
 Words Recalled for Groups Differentiated on  
 Authoritarianism with Three Levels  
 of Information

<u>Source</u>	Covariate: Intelligence				Covariate: Cognitive Complexity			
	<u>df</u>	<u>SS</u>	<u>MS</u>	<u>F</u>	<u>df</u>	<u>SS</u>	<u>MS</u>	<u>F</u>
Information (I)	2	157.66	78.83	7.25****	2	158.72	79.36	6.66***
Author.(A) <sup>a</sup>	2	77.57	38.78	3.57*	2	113.35	56.68	4.76**
A x I	4	26.00	6.50	.60	4	46.34	11.59	.97
Error (wg)	134	1456.51	10.87		134	1596.93	11.92	
Total	142	1717.74			142	1915.34		

<sup>a</sup>Abbreviated form for authoritarianism.

\*p <.05.

\*\*p <.01.

\*\*\*p <.005.

\*\*\*\*p <.001.

Table 17

Analyses of Variance and Covariance for Quantity of Incidental  
 Concept Words Recalled for Groups Differentiated  
 on Intelligence with Varying Amounts  
 of Information Input

<u>Source</u>	Analysis of Variance				Analysis of Covariance			
	<u>df</u>	<u>SS</u>	<u>MS</u>	<u>F</u>	<u>df</u>	<u>SS</u>	<u>MS</u>	<u>F</u>
Information Input (A)	2	155.93	77.96	6.99*	2	160.63	80.31	7.18*
Intelligence (B)	2	165.39	82.69	7.42*	2	158.89	79.44	7.10*
A x B	4	101.90	25.48	2.29	4	101.37	25.34	2.27
Error (wg)	135	1504.44	11.14		134	1498.72	11.18	
Total	143	1927.66			142	1919.61		

\*p < .001.

Interrelationships of Variables

Table 18 presents the intercorrelations between the dependent variables and the three personality variables involved in the preceding analyses for the entire group of 144 subjects.

Cognitive complexity scores correlated .08 with intentional concept formation, .06 with incidental concepts formed, and .05 with amount of incidental words recalled. Intelligence scores, on the other hand, correlated .30 and .39 with intentional and incidental concept formation respectively, and .33 with quantity of recalled words. Scores on the F Scale correlated -.12 with intentional concept formation, -.23 with incidental concept formation, and -.24 with incidental words recalled. Intentional and incidental concept formation correlated .19; and incidental concept formation correlated .89 with the amount of incidental words recalled. Finally, cognitive complexity correlated -.20 with authoritarianism and .11 with intelligence scores.

Table 18  
Intercorrelations Between the Dependent Variables  
and the Three Personality Variables

	IcW	IcC	IQ	F	CC
Int	.24	.19	.30	-.12	.08
IcW		.89	.33	-.24	.05
IcC			.39	-.23	.06
IQ				-.23	.11
F					-.20

Note.-Abbreviations represent: intentional concept formation (Int), incidental concept words (IcW), incidental concept formation (IcC), intelligence (IQ), authoritarianism (F), cognitive complexity (CC).

### Discussion

The hypothesis predicting no difference between abstract and concrete conceptual structures on intentional concept formation was substantiated. This would seem to indicate that both types possess similar abilities in processing relevant cues; and that in a situation demanding minimal integrative processes, simple structures function as effectively as high-level individuals. This finding coincides with Schroder's (1967) contention that equality will exist between levels if sufficient material is delivered to the subject and if appropriate performance requirements are explicitly stated.

Contrary to our prediction, high-level subjects did not perform significantly better than simple-level individuals on incidental concept formation. This result may be attributed to either the inappropriateness of the task environment or to the validity of the Paragraph Completion Test. In the first case, Schroder states in his book (1967) that overly simple task situations often fail to stimulate processes of integration, therefore permitting low-level structures to function effectively. Streufert and Schroder (1965) further clarified this statement by demonstrating that two to five units of information represent suboptimal loads for processing procedures. In this experiment, there were only two incidental words which may have allowed low-level individuals to perform as effectively as more complex persons. However, the legitimacy of this

criticism can be questioned by noting (a) that the mean performances on the intentional and incidental concept formation tasks were very low (see Tables 2 and 7), thereby indicating that the tasks were not "overly simple"; and (b) that Schroder considers complexly-integrative persons to be highly creative. Laughlin (1967), employing a similar procedure, analyzed the effect of creativity and found that high creatives exceeded medium and low creatives. Therefore, if Schroder's assumption is correct, the task should have been sufficient; and on this basis, our results should have been significant.

The second plausible explanation questions the validity of Schroder's test. It is a confirmed fact that intelligence is significantly correlated with complexity (.12 to .45); and therefore, several investigators postulate that the two may be identical. Schroder (1967) denies this by noting that his research discovered variations in cognitive structures while maintaining intelligence at a constant level and by explicating that intelligence is a general ability while conceptual level varies across content areas. The present results tend to confirm this statement since the correlation between these two traits was only .11. Consequently, even though employing intelligence as a covariate eliminated the initially significant results, stating that the two are identical fails to fully satisfy our problem.

The answer appears to involve the ability of the test to

actually determine a person's processing capabilities in any situation. Since this conceptual structure supposedly varies across stimulus areas, the test form administered in this project may have analyzed a person's ability for the wrong area. This is certainly a parsimonious solution to a complex problem but not very meaningful. The basic problem involves Schroder and his associates' attempt to measure some entity which currently refuses quantification. Their analysis that the relational aspects of an individual's operations upon input information is more significant than the pure content of the input is definitely a correct postulation. However, their measuring instrument reeks with simplicity when one realizes that its purpose is to analyze a complex entity that constantly varies. Consequently, their endeavor is noteworthy but certainly one that does not even approach the final solution.

For the variable of information load, the results demonstrated that a curvilinear relationship exists between quantity of relevant material and performance on the intentional concept formation task. This suggests that an input load of eight concept exemplars, in contrast to only six, offers the subject additional cues which may be employed in the categorization of stimuli. This effect is similar to that discovered by Bourne and Haygood (1961) and is actually a further extension of Walker and Bourne's (1961) distinction between the two uses of the word "redundancy". In this experiment, the relevant

redundant information did not require the subject to employ additional information in the classification of material nor did it necessarily permit the participant to employ any one of several dimensions but it actually increased the identification (or saliency) of the concept by repeating it through added exemplars.

However, this rate of improvement did not continue for loads of ten exemplars which, in fact, produced a decrement in performance. Even though this decline was not significant, the overall trend analysis indicated that the larger input may represent an overloading of incoming information. In this instance, the individual is not able to assimilate the particular quantity of material in a specified time period; and therefore, fails to utilize the additional cues that could be at his disposal. In actuality, the overloading condition causes a "jamming" of information systems, prohibits normal functioning, and thus, decreases concept identification. Streufert and Driver (1965) concluded that excessive information loads decrease differentiation and integration and Garner (1962) found that information transmission initially increases and then declines as the load becomes larger. Lanzetta and Roby (1957) similarly determined that a decrement occurs in processing highly complex information, while Hyman (1953) certified that reaction time increases as input in bits increases. In conclusion, the suggestion can be formulated that further



experimentation on intentional concept identification should include stimulus lists of eight words instead of six to permit maximum performance. This may promote intentional concept formation as a better measure than currently accepted in learning research.

On incidental concept formation, the prediction that added quantities of irrelevant information decrease identification was substantiated. Since on this task, the intentional concept words were processed as irrelevant material and the incidental exemplars as relevant input, this effect augments Bourne and Haygood's (1959) formulation that redundant irrelevant information increases the saliency of the irrelevant cues and thus limits performance. In the same realm, Murdock's (1965) "limited capacity" hypothesis lends some explanatory assistance by theorizing that a constant amount of material can be retained or learned in a constant period of time. Likewise, Wolfgang (1967) confirmed the assumption that learning rate decreases with increased amounts of irrelevant input. This suggests that since an individual's storage capabilities may possess limitations, a subject stores only relevant information and therefore is unable to recall later requested incidental material. Laughlin (1967) and Laughlin, Doherty, and Dunn (1968) likewise found that stimulus lists of six nouns allow efficient performance on incidental concept formation.

Regarding the effect of authoritarianism, the findings

showed that no differences occurred between groups on intentional concept identification. This confirmed the hypothesis that all levels should demonstrate equal proficiency in learning basic material where instructional stimuli are explicitly stated, where presentation of information is clear, and where no cognitive shifts are required. In contrast, low authoritative individuals performed significantly better than other persons on incidental concept formation. Since subjects were required to shift from an intentional-learning set to an incidental concept attainment task, these results confirm Rokeach's (1948) discovery that relatively high F persons exhibit an inability of shifting from established sets. Likewise, these people maintain strict rigidity in their thinking, denoting that the subject would focus his attention only on the relevant information, would immediately screen out non-essential input during presentation, and therefore would be unable to complete the incidental task.

This trend continued when intelligence and cognitive complexity were employed as covariates. In the first case, the difference was less significant indicating that the cognitive style measured by the Authoritarianism Scale overlapped with that ability analyzed by the intelligence test. This effect was particularly noticeable in the multiple-range comparisons where the low group differed from the medium but not from the high group. With integrative ability as covariate, the level

of significance was only minimally affected. This denoted that the two tests concentrated on two basically unrelated processes. This latter conclusion was further supported with the correlation coefficient being only  $-.20$ , confirming Schroder's (1967) contention that the relationship between authoritarianism and cognitive structure is anything but clear-cut.

For intentional concept formation, intelligence was the only personality variable that had a significant effect which coincides with the findings of Laughlin, Doherty, and Dunn (1968). Comprehension of this conclusion may occur by realizing that intentional learning procedures closely resemble those of the academic situation and that Wallach and Kogan (1965) proposed that intelligence is a direct predictor of academic achievement. In the same manner, intelligence significantly affected performance on incidental concept formation and recall of incidental stimuli. This result replicates the findings of Laughlin and his associates (1968) and substantially indicates that the ability to form, identify, and recall relationships for high school students is highly dependent upon intelligence. It also presents the possibility that this type of task taps an individual's processes for storing and retrieving information more than his procedures for processing input data; and that if intelligence basically represents the ability to store and retrieve material, the effect on both types of learning would be significant.

The interaction between information input and intelligence on incidental learning offers little insight into the processes entailed since the only difference occurred between the low level-high intelligence group and the remaining groups. This simply suggests highly intelligent persons are capable of efficiently processing, storing, and retrieving minimal loads of information better than less intelligent people with larger input lists.

In general, this experiment demonstrated that intentional and incidental learning are not dependent upon the integrative ability of the individual but do rely upon the amount of stimuli presented for processing in a limited time period. The theoretical explanation forwarded by Deese (1964) received some confirmation since additional intentional words should assist in the development of numerous similar representational responses; and assuming the accuracy of Murdock's (1965) "limited capacity" formulation, these intentional representations should restrict those for incidental matter and subsequently degrade performance. Statements by various investigators (Miller & Lakso, 1964; Wray, 1967; Schneider & Kintz, 1967) noting the element of attention in learning and retention and specifically Plenderleith and Postman's (1956) position that success in incidental learning corresponds with a person's ability to maintain attention on multiple phases of the information input were tentatively supported by the fact that low authoritative

individuals were more proficient in their identifications than other participants in the project. This report also affirmed the role of intelligence in the analysis of both types of learning and emphasized that all future experimentation must recognize and control the presence of this factor. Negligence on this point suggests that some past research might be susceptible to criticism.

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APPROVAL SHEET

The thesis submitted by David J. Marx has been read and approved by the director of the thesis. Furthermore, the final copies have been examined by the director and the signature which appears below verifies the fact that any necessary changes have been incorporated, and that the thesis is now given final approval with reference to content and form.

The thesis is therefore accepted in partial fulfillment of the requirements for the degree of Master of Arts.

1/6/69

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