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CONCEPT LEARNING IN HIGH SCHOOL STUDENTS AS A FUNCTION OF  
CONCEPTUAL LEVEL, INTERNAL-EXTERNAL CONTROL,  
AND, ENVIRONMENTAL STRUCTURE

by

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A Dissertation  
Submitted to the Faculty of Graduate Studies  
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## ABSTRACT

A review of research with the Conceptual Level (CL) and Internal-External Control (I-E) personality variables suggested that the employment of these variables in combination would yield more powerful prediction of learning performance in different environments, than had been achieved by the use of either of these personality variables alone. It was predicted specifically, that high CL-internals would learn better in low than in high structure, and learn better than low CL-externals in low structure; while low CL-externals would learn better in high structure than in low structure, and learn better than high CL-internals in high structure. These predictions were tested in a study in which Grade 11 male high school students, whose I-E and CL had been measured, performed a learning task in either a high or a low structure environment. The findings provided support for two of the four predictions, giving rise to a CL x I-E x Environmental Structure interaction effect for learning performance scores. A CL x Environmental Structure interaction effect was also obtained for subjects' satisfaction, as measured by questionnaire responses. These results are interpreted as providing support for Hunt's CL matching model conceptualization, and as evidence for the utility of obtaining multidimensional characterizations of learners in educational pupil-instruction matching.

## PREFACE

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## CHAPTER I

### INTRODUCTION

#### The Problem

The purpose of this study was to examine how the personalities of students interact with different types of teaching environments in determining academic achievement. The personality variables of Conceptual Level and Internal-External Control provided the specific focus for the study. In the following sections, the special relevance of these two personality variables to educational settings will be discussed, and the literature relevant to these personality variables reviewed, in the framework of an interactive approach to the study of behaviour.

#### Behaviour as an Interactive Function of Individual and Environment

The notion that it is necessary to take account of both individual and environmental variables in order to achieve a complete understanding of human behaviour is not a new one. Lewin (1935) provided the classic statement of this interactive point of view, exemplified in his formula  $B=f(P, E)$ , that is, behaviour is a function of both the person and the environment. J. McV Hunt (1961; 1965) is another more recent writer, who has emphasized the necessity of studying behaviour within an interactive framework. Empirical evidence for the utility of such an approach comes from a series of studies by Hunt and his collaborators (Endler, Hunt, & Rosenstein, 1962; Hunt, 1965) involving modes of anxiety response in various anxiety-

provoking situations. Subjects were required to complete an inventory of anxiousness, asking them to rate the degree to which they experienced each of a number of anxiety reactions in a number of different situations. The results indicated that modes of response were the largest source of variance, with situations contributing the second largest amount of variance, considerably more than the variance due to persons. However, neither situations nor subject differences contributed as much as 5% of the total variance. In fact all the main sources of variance combined (subjects, situations, and modes of anxiety response) contributed only about one third of the total variance, with simple interactions contributing another third, and triple interactions together with residual variance accounting for the remaining third. These findings were replicated with fifteen separate subject samples and different forms of the anxiety-response inventory. Hunt concludes from such evidence:

"Thus it is neither the individual differences among subjects per se, nor the variations among situations per se, that produce the variations in behaviour, rather the interactions among these which are important" (Hunt, 1965, p.83).

Many researchers, though voicing theoretical support for the interactive approach, have continued to concentrate exclusively on either individual or treatment differences. This state of affairs prompted Cronbach (1957) to make a distinction between two disciplines of scientific psychology. He pointed out that one major area of research within psychology, usually termed "experimental psychology" tended to

be interested only in the effects of treatment variables, individual difference variables being an unwanted source of variance, subsumed by error variance terms. The other major research trend within psychology, labelled "correlational psychology" tended to study only individual differences, with treatment variations ignored. Cronbach contended that this schism within psychology was detrimental to the fulfillment of its scientific objectives. Thus:

"Our job is to invent constructs and to form a network of laws which permits prediction. From observations we must infer a psychological description of the situation and of the present state of the organism. Our laws should permit us to predict, from this description, the behaviour of organism-in-situation" (Cronbach, 1957, p.681).

Cronbach's concept of "organism-in-situation" captures the essence of the interactive approach to the study of behaviour. In somewhat similar terms, Hunt suggests that "...we should be looking toward instruments that will classify people in terms of the kinds of response they make in various categories of situations" (Hunt, 1965, p.83). Despite the logical strength of such appeals for interactive approaches, there has been little progress toward the development of constructs, or frameworks, for the coordination of person-environment effects (Hunt, 1971; Pervin, 1968; Schroder, Driver, & Streufert, 1967). D. E. Hunt (1971) suggests that one reason for this lack may be the difficulty of developing research strategies for specific situations, even though the general principle is clear.

Pervin (1968) has provided a review of much of the research carried out within an interactive framework, specifically those

4

studies which have been concerned with performance and satisfaction as dependent variables. In his accompanying discussion of theoretical models relevant for the analysis of interactions, Pervin finds that the "match" or "best-fit" model (Jahoda, 1961) possesses good general utility as a framework for thinking about person-environment interactions. This is a matching model for individual-environment fit, which assumes that there exists an optimum combination of individual and environment, which is characterized by optimal levels of performance and satisfaction. Lack of fit, due to inadequate matching of individual and environmental characteristics is considered to result in inferior levels of performance and satisfaction, and considerable stress within the individual.

A specific area in which matching principles may usefully be applied is in the the field of education. Clearly, an optimal educational environment is one which is able to provide educational treatments that will match individual characteristics in such a way as to lead to the maximization of educational outcomes for the maximum number of students.

#### The Interactive Model in Education

Contemporary approaches within the field of education have begun to recognize the necessity of taking an interactive orientation toward the study of issues in education. The emphasis has moved from the consideration of individual characteristics, curriculum characteristics, or college characteristics, in isolation, to a concern with the relative

efficacy of various combinations of these characteristics in achieving desired ends (Pervin, 1968). Although this increasing operational interest in the interactive approach has been a relatively recent happening in education, interactive notions have been propounded by influential educational theorists since the beginning of the century. Thus, for example John Dewey treated the issue in the following terms:

"The fundamental factors in the educative process are an immature, undeveloped being; and certain social aims, meanings, values incarnate in the matured experience of the adult. The educative process is the due interaction of these forces. Such a conception of each in relation to the other as facilitates completest and freest interaction is the essence of educational theory." (Dewey, 1902, p.4).

The influential work of Montessori at the turn of the century also emphasized close observation of individual children, with the aim of discovering educational operations, specific to the child, which would be conducive to the child's conceptual growth (Standing, 1957). Piaget (1932) also has focused generally on the problem of providing environmental stimulation to match existing cognitive schemata in such a way that the accommodation process, crucial to development, can occur. More recently, another developmental theorist (Kohlberg, 1966), in the context of his theory of moral development, has emphasized the necessity of matching moral communications designed to promote moral development to the developmental level of the child:

"There is also an important problem of match between the teacher's level and the child involved in effective moral communication. Conventional

moral education never has had much influence on children's moral judgement because it has disregarded this problem of developmental match." (Kohlberg, 1966, p.24).

As Torrance (1965) has pointed out, effective teachers tend to take account intuitively of individual-environment interaction in tailoring their teaching methods to match the characteristics of individual children, or groups of children. However, explicit study of the salient aspects of individual-environment interaction is likely to lead to more effective matching than can be achieved on an intuitive basis alone.

Cronbach (1967) has provided a formulation of the interactive model specifically for education -- the Aptitude-Treatment-Interaction (ATI) model. This model provides a paradigm for studying educational outcomes in terms of the differential effects of various combinations of student aptitudes and educational treatments. Cronbach and Snow (1968) and Snow (1969) have also provided discussions of methods and approaches for the application of the ATI model to educational problems. Hunt (1971) in his educational research involving learner-environment matching in terms of conceptual and environmental structure, has made particular use of two models suggested by Snow (1969), for the derivation of hypotheses relating to aptitude-treatment interactions. One model, the "compensatory" model, regards treatments as a means of compensating for some deficiency in the learner. In this sense, the treatment acts as an "artificial aptitude", providing those information processing functions that the

learner does not possess himself. In terms of the compensatory model then, "best-fit" possesses additive implications, the environmental treatments being such that they add to the learner's existing capacities. In the "preferential" model, treatments are regarded as capitalizing on existing capacities rather than compensating for deficiencies in capacity. In this model, treatments are provided which will maximize the utilization of the learner's current capacities. Application of the compensatory model therefore leads to a focus on treatments designed to compensate for deficiencies within the learner, while application of the preferential model leads to a focus on treatments designed to utilize the learner's strengths.

#### Conceptual Level Matching Model

The Conceptual Level matching model (Hunt, 1971) is an interactive model with considerable applicability to the field of education. This model is based on the personality dimension of Conceptual Level, which in turn is derived from Conceptual Systems Theory (Harvey, Hunt, & Schroder, 1961). This is a theory of cognitive and personality development founded on an analysis of the characteristic ways in which individuals select, organize, store, and use information, in adapting to various aspects of their world. In the tradition of Lewinian developmental theory (Kagan & Kogan, 1970), the individual's information processing capacities are considered



to develop through a process of progressive differentiation and hierarchic integration. Thus, the individual gradually learns to differentiate among his environmental experiences and progressively organizes these differentiated experiences into integrated, personally meaningful patterns. This informational interaction between individual and environment leads to the development of standardized patterns of organizing environmental experiences by the individual, in the form of perceptual and behavioural constancies. These constancies are the concepts of Conceptual Systems Theory, and provide the mediating links between the individual and his environment.

The level of differentiation and integration attained by the individual at any point depends on the quality of the interactions which he has had with the major training agents in his environment (i.e. parents, parent surrogates, teachers). If environmental experiences during a particular stage match the child's level of conceptual development, then the conditions are conducive to his further conceptual growth. On the other hand, if environmental experiences do not match his attained level of conceptual development (i.e. his current information-processing capacities), then arrestation rather than growth will be the result. Level of conceptual organization or information-processing capacity is considered to vary along a continuous dimension which reflects the personality variable of Conceptual Level (Hunt, 1970). At the lower

levels of this personality dimension, individuals are characterized as possessing a fixed, concrete kind of cognitive structure, with rigid adherence to rules. A low Conceptual Level individual is therefore cognitively simple, dependent, and incapable of generating his own concepts. In contrast, individuals possessing high levels of conceptual organization have more flexible, abstract kinds of cognitive structures, which because of their greater integrative complexity allow variation in perspectives and an interrelation among different perspectives. A high Conceptual Level individual is therefore cognitively complex, independent, and capable of generating his own concepts.

Measurement of Conceptual Level: Both projective and objective methods have been employed in the assessment of Conceptual Level or related conceptions of information-processing capacity as a personality variable. Harvey (1966; 1967) has made extensive use of the "This I Believe" (TIB) test, a projective test involving paragraph completion. Subjects are presented with the phrase "This I believe about..." with the blank filled successively by referents of social and personal relevance such as: guilt, friendship, marriage, religion, etc. The time allowed for completion of each paragraph is limited, and subjects are classified into one of a number of discrete categories on the basis of the way in which the content of their responses reflects their

conceptual functioning. Schroder, Driver, and Streufert (1967), and Hunt (1970) have employed another form of projective test involving paragraph completion, termed the "Paragraph Completion" test. This test provides the respondent with a number of incomplete sentences which are considered likely to generate some degree of cognitive imbalance or conflict within him, and therefore require some "conceptual work" on his part to resolve issues raised. Responses are again subject to a time limit and are scored in terms of the conceptual functioning underlying the response, rather than on the content-oriented basis employed by Harvey in his sentence completion test. This underlying conceptual structure is regarded as a continuous dimension, not as the series of discrete conceptual system categories visualized by Harvey (Schroder et al., 1967). Schroder et al. (1967) and Hunt, Lapin, Liberman, McManus, Post, Sablis, Sweet, and Victor (1968) have provided detailed manuals for scoring Paragraph Completion test responses. Both these scoring methods are similar, though Schroder et al. label the conceptual dimension they are measuring "integrative complexity" rather than Conceptual Level.

Another kind of projective test which has been employed in the measurement of Conceptual Level is the "impression formation" test, adapted by Schroder and his co-workers from the work of Asch (1946). Subjects are required to write down

their impression of a person on the basis of adjectives presented to them, describing the person. The manner in which the subject integrates incongruent or contradictory adjectives into a consistent view of the person provides a measure of conceptual system functioning.

Schroder et al. (1967) discuss a number of attempts that have been made to develop objective measures of conceptual structure. For example, one such test, the "situational interpretation" test, requires subjects to choose one of a number of alternatives, regarding the way they feel they would react to criticism from some specified person. The correlations between objective measures of the Conceptual Level dimension and the Paragraph Completion measure tend to be low though often significant. However, in construct validity studies employing behavioural criteria, projective measures show considerable superiority over objective measures (Schroder et al., 1967). Schroder et al. feel that projective items involving some kind of discrepancy, uncertainty, or conflict, which will therefore engage the subject in some form of cognitive "resolution", provide responses of greatest relevance to the Conceptual Level construct. They suggest that objective tests may by their very nature be incapable of providing adequate differential measurement of conceptual structure. Thus, highly concrete (low CL) persons may perceive relationships between novel, incoming information and

existing cues when these are made salient by a multiple-choice format, but may fail to make such connections in a free-response format. These authors conclude that "measures of the level of information processing are most valid when the individual generates the response" (Schroder et al., 1967, p.204). Hunt too, has been unable to develop an objective test with validity comparable to that of the Paragraph Completion test. He feels that at the present time the Paragraph Completion method is the most satisfactory method available for measuring Conceptual Level (Hunt, 1971; 1974). In conclusion, the work of both the Schroder group and Hunt suggests that the Paragraph Completion test currently provides the most promising method for assessing Conceptual Level.

Schroder et al. (1967) and Hunt (1971) have reviewed evidence relating to the reliability of the Paragraph Completion test. They report inter-rater reliabilities for trained raters in the .80 to .85 range; a split-halves reliability of .70; and correlations between individual items and total scores (over six items) ranging from .57 to .75. These data indicate that the test possesses satisfactory internal consistency. The intercorrelations among similar pairs of items (referring to ambiguity, external imposition, and interpersonal conflict, respectively) provide another measure of internal consistency, and are

reported as .46, .38, and .56 (Schroder et al., 1967).

Although these correlations indicate that different classes of item may produce rather different levels of conceptual functioning, Schroder et al. (1967) conclude that ~~the~~ correlations are sufficiently high to warrant summation of scores to achieve a general score.

Hunt (1971) has summarized evidence relating to the construct validity of the Conceptual Level concept as measured by the Paragraph Completion test. This evidence will be reviewed in the following section.

Validity Studies: A review of the relevant evidence (Hunt, 1971) suggests that the Conceptual Level construct possesses satisfactory discriminant validity if the intelligence and social class of subject samples are carefully controlled. Thus, Hunt reports a low, non-significant correlation between Conceptual Level and intelligence for intellectually homogeneous groups, though for intellectually heterogeneous groups, this correlation may sometimes reach significance. There is some relation between Conceptual Level and social class, with middle class samples tending to have higher Conceptual Level scores than lower class samples. Curvilinear relations have been obtained between Conceptual Level and social desirability, with a low CL score apparently being more socially desirable than a very low or a high CL score. Therefore, it seems advisable to use extreme groups

wherever possible, to minimize social desirability effects.

The construct validity of Conceptual Level receives strong support from cross-sectional and longitudinal evidence which is consistent with the developmental rationale underlying theorizing about conceptual structure. Thus, one study which compared the EL scores of matched groups of boys between the ages of twelve and sixteen found an orderly though not large increment in Conceptual Level between these ages (reported in Hunt, 1971). Another study reported by Hunt (1971) investigated the CL scores of a group of 72 boys over a four-year period, between Grades 6-8 and Grades 10-12. The mean CL score of the total group was found to increase significantly over this period. Further developmental evidence which supports the construct validity of Conceptual Level has been obtained by Sullivan, McCullough, and Stager (1970). They reported substantial correlations between Conceptual Level and levels of moral and ego development as measured by Kohlberg's Moral Maturity Scale (Kohlberg, 1964), and Loevinger's Ego Development Scale (Loevinger, 1966). These findings support the developmental conception of Conceptual Level, since they indicate that the Conceptual Level construct, in accord with theory, follows the general developmental trend of other important individual characteristics.

The relationships which have been obtained between Conceptual Level and other personality variables provide

further support for the construct validity of Conceptual Level. Thus, in accord with theoretical prediction, Conceptual Level tends to be significantly correlated with parental non-authoritarianism, and with the personality variables of future orientation, non-alienation, and internal control (Hunt, 1971). Also, for college level subjects, Conceptual Level has been shown to be inversely related to dogmatism and authoritarianism (Schroder et al., 1967).

Some evidence is available to support the predictive validity of Conceptual Level. In keeping with the hypothesized lack of organization and lack of assimilation of norms of low CL individuals (Hunt, 1971), groups of low CL boys showed a higher incidence of delinquency compared to high CL groups. Another study indicated a differential relation between Conceptual Level and academic achievement (with the effects of intelligence partialled out) depending on content area. In line with expectation, Conceptual Level was inversely related to achievement for engineering, and positively related to achievement in the social sciences and humanities -- it was supposed that the latter subject matter probably required a more critical, analytical approach, while the former subject matter probably put greater emphasis on memory and convergent thinking.

The Conceptual Level Matching Model in Education: The Conceptual Level matching model is similar in rationale to



Cronbach's ATI approach. It attempts to provide principles which will stipulate the nature of the treatments required to maximize the achievement of given objectives for individuals with differing characteristics. In educational terms, the problem is to tailor educational approaches to learner characteristics in such a way as to provide for the attainment of educational objectives by the maximum number of learners. Such a model therefore, must operate in terms of a conception of the individual, the environment, and the interactive process between individual and environment.

In the application of the Conceptual Level matching model to education (Hunt, 1971), individual variation is examined in terms of the Conceptual Level dimension. Since the personality dimension of Conceptual Level refers to the conceptual complexity, or level of cognitive abstractness of the individual, a congruent environmental consideration according to the matching model is the dimension of structure (Hunt, 1971) or environmental complexity (Schroder et al., 1967). The degree of structure within the environment refers to the amount of organization or clarity of expectations that the person encounters. An environment with low structure possesses little organization, and the responsibility for clarification and organization lies with the person himself. In a high structured environment on the other hand, the organization is clear, well-organized, and usually

determined by an external training agent rather than by the person himself. In the educational context, a highly structured environment typically involves teacher strategies which emphasize a teacher-centred, organized approach, with for example, the teacher providing the content material for students in the form of lectures. In contrast, a low structured educational environment is generally characterized by student-centred, independence-oriented teaching approaches, with the teacher acting in an advisory capacity, seeking to encourage students to discover the content material through their own efforts, and providing the means for them to do so.

Hunt has employed Snow's compensatory and preferential models to derive hypotheses concerning learner-teaching environment interactions. Application of a compensatory model leads to the prediction that low CL subjects will perform better under high than low structure, because the simple organization of the environment will compensate for subjects' lack of conceptual complexity. However, in terms of this model, high CL subjects should perform equally well under both high and low structure since they possess no deficiencies in conceptual organization, and therefore do not require compensatory assistance from the environment. An analysis in terms of the preferential model leads to a prediction for low CL individuals which is in agreement with that made by the compensatory model. Thus, low CL individuals

would be expected to perform better in an environment which is congruent with their personality structure, that is, a simple environment. However, for high CL individuals, the prediction obtained by using the preferential model differs from that which was derived from the compensatory model. According to the preferential model, high CL subjects will perform worse under high structure than low structure, since the highly structured simple environment will interfere with high CL subjects' preference, and the mismatch will lead to decreased performance. It can be seen, then, that the compensatory model predicts an ordinal interaction between CL and environmental structure, while the preferential model predicts a disordinal or "crossover" interaction between CL and environmental structure. Hunt (1971) concludes that while the Conceptual Level matching model provides a clear prediction of the low CL individual's behaviour, for high CL individuals there is some ambiguity in prediction. He states: "...in some cases we expected disordinal interactions, and in other cases, we hedged the prediction for high CL learners because we did not know to what extent preferential factors would operate" (Hunt, 1971, p. 44).

An analysis by Hunt and Hardt (1967) of the effectiveness of a number of summer Upward Bound programmes (sponsored by the U.S. Office of Economic Opportunity, for culturally disadvantaged high school students) furnishes impressive large-scale

evidence for the utility of the Conceptual Level matching model. Where the structure of the programme and the predominant conceptual structure of the participant group were matched (i.e. structured programme - low CL; flexible programme-high CL), there tended to be greater gains by the end of the programme, for the majority of measures used, as compared to participants in mismatched programmes.

Another study reported by Hunt (1971) provides a further demonstration of the practical utility of the Conceptual Level matching model in an educational setting. Three classroom groups consisting of Grade 9 students of homogeneously very low, low, and high Conceptual Level, were formed. Teachers, unaware of the groups' placements on the Conceptual Level dimension reported that the very low Conceptual Level group profited most from a high degree of structure, the low Conceptual Level group from moderate structure, and the high Conceptual Level group from low structure. The finding that the high CL group profited more from low structure than from either moderate or high structure is consistent with the theoretical analysis suggested by the preferential model.

There have also been some convincing empirical examinations of the Conceptual Level matching model -- by Tomlinson and Hunt (1971), and McLachlan and Hunt (1973). Tomlinson and Hunt defined environmental structure in terms of the ordinal proximity of rules and examples. A condition

in which the examples were followed much later by the rule represented low structure; examples followed soon afterwards by the rule represented moderate structure; and in the high structure condition, the rule preceded the examples. Subjects were Grade 11 students, and composite scores on multiple criteria of learning of the rule were collected. The results indicated that the low CL groups learned more effectively in high high structure than in low and intermediate structure, and learned less than high CL groups in low and intermediate structure. The high CL group tended to show greater learning in low than high structure, and tended to learn less than the low CL group in high structure. However, these results for the high CL group under high structure conditions did not reach significance, and therefore the tendency for disordinal interaction must be interpreted as suggestive rather than strong support for the preferential model.

The study by McLachlan and Hunt used the analysis of a painting by Picasso as the learning task. Low and high CL groups of Grade 11 students were exposed to teaching methods involving both low and high structure. With each method, students viewed slides containing the whole picture, as well as component parts of the picture. In the high structure condition, however, component slides were accompanied by short lectures explaining their significance and meaning; whereas in the low structure condition, students were provided with no

further teaching aids and therefore had to arrive at a meaningful understanding of the picture through their own efforts. Measures were taken of subjective integration -- the extent to which subjects comprehended the central meaning of the picture and were able to integrate the components of the picture into the total meaning. Scores on this measure indicated that low CL students performed significantly better in high structure than in low structure. High CL students however, performed equally well in both high and low structure. In this study then, the interaction obtained was of an ordinal nature, and therefore these results support the compensatory rather than the preferential model.

The findings of these studies provide support for both the preferential and compensatory models. As Hunt (1971) points out, these models are not necessarily mutually exclusive and are not regarded as "...providing highly precise means for deriving hypotheses; rather, they are provisional ways of thinking about person-environment interactions" (Hunt, 1971, p. 44). The major issue is the behaviour of high CL individuals in high structure as compared to low structure conditions. Will they perform equally well in both high and low structure because of their considerable conceptual flexibility, or will their performance be worse in a high structured environment because environmental structure interferes with or holds back the utilization of

their conceptual potential? It is possible that the answer to this question may depend on the specific environmental situation, in which case it will be necessary to provide a scheme for differentiating among environments in more precise fashion than simply the degree of structure. Clearly, the predictive usefulness of the Conceptual Level Matching model would be increased by the development of a more explicit basis for predicting the behaviour of high CL individuals.

Extension of the Conceptual Level Matching Model: The absence of strong disordinal interactions interactions between Conceptual Level and environmental structure in the empirical studies reviewed may be due to the relatively little dynamic force possessed by the Conceptual Level construct. That is, although conceptual structure-environmental structure mismatching may possess implications for cognitive performance, it is possible that it does not lead to any strong affective reactions on the part of the individual. In other words, high CL individuals under high structure may not be particularly disturbed simply because their conceptual structure has not been matched by environmental stimulation. Thus for the highly conceptually complex individual, his Conceptual Level may be of less importance in determining his behaviour than the structure of the environment. Certain types of high environmental structure might be more disturbing than other types, leading decreased performance in some high structure conditions, and

equivalent performance in other high structure conditions. The extent to which the structural aspects of a particular environment are disturbing to the high CL individual may depend on his other personality characteristics. Indeed, Hunt (1970) has extended the Conceptual Level matching model, pointing to the necessity of giving consideration to other characteristics of the learner, as well as his cognitive characteristics.

Thus, in terms of his individual-environment matching analysis, Hunt conceives of the learner as possessing various types of accessibility channels, which are crucial in relating to the environment. The Conceptual Level matching model refers to the learner's cognitive accessibility channel. Other important accessibility channels possessed by the learner relate to his motivational, value, and sensory orientations. In terms of this revised matching model, Hunt points to the necessity of investigating all of the channel characteristics of the learner, in order to obtain effective matching formulas for learner and teaching environment.

It seems, therefore, that the understanding of the interaction between conceptual structure and environmental structure might be improved and prediction facilitated with the use of another appropriate personality variable in conjunction with Conceptual Level. In his review of studies which have been concerned with aptitude-treatment interactions, Bracht (1970) concludes that aptitude-treatment interactions



are more likely to occur when two personological variables are included in the design. If the two personality variables are selected such that one is expected to correlate substantially with success in one treatment, and the other is expected to correlate substantially with success in the second treatment, then a disordinal interaction is likely to be obtained, providing also that the correlation between the personality variables is low.

In considering which personality variables might be of relevance in the analysis of educational settings, it is necessary to examine the dimensions along which teaching environments can vary. Furthermore, finer discrimination among individuals should be matched by finer discrimination among environments. An important characteristic of educational environments, consideration of which may provide further environmental differentiation, relates to the extent to which a learner is able to control his own learning experiences. Clearly, in the construction of a teaching environment, a decision must be made regarding the amount of direction to be imposed on the learner. Focusing on the directiveness-non directiveness characteristics of the environment leads to more precise definition of the environment than can be obtained by consideration of the degree of structure alone. Although, generally, a highly structured environment allows less personal control over learning experiences than a low

structured environment, it is possible to vary the amount of control possessed by a learner in an environment with a given degree of structure. Differentiation of educational environments in terms of the degree of control possessed by the learner, also gives an important advantage in terms of the matching model. It enables a linkage with a congruent personality variable, internal-external control (Rotter, 1966), surrounding which there is a large body of useful empirical evidence.

#### Internal-External Control

The concept of internal-external control (I-E) represents the extent to which an individual believes that events in his life are under his personal control. Such generalized expectancies regarding the locus of control of reinforcements are considered to develop progressively in the process of social learning in a variety of situations. Thus, an internally controlled individual is one who holds the generalized belief that life's outcomes are predominantly the consequence of his own actions. The externally controlled individual, on the other hand, believes that his outcomes are mainly determined by external forces such as chance, fate, or more powerful others. Since I-E refers to expectancies about how reinforcements can be obtained, it can be regarded as both a cognitive and a motivational variable. It possesses cognitive

aspects, since it refers to expectancies, and motivational aspects, since these expectancies concern the attainment of reinforcements. Empirical work has supported this conception of I-E in both cognitive and motivational terms (e.g. Watson & Bauml, 1967).

The conceptualized relationships between internal-external control and a number of behavioural criteria have received extensive empirical validation, and provide strong evidence for the construct validity of the internal-external control concept. Reviews of this work are provided by Lefcourt (1966; 1972), Rotter (1966), Joe (1971), and Minton (1972). The behavioural dimensions which have been shown to be related to the internal-external control construct include four major categories; (1) performance in controlled laboratory tasks; (2) attempts to control the environment; (3) performance in achievement situations; and (4) reactions to social influence. Thus, in comparison to externally controlled individuals, individuals characterized as internally controlled have tended to be: (1) more efficient and more motivated in tasks involving skill rather than chance; (2) more alert to their surroundings and more active in attempting to improve environmental conditions; (3) more involved and persistent in achievement tasks; and (4) both more resistant to attempts at being influenced and more successful in exercising influence over others.

A group of studies within the internal-external control literature which provide support for a conceptualization of I-E in motivational terms are those which have focused on the degree of congruency between one's beliefs concerning the locus of personal control, and the actual degree of personal control that one is afforded in specific situations. Collins, Martin, Ashmore, and Ross (1973) in their review of notions of internality-externality within the field of personality, emphasize the necessity of distinguishing between the extent to which individuals' behaviour actually is subject to internal or external determination of behaviour, and the nature of individuals' beliefs concerning the locus of determination of behaviour. A logical analysis of situations involving control suggests that individuals will tend to prefer those situations which they believe will lead to a maximization of outcomes (Watson & Baumal, 1967). Therefore, internally controlled individuals, believing their reinforcements to be dependent on their own efforts, should prefer situations in which the locus of control resides within themselves. However, externally controlled individuals, believing their reinforcements to be beyond their personal control, should prefer situations in which their outcomes are indeed controlled by others. Watson and Baumal (1967) report results which are consistent with this analysis. They found that internally controlled subjects experienced greater dissatisfaction and

made more errors in a learning task when they believed that they would have no control over their outcomes in a subsequent situation involving shock avoidance. Externally controlled subjects, however, made more errors when they believed that efficient learning performance would enable them to avoid the subsequent shocks.

Studies by Cromwell, Rosenthal, Shakow, and Zahn (1961), Rotter and Mulry (1965), and Hrycenko and Minton (1974) provide additional support for the hypothesized congruency between expected locus of control, and preference for locus of control in a given situation. Cromwell et al. reported that schizophrenic subjects, who were significantly more externally controlled than normal subjects, preferred conditions of external control and performed better under them than did normal, internally controlled subjects. Rotter and Mulry in their study, using college students, found that internally controlled subjects preferred rewards obtained by their own efforts, while externally controlled subjects preferred rewards which emanated from external sources. Hrycenko and Minton, also using college students, obtained a disordinal interaction between internal-external control and power position, in the determination of satisfaction in task-oriented male groups (though the same pattern of results did not apply for female groups). Thus, internals preferred the high power to the low power position, and were also more satisfied than externals in

the high power position. Externals on the other hand, preferred the low power position to the high power position, and were also more satisfied than internals in the low power position.

Correlational evidence of a relation between expected and preferred locus of control has been reported by Schneider (1968). He obtained a high correlation between internal-external control and a forced-choice "Activity Preference Scale" composed of pairs of skill and chance activities. Internally controlled individuals preferred activities which demanded skill, while externally controlled individuals preferred activities based on chance factors.

These studies indicate that greater positive affect is associated with situations in which the actual locus of control is congruent with the subject's expectancy, than with situations in which actuality and expectancy are incongruent. Therefore, an individual's locus of control expectancies may be considered to possess some motivational implications for him, in terms of the degree of environmental control, that he will prefer. Thus, in an environment which possesses control as well as structural implications, I-E is a personality variable which it seems might usefully be employed in conjunction with Conceptual Level to increase the predictive power of the latter. Furthermore, these two personality variables appear to satisfy the requirements

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stipulated by Bracht (1970) for increasing the likelihood of disordinal aptitude-treatment interaction. These were: a low correlation between the two personality variables, and substantial correlations between one personality variable and success in treatment A, and between the other personality variable and success in treatment B. Consistent with these stipulations, Hunt (1970) has reported a low correlation (.12) between internal control and Conceptual Level. Secondly, the evidence which has been reviewed suggests that while Conceptual Level correlates very highly with performance in low environmental structure, predictions for high environmental structure are uncertain. However, where environmental structure also involves significant levels of actual internal or external control, I-E has been shown to be an effective predictor of performance under high structure or external control conditions.

In a study involving the teaching of reading skills to primary school children, Grimes and Allinsmith (1961) have demonstrated the additional effectiveness of using two personality variables in combination to predict performance in different environmental structures. Anxiety and compulsivity were the two personality variables, and these were found to interact with one another and with environmental structure, in determining performance (the acquisition of reading skills). With a high structured teaching

method, compulsive children performed better than non-compulsive children irrespective of anxiety level, while with a low structured teaching method, low anxiety children performed worse than high anxiety children irrespective of degree of compulsivity.

Lefcourt (1973) has emphasized that I-E is only one element of a behavioural prediction formula, also including reinforcement value and situational determinants. Therefore, he has pointed out that use of locus of control as the sole predictor of given criteria is unlikely to result in high magnitude relationships with these criteria. In his review of studies which have been concerned with the relationship between I-E and cognitive activity, Lefcourt (1973) concludes that I-E by itself is only a weak predictor of cognitive activity. However, though accounting for only a limited part of the variance in the performance of cognitive tasks, the contribution of I-E tends to be very reliable. There is evidence that internals tend to be more cognitively active than externals, and engage in more extensive information-processing, including more comparisons with past experience (Lefcourt, 1973).

In an attempt to increase the predictive power of I-E for cognitive tasks, Lefcourt and Telegdi (1971), and Lefcourt, Gronnerund, and McDonald (1973) have used I-E in conjunction with field dependence-independence, as predictor



variables. In the first study, neither I-E nor field dependence-independence alone, produced a significant main effect in the prediction of cognitive activity. However, the combination of these personality variables did enable significant prediction of performance on a number of cognitive measures. Consistent with prediction, the internal-field independent group showed the highest performance. Somewhat surprisingly, the other congruent group (external-field dependent) showed the next best performance, with the two incongruent groups (internal-field dependent, and external-field independent) scoring poorest on each measure. The researchers discussed these results in terms of performance being best when expectations were in line with actual cognitive abilities. Thus, even external-field dependent subjects would perform better than subjects whose expectations did not accurately reflect their cognitive skills, according to this reasoning.

The second study investigated the onset of awareness in a double entendre task. Again, I-E and field dependence-independence in combination, provided better prediction of behaviour than either personality variable alone. However, although the internal-field independent group showed the earliest awareness, the results for the other three groups did not fall into any clear-cut pattern.

Butterfield (1964) has also provided evidence indicating

that the usefulness of I-E can be increased by combining it with another personological variable. He found that children's school achievement behaviour could be predicted more accurately by a combination of I-E and a measure of the discrepancy between students' and teachers' conceptions of appropriate achievement striving behaviour, than by I-E alone. Where there was no discrepancy between students' and teachers' achievement values, internals achieved as well or better than externals. However, where students' achievement values differed from those of the teacher, externals showed greater higher achievement than internals.

#### CL, I-E, and Environmental Structure

The empirical findings relating to the Conceptual Level matching model suggest that this cognitive variable alone does not possess sufficient strength to enable clear predictions in situations involving a high degree of environmental structure. Consequently, no clear disordinal interactions have been obtained between Conceptual Level and environmental structure. Similarly, I-E when considered alone is unlikely to be a powerful predictor of cognitive performance. However, the evidence indicates that superior prediction of cognitive criteria can be achieved by using I-E in conjunction with another relevant personality variable.

In view of the evidence indicating that the expected

locus of control is also the preferred locus of control, externals may be expected to feel more satisfied than internals in a high environmental structure condition, in which the locus of control is external. Analogously, the converse will hold in a condition of low environmental structure, in which the locus of control is internal. It is suggested therefore, that the internal-external control construct can provide the motivational component lacking in the Conceptual Level construct, and lead to interactions of a disordinal nature with appropriate environmental variables. The use of the cognitive variable, Conceptual Level, together with the cognitive-motivational variable, internal-external control, should therefore enable more powerful prediction of performance in environments which vary along dimensions of both directiveness-non directiveness and degree of structure, than can be achieved by either variable alone. In the present study, then, the high structured environment is such that relatively little personal control over learning experiences is possible, while the low structured environment allows comparatively greater personal control over learning experiences.

Theoretical considerations, and correlational evidence, indicate that a congruent personality structure for an individual consists either of high Conceptual Level and internal control, or low Conceptual Level and external

control. It is hypothesized, that for these groups of subjects, whose personality structure is congruent, there will be a disordinal interaction between Conceptual Level and environmental structure, in the determination of cognitive performance. Specifically, it is predicted that: (a) high CL-internal subjects will perform better in a low environmental structure than in a high environmental structure; (b) low CL-external subjects will perform better in a high environmental structure than in a low environmental structure; (c) high CL-internal subjects will perform better in a low environmental structure than will low CL-external subjects; (d) low CL-external subjects will perform better in a high environmental structure than will high CL-internal subjects.

No interaction between Conceptual Level and environmental structure is predicted for the groups of subjects whose personality structure is incongruent (i.e. high CL-external control; low CL-internal control). The personality variables of CL and I-E are expected to confound each other's effects on the performance of these incongruent subjects. Thus, specifically, it is predicted that the performance of these two groups will not be affected by the structural differences in the environment, and will therefore be similar, falling in between the two congruent groups' performance in each environmental condition. The postulated form of the interactions between CL and environmental structure for both congruent and

incongruent subjects is presented diagrammatically in Figure 1  
(on page 57).

## CHAPTER II

### METHOD

#### Subjects

The subject sample comprised 130 male high school students from Grade 11 English classes, in Windsor. In order to obtain a sample of this size it was necessary to draw subjects from two high schools. With the aid of the Windsor School Board, two schools similar in the predominant socio-economic class of students and general teaching climate, were selected. One school (Herman) provided 81 subjects, and the other school (Riverside) 49 subjects.

It was decided to select subjects from Grade 11 in order to make the findings comparable with the previous research of Tomlinson and Hunt (1971), and McLachlan and Hunt (1973). Furthermore, strong evidence is available for this age range, regarding the reliability and validity of the prospective measures of both Conceptual Level (Hunt, 1971), and internal-external control (Nowicki & Strickland, 1973).

#### Measurement of Conceptual Level

The Paragraph Completion test (Hunt et al., 1968) was used to assess Conceptual Level. This test consists of six incomplete sentences which are considered likely to arouse some uncertainty in the individual, and therefore require conceptual work on his part in order to resolve them, e.g.

"What I think about rules..."; "When I am criticized..."; "What I think about parents..."; "When someone disagrees with me..."; "When I am not sure..."; and "When I am told what to do...". The respondent is required to complete a paragraph beginning with each of these phrases. The response to each item is coded on a scale from 0-3, using the scoring manual of Hunt et al. (1968). In accord with the procedure suggested by Schroder et al. (1967), and employed by Hunt, a subject's score was calculated by taking the mean of his highest three item scores. With this scoring method, there is less likelihood of a subject's score underestimating his true Conceptual Level, if he showed less interest, or expended less effort, in responding to a few of the items. All protocols were scored independently by two raters, with reconsideration of responses occasioning disagreement. The inter-rater reliability was .77.

#### Measurement of Internal-External Control

For adults, the most commonly used measure of I-E has been the scale developed by Rotter (1966). Several tests have been developed in an attempt to measure locus of control expectancies for children. Bialer (1961) developed a paper-and-pencil measure consisting of 23 items, requiring yes-no answers. Battle and Rotter (1963) constructed a projective measure, termed the Children's Picture Test of Internal-External Control. Crandall, Katkovsky, and Crandall (1965)

developed a more specific measure of I-E -- the Intellectual Achievement Responsibility Questionnaire -- designed to tap children's expectancies of locus of control in intellectual-academic achievement situations. After a review of the psychometric evidence relevant to these tests, Nowicki and Strickland (1973) concluded that none offered a satisfactory measure of generalized locus of control expectancies in children. Thus, Bialer's scale possesses questionable reliability, and fails to exclude the possibility of response style effects. The Battle and Rotter measure is not supported by adequate evidence of reliability, and is difficult to administer to groups. There is more promising psychometric evidence for the Crandall et al. scale, but this scale measures specific rather than generalized expectancies of locus of control.

In an attempt to fill the need for a reliable and valid measure of children's locus of control expectancies, Nowicki and Strickland (1973) have carried out a programme of research which has resulted in the development of the Nowicki-Strickland Locus of Control scale. This is a 40 item questionnaire, requiring yes-no answers. Validation studies have indicated that this scale possesses satisfactory reliability and validity for children in Grades 3-12. With regard to Grade 11 subjects, Nowicki and Strickland report a test-retest reliability (for a six-week period) of .75, and a split-half reliability (corrected by the Spearman-Brown formula) of .74. Since the test is



additive, and items are not comparable, the split-half reliability actually underestimates the true internal consistency of the scale, which is therefore regarded as satisfactory. Non-significant correlations between this scale and measures of social desirability and intelligence, provide evidence of discriminant validity. Nowicki and Strickland also provide substantial support for the construct validity of the scale. In accord with prediction, there are significant though not high correlations between this scale and the Bialer and Battle and Rotter tests for samples of children, and between an adult form of the scale and the Rotter scale for college student samples. The predicted increase in internality with age was obtained, and with regard to behavioural criteria, internality on this scale was associated with academic competence, social maturity, and independent, striving, self-motivated behaviour. In view of the aforementioned evidence, it was felt that the Nowicki-Strickland scale (see Appendix A) would provide a satisfactory measure of the generalized locus of control beliefs of a Grade 11 population.

#### Materials

All subjects were required to learn the well-known social psychological principle of Cognitive Dissonance (Festinger, 1957). It seemed that this principle would offer a good measure of the concept learning capacities of Grade 11

subjects, without making curriculum specialization differences salient (since the principle is taken from an extra-curricular subject area). This principle was of sufficient complexity to provide Grade 11 subjects with a genuine concept learning task, which at the same time possessed some relevance to everyday situations. Furthermore, Tomlinson and Hunt (1971) employed the same concept learning task, which meant that the comparison of findings between studies would be facilitated. Following Tomlinson and Hunt, Cognitive Dissonance was defined as follows:

"Cognitive Dissonance is a concept used to refer to the state of discomforting tension felt by a person when he experiences a contradiction within himself. This contradiction may be between attitudes or beliefs he holds or decisions he makes; in general a person tries in various ways to reduce any cognitive dissonance he may experience.

Five examples of this rule in narrative form were provided (see Appendix B).

#### Procedure<sup>1</sup>

The study consisted of four experimental sessions. The two experimenters for the first session, involving the administration of the personality tests, differed from the two experimenters for the other sessions, in order to prevent possible connection by subjects of personality tests with

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<sup>1</sup> The general experimental methodology for this study was based on that used by Tomlinson and Hunt (1971), with some minor modifications.

later experimental treatments. The course content of class-time in which experimental treatments were administered was kept constant (all experimental sessions were carried out during English periods), in order to control for possible differences in demand characteristics associated with different subject matters.

Contact was made with the principals of the two schools involved, and the aims and requirements of the study were explained to them. Board of Education regulations required parents of all subjects to sign forms agreeing to their sons' participation in the study. Therefore, the principals arranged for teachers to inform subjects of the study in very general terms, referring to it as a "University of Windsor Research Project".

Session 1: The identical procedure was followed in both schools. The schools had arranged for all subjects to be assembled in one room, and the Nowicki-Strickland Locus of Control scale, and the Paragraph Completion test, in that order, were administered by two experimenters. This order of presentation (objective test followed by projective test), it was felt, would be the less fatiguing one. Subjects were told that the purpose of administering these questionnaires was to obtain data concerning the attitudes of high school students toward various personally and socially relevant issues.

Session 2: One week after the first session, subjects

were again re-assembled in one room, by two different experimenters. Subjects were told that they were participating in a study designed to investigate how rules, or principles, were learned. This was a learning session, the experimenters would be returning on two future occasions within about a week, and again about three weeks later, to test how well the principle had been learned. The classroom group was then randomly split in half, and half the students were asked to go to another room. Each group then received one of two experimental treatments. One treatment was designed to set up a condition in which subjects were required to perform a learning task under a high degree of structure, with little control over their learning activities. The other treatment was designed to set up a condition in which subjects were provided with a low degree of structure to perform their learning task, and possessed a relatively greater degree of control over their learning activities.

High Structure Condition: Presentation of a rule followed by examples of the rule may be considered to constitute a learning situation with a high degree of structure (cf. Tomlinson & Hunt, 1971). In this condition, then, subjects were initially presented with the definition of Cognitive Dissonance, which they were allowed to study for two minutes. Since it was desired to create a condition in which subjects also possessed relatively little control over their learning

experiences, the narrative examples were then presented one at a time on separate sheets, and subjects were allowed two minutes to study each example. This means that subjects had no control over the distribution of the ten minutes example-time, in terms of either order of examples studied, or the amount of time spent on each example, both being determined by the experimenter. After the study of the examples was completed, subjects were given five minutes to write down examples of personal experiences similar to those in the narratives. The definition of Cognitive Dissonance was then redistributed, and the experimenter explained briefly how each of the examples illustrated the definition. The experimental session was concluded with the distribution of a brief questionnaire (see Appendix C). Subjects rated their learning performance, their interest in the learning task, and the importance they attached to good performance on the learning task, in terms of seven-point scales. Finally, they wrote down a definition of Cognitive Dissonance in their own words.

Low Structure Condition: The presentation of examples of a rule, without providing a definition of the rule, requires subjects to form their own conception of the rule. A learning situation of this type may therefore be considered to reflect a low degree of environmental structure (cf. Tomlinson & Hunt, 1971). In this condition, then, subjects were presented immediately with the narrative examples and instructed to

search for "recurring instances of similar types of personal experience." Subjects were able to exercise relatively greater control over their learning experiences in this condition, since all the examples were presented together, and subjects could determine for themselves the order in which they studied the examples, and the manner in which they distributed the time allowed. After the ten minutes was over, subjects were asked to write down what they thought the examples had in common, and then were given five minutes to write down examples of personal experiences similar to those in the narratives. The definition of Cognitive Dissonance was then distributed, and subjects were allowed two minutes to study it. As in the high structure condition, the experimenter then explained how each of the examples illustrated the definition, and subjects completed the questionnaire previously described.

By staggering the starting times of the two experimental conditions, it was possible for the same person (the author) to act as the chief experimenter in both conditions, with the other experimenter acting as an assistant. This was done in order to avoid the possibility of experimenter-condition interaction effects.

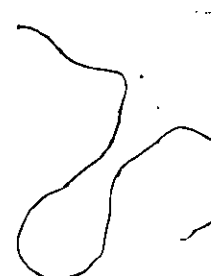
Session 3: The design of the study originally called for this session to follow one week after the second session. However, practical difficulties in the schools made it necessary to hold this session eight days after the second

session for the larger of the two schools, and twelve days after the second session for the smaller school. Session 3 was the first test-of-learning session. Subjects were re-assembled in one room, and asked: (1) to write down a definition of Cognitive Dissonance; (2) as many of the narrative examples as they could recall; and, (3) one example of their own, involving themselves or others, to illustrate the principle of Cognitive Dissonance.

Session 4: This was the second and final test-of-learning session, and for both schools it was conducted thirty days after the learning (second) session. Subjects were again re-assembled, and the same procedure as in Session 3 was followed. A short de-briefing completed this session. The de-briefing concentrated on the connection between different teaching methods and learning performance. It was felt that the personality testing aspects of the experiment should not be divulged to subjects, since adequate explanation and alleviation of personal concerns would have required individual interviews.

#### Scoring of Concept Learning

The definitions and examples of Cognitive Dissonance produced by subjects were scored from 0-4, according to the degree to which subjects' responses reflected comprehension of the operation of the principle of Cognitive Dissonance. The



following aspects of this principle were considered to be of central importance in the scoring:- the inner contradiction experienced between cognitive elements, the discomforting tension aroused, and the attempts to resolve this tension. Each subject received a score for his definition, for each example he recalled, and for the example he produced. An overall learning score was then calculated for each subject, by averaging his definition score, his highest score among examples recalled, and the score for his own example. As in the Tomlinson and Hunt (1971) study, it was felt that this overall learning score represented the learning measure which was the most relevant dependent variable for testing the interaction hypothesis. This overall measure of concept learning takes into account both the subject's retention of the rule, and also his understanding of the practical operation of the rule, through his ability to recall an instance of the rule, and to generate his own instance of the rule. The inter-rater reliability for the overall learning scores of forty randomly selected subjects was .93.



## CHAPTER III

### RESULTS

All subjects were classified into one of four groups on the basis of their responses to the personality questionnaires: high CL-internal; low CL-external; high CL-external; or, low CL-Internal. Conceptual Level scores for the total sample of subjects ( $n=130$ ) ranged from 0.66 to 2.33, with a mean of 1.21, and I-E scores ranged from 5 to 27, with a mean of 13.92 (the correlation between CL and I-E was .23,  $p < .05$ ). In order to retain a sufficient number of subjects for meaningful analysis, it was necessary to perform median splits on the distributions of CL and I-E scores. In the distribution of CL scores, 1.16 and 1.33 were the adjacent median points. Scores of 1.33 and higher were therefore classed in the high CL group, while scores of 1.16 and lower were classed in the low CL group. On the Nowicki-Strickland Locus of Control scale, scores of 14 and above were classed as external, while scores of 13 and below were classed as internal. The grade-point averages of members of the low CL and high CL groups were compared, and several subjects were eliminated, in order to assure that these groups were similar in school learning performance. The mean grade-point percentage for the high CL group was 69, while for the low CL group it was 66.9. The CL groups were also matched as far as possible for socioeconomic class, which

was defined in terms of fathers' occupations. Occupation is one of the economic criteria commonly used to define social class (cf. Watson 1966), and information relating to parental occupations was readily available. In terms of this classification scheme, all of the remaining subjects following matching, came from the Upper Middle (characterized by professional, business, and managerial occupations), Lower Middle (white-collar and skilled worker occupations), and Upper Lower (service and semi-skilled worker occupations) classes.

Since subjects experienced either a high or low structure learning treatment, the data were organized in terms of the four personality groupings and the two learning treatments, to yield eight experimental groups in all, for analysis purposes. The mean CL and I-E scores for these groups are shown in Table 1. Table 2 gives the mean overall learning scores for

TABLE 1

## Mean CL and I-E Scores for Experimental Groups

Personality	Environment			
	High Structure		Low Structure	
	CL	I-E	CL	I-E
High CL-Internal	1.69	10.00	1.75	10.20
High CL-External	1.60	17.80	1.47	16.70
Low CL-External	1.07	17.50	0.97	18.30
Low CL-Internal	1.03	10.40	1.02	10.90

TABLE 2

## One Week Post-Test Learning Scores

High Structure			Low Structure		
<u>Personality</u>	<u>Mean Score</u>	<u>n</u>	<u>Personality</u>	<u>Mean Score</u>	<u>n</u>
High CL-Internal	1.417	9	High CL-Internal	2.037	12
High CL-External	1.700	9	High CL-External	1.037	10
Low CL-External	1.139	11	Low CL-External	0.970	12
Low CL-Internal	1.250	14	Low CL-Internal	1.024	16

these groups, as obtained on the one week post-test (Session 3). The possible range for these learning scores was 0 to 4.

Tables 3, 4, and 5 (on pages 51, 52, and 53, respectively) give the mean scores for experimental groups' estimates of their learning performance, their interest in the learning task, and the subjective importance of performing well on the learning task, as reflected by the questionnaire responses obtained in Session 2.

A 2 x 2 x 2 x 2 (Conceptual Level x Internal-External Control x Environmental Structure x Schools) analysis of variance was performed on the one week post-test learning scores. Schools were included as an independent variable in this initial analysis, because of the possibility that there might be general environmental differences between the schools, even though the schools were similar in social class. The

TABLE 3

## Estimated Performance on the Learning Task

High Structure		Low Structure	
<u>Personality</u>	<u>Mean Score</u> <sup>a</sup>	<u>Personality</u>	<u>Mean Score</u>
High CL-Internal	2.250	High CL-Internal	2.222
High CL-External	2.200	High CL-External	2.000
Low CL-External	2.750	Low CL-External	2.727
Low CL-Internal	2.625	Low CL-Internal	3.714

<sup>a</sup>Scores could vary from 1 (high) to 7 (low).

TABLE 4  
Interest in the Learning Task

High Structure		Low Structure	
<u>Personality</u>	<u>Mean Score</u> <sup>a</sup>	<u>Personality</u>	<u>Mean Score</u>
High CL-Internal	2.417	High CL-Internal	2.556
High CL-External	1.700	High CL-External	2.222
Low CL-External	2.083	Low CL-External	3.182
Low CL-Internal	3.000	Low CL-Internal	3.143

<sup>a</sup>Scores could vary from 1 (high) to 7 (low).

TABLE 5  
Importance of Doing Well on the Learning Task

High Structure		Low Structure	
<u>Personality</u>	<u>Mean Score</u> <sup>a</sup>	<u>Personality</u>	<u>Mean Score</u>
High CL-Internal	2.917	High CL-Internal	2.333
High CL-External	2.500	High CL-External	2.111
Low CL-External	2.167	Low CL-External	3.091
Low CL-Internal	3.250	Low CL-Internal	3.714

<sup>a</sup>Scores could vary from 1 (high) to 7 (low).

summary analysis of variance table is presented in Table 6 (page 55). It can be seen that there is a significant main effect due to Conceptual Level, and a significant Conceptual Level x Internal-External Control x Environmental Structure interaction effect. The Internal-External Control x Environmental Structure x Schools interaction effects just fails to achieve significance. The significant main effect indicates that high Conceptual Level subjects learned better than low Conceptual Level subjects, regardless of environmental structure. The triple CL x I-E x Environmental Structure interaction effect (the relevant cell means are shown in Table 2, page 50) is consistent with the prediction that for subjects congruent as distinct from incongruent in personality structure (in terms of CL and I-E), there would be an interaction between CL and environmental structure, in determining learning performance. It was predicted that this interaction would be of a disordinal nature, with high CL-internals learning better in low than in high structure, and learning better than low CL-externals in low structure. While low CL-externals would learn better in high structure than in low structure, and learn better than high CL-internals in high structure. These predictions were tested by means of one-tailed t-tests. The results of these analyses provided support for two of the predictions. Thus, high CL-internal subjects learned better in low than in high structure ( $p < .05$ ), and learned better than low CL-

TABLE 6

Summary of the Analysis of Variance of One Week  
Post-Test Learning Scores

Source of Variation	df	MS	F
Conceptual Level (A)	1	4.300	6.449**
Internal-External Control (B)	1	0.725	1.087
Environmental Structure (C)	1	0.304	0.456
Schools (D)	1	0.058	0.086
A x B	1	0.245	0.368
A x C	1	0.231	0.346
A x D	1	0.506	0.758
B x C	1	1.379	2.068
B x D	1	0.298	0.446
C x D	1	0.620	0.930
A x B x C	1	2.726	4.088**
A x B x D	1	1.358	2.036
A x C x D	1	0.602	0.903
B x C x D	1	2.427	3.639*
A x B x C x D	1	0.207	0.310
Error	77	0.667	

\*  $p < .10$

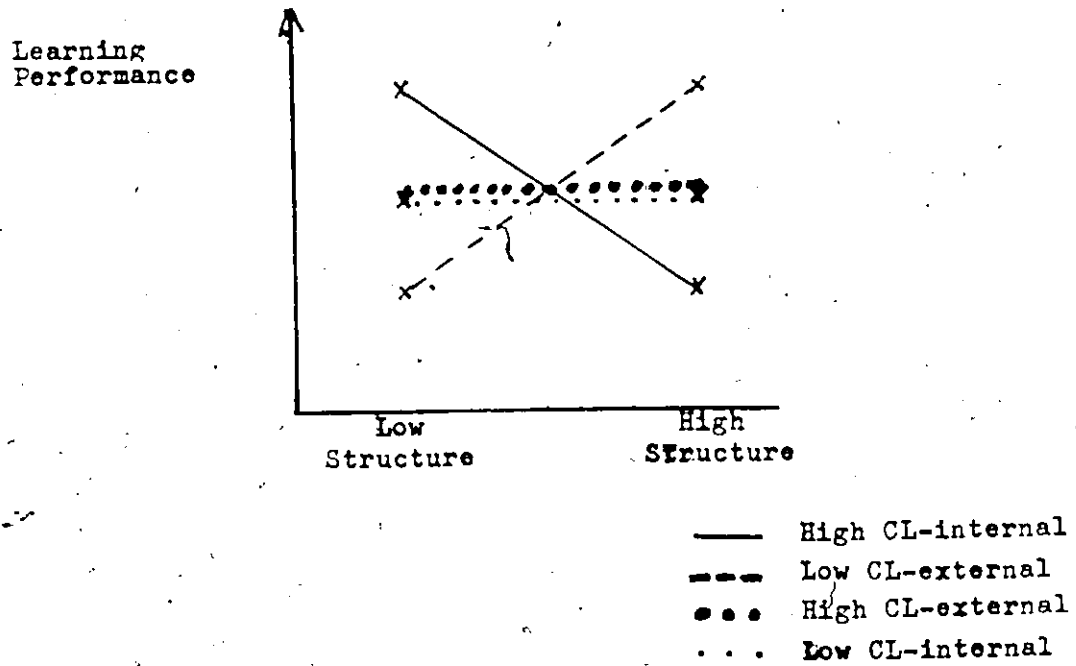
\*\*  $p < .05$



externals in low structure ( $p < .01$ ). Although low CL-external subjects tended to learn better in high structure, compared to low structure, this difference did not reach statistical significance. Contrary to prediction, low CL-external subjects tended to show inferior learning in the high structure environment, compared to high CL-internal subjects, though this effect too, fell short of significance. The form of the predicted and obtained triple interaction effects are illustrated graphically in Figure 1 (page 57).

The only effect of schools on learning performance, which approached significance, was a three-way I-E x Environmental Structure x Schools interaction ( $p < .06$ , see Table 6). Investigation of this effect by the Duncan Multiple Range Test indicated that it was due mainly to internals in the high structure condition at Riverside school learning better than externals in the low structure condition at Herman school. Since schools did not appear to affect learning performance in any major fashion, it was decided to eliminate schools as an independent variable, in the analysis of the one month post-test learning scores collected in Session 4. Unfortunately, about a third of the subjects from Session 3 failed to appear for Session 4, so that  $n$  for this session was only 62. Table 7 (page 58) gives the pattern of one month post-test learning scores for the experimental groups, and the results of the analysis of variance of these scores are summarized in Table 8 (page 59).

## (i) Predicted Interaction



## (ii) Obtained Interaction

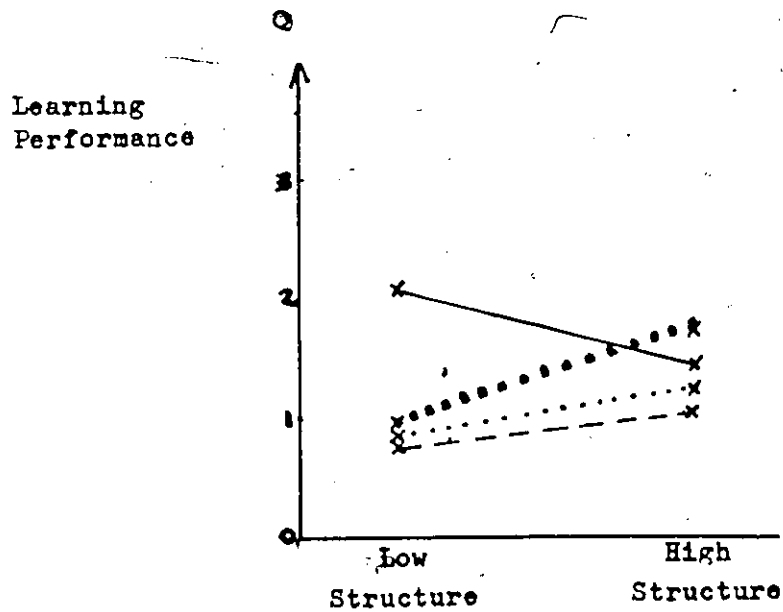


Figure 1 Predicted and Obtained Interactions Between CL, I-E, and Environmental Structure.

TABLE 7

## One Month Post-Test Learning Scores

High Structure			Low Structure		
<u>Personality</u>	<u>Mean Score</u>	<u>n</u>	<u>Personality</u>	<u>Mean Score</u>	<u>n</u>
High CL-Internal	1.298	9	High CL-Internal	1.388	6
High CL-External	1.286	7	High CL-External	0.833	6
Low CL-External	1.259	9	Low CL-External	0.722	6
Low CL-Internal	1.199	10	Low CL-Internal	0.889	9

Inspection of Table 8 indicates that the independent variables had no significant effect on concept learning scores obtained one month after initial learning.

After study of the examples was complete, subjects in the low structure condition were asked to write down their guess concerning the nature of the rule underlying the examples. However, only a small number of subjects offered a guess. Of the guesses that were made, only three were scored higher than zero, in terms of comprehension of the Cognitive Dissonance principle. Each of these three guesses obtained a score of 1 out of the maximum of 4. It is clear, that in the low structure condition, subjects were not able to form an accurate impression of the rule, after simply a study of examples of the rule.

In order to examine the overall effects of personality

TABLE 8

Summary of the Analysis of Variance of One Month  
Post-Test Learning Scores

Source of Variation	df	MS	F
Conceptual Level (A)	1	0.424	0.708
Internal-External Control (B)	1	0.225	0.376
Environmental Structure (C)	1	1.429	2.388
A x B	1	0.165	0.275
A x C	1	0.220	0.367
B x C	1	0.515	0.860
A x B x C	1	0.093	0.155
Error	54	0.600	

variables and environmental treatments, a multivariate analysis of variance was performed, with responses to the three questionnaire items and the one week post-test learning scores, as dependent variables. The results of this  $2 \times 2 \times 2 \times 2$  (Conceptual Level  $\times$  Internal-External Control  $\times$  Environmental Structure  $\times$  Schools) analysis are summarized in Table 9 (page 61). It can be seen that there is a highly significant multivariate main effect due to Conceptual Level, reflecting the significant univariate CL effects on each dependent variable. Thus, high CL subjects, as compared to low CL subjects, estimated that they had learned better, showed greater interest in the learning task, felt it was more important to do well, and also were superior in actual concept learning. The significant multivariate effect due to I-E appears to be the result of significant univariate effects for two of the dependent variables. Inspection of Tables 4 and 5 shows that externals were more interested in the learning task than internals, and considered that it was more important to perform well on the learning task. The significant multivariate effect of environmental structure is accounted for primarily by the interest variable. Inspection of Table 4 indicates that subjects were generally more interested in the high structure than the low structure environment, regardless of personality.

The univariate interaction effects underlying significant

TABLE 9

## Summary of the Multivariate Analysis of Variance

Source of Variation	Multivariate		Univariate <sup>a</sup>				
	df	F	df	F	F	F	F
				Var.1	Var.2	Var.3	Var.4
CL (A)	4,74	6.52***	1,77	14.39***	14.93***	6.05*	6.45*
I-E (B)	4,74	2.80**	1,77	1.85	8.70***	7.03**	1.09
Environment (C)	4,74	2.12*	1,77	2.14	7.63**	0.53	0.46
Schools (D)	4,74	0.28	1,77	0.78	0.50	0.80	0.09
A x B	4,74	0.56	1,77	0.34	0.07	1.03	0.37
A x C	4,74	1.75	1,77	3.07*	0.53	5.82*	0.35
A x D	4,74	0.59	1,77	0.89	0.09	0.08	0.76
B x C	4,74	4.06**	1,77	2.25	5.17**	0.84	2.07
B x D	4,74	0.34	1,77	0.00	0.20	0.69	0.45
C x D	4,74	2.21*	1,77	7.56**	2.43	3.89*	0.73
A x B x C	4,74	1.76	1,77	0.79	1.03	0.28	4.09**
A x B x D	4,74	1.14	1,77	0.14	0.00	1.89	2.03
A x C x D	4,74	0.56	1,77	1.35	0.07	0.27	0.90
B x C x D	4,74	2.05*	1,77	1.18	2.29	3.93*	3.64*
A x B x C x D	4,74	2.87**	1,77	0.18	10.00***	1.53	0.31

<sup>a</sup>Var. 1 refers to estimated learning performance; Var. 2 to interest in the learning task; Var. 3 to the importance of doing well on the learning task; and, Var. 4 to actual learning performance on the one week post-test.

\*p < .10

\*\*p < .05

\*\*\*p < .01

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

multivariate interactions were investigated by means of the Duncan Multiple Range test. These analyses indicated that the multivariate I-E x Environmental structure effect was mainly due to externals in the high structure condition showing greater interest than any other group. The Environmental Structure x Schools effect was caused by subjects in the low structure condition at Riverside giving lower estimates of their learning performance, and attaching less importance to their performance than other groups. The multivariate three-way and four-way interaction effects were both due to complex patterns of group differences affecting mainly the importance and interest variables, respectively.

Inspection of the pattern of results arising from the multivariate analysis of variance suggested that the three questionnaire variables might be related. Therefore the correlations between the four dependent variables were calculated -- the correlation matrix is presented in Table 10 (page 63). This table shows that the questionnaire variables were interrelated, and highly unrelated to the learning performance variable. Responses to these three questionnaire items were factor analysed by the Principal Components method, and one major factor, accounting for 70.3% of the total common variance among questionnaire responses, emerged. The loadings of each questionnaire item on this factor were all high and approximately equal. These loadings were .82, .84,

TABLE 10

## Correlation Matrix for the Dependent Variables

	Var.1	Var.2	Var.3	Var.4
Var.1 (Estimated Performance)	_____	.518	.561	-.150
Var.2 (Interest)	.518	_____	.586	-.114
Var.3 (Importance)	.561	.586	_____	-.102
Var.4 (Actual Performance)	-.150	-.114	-.102	_____

and .86, for the estimate of performance, interest, and importance items, respectively. This general Confidence in Performance-Interest-Involvement factor was labelled "Satisfaction". It was felt that interpretation of the findings would be simplified by considering subjects' factor scores on this Satisfaction factor, as well as their responses to individual questionnaire items, in the analysis of results. A 2 x 2 x 2 x 2 analysis of variance was performed on these factor scores (see Appendix D), and the results of this analysis are summarized in Table 11 (page 64).

It can be seen from Table 11 that all main effects for Satisfaction factor scores are significant. Thus, high CL subjects were generally more satisfied than low CL subjects, externals were generally more satisfied than internals, and the high structure environment appeared to be more satisfying



TABLE 11

Summary of the Analysis of Variance of Scores  
on the Satisfaction Factor

Source of Variation	df	MS	F
Conceptual Level (A)	1	12.392	17.360****
Internal-External Control (B)	1	5.925	8.300***
Environmental Structure (C)	1	2.882	4.038**
Schools (D)	1	0.759	1.063
A x B	1	0.238	0.334
A x C	1	3.048	4.270**
A x D	1	0.109	0.153
B x C	1	0.323	0.452
B x D	1	0.218	0.306
C x D	1	4.881	6.838***
A x B x C	1	0.049	0.068
A x B x D	1	0.392	0.549
A x C x D	1	0.474	0.664
B x C x D	1	2.610	3.656*
A x B x C x D	1	2.746	3.847*
Error	77	0.712	

\*p &lt; .10

\*\*p &lt; .05

\*\*\*p &lt; .01

\*\*\*\*p &lt; .001

generally, than the low structure environment. The significant interaction effects were examined further by means of the Duncan Multiple Range test. The CL x Environmental Structure interaction appeared to be due to the greater satisfaction of high CL subjects in both environmental treatments, compared to low CL subjects, and the greater satisfaction of low CL subjects in high, as compared to low structure. The Environmental Structure x Schools interaction effect is accounted for by the lesser satisfaction of subjects in the low structure environment at Riverside, in comparison to all other groups. The lesser satisfaction of internals in the low structure environment at Riverside, compared to other groups, appears to underlie the triple interaction between I-E, Environmental Structure, and Schools, which almost reaches significance. The complex four-way interaction appears to be due mainly to the lesser satisfaction of low CL-external subjects in the low structure environment at Riverside, as compared to most of the other experimental groups.

## CHAPTER IV

### DISCUSSION

It was hypothesized that the use of the internal-external control personality variable in combination with Conceptual Level would enable more precise prediction of the learning performance of students in differently structured teaching environments. In comparison to previous findings, clearer evidence of disordinal interaction between CL and environmental structure was expected, for those students whose level of internal-external control was congruent with their Conceptual Level. Whereas, no interaction effects were predicted for the learning performance of students whose internal-external control and Conceptual Level characteristics were incongruent.

The significant Conceptual Level x Internal-External Control x Environmental Structure interaction effect that was obtained for one week post-test learning scores is therefore consistent with expectation. Two of the four specific predictions which were made regarding this interaction are supported by the findings. As predicted, high CL-internal subjects learned better in low structure than in high structure, and learned better than low CL-external subjects in low structure. The tendency of low CL-external subjects to learn better in high structure than in low structure is in the direction predicted, though failing to achieve statistical

significance. The tendency of high CL-internal subjects to show superior learning performance in the high structure environment, as compared to low CL-external subjects, is contrary to prediction, though insignificant statistically.

The results showed that high CL subjects generally learned better than low CL subjects. Internal-external control and environmental structure, however, did not significantly affect learning performance. It appears that Conceptual Level was a much stronger determinant of learning performance in the teaching environments used in this study than internal-external control. However, it is interesting to note that though the high CL-internal students showed easily the best learning performance in the low structure environment, in the high structure environment, it was high CL-external subjects who learned best. High CL-external subjects were considerably superior in learning performance in the high structure as compared to the low structure environment, though this difference just fails to achieve significance, according to the Duncan New Multiple Range test. It seems then, that internal-external control may have provided some additional discriminatory power to the Conceptual Level dimension, at least at the upper reaches of this dimension. Given the overall superior learning performance of high CL students, externally controlled high CL students appear to be better matched to a high structure teaching environment, while internally controlled high CL

students are better matched to a low structured teaching environment. However, a low degree of conceptual differentiation may depress the learning performance of students to such an extent that other individual characteristics become relatively insignificant in their further effects on learning.

Concept learning scores after one month were collected in order to obtain some empirical evidence concerning the long-term generality of the learning effects expected after one week. However, the learning performance of subjects in the one month post-test did not demonstrate the same pattern of effects as learning performance in the one week post-test. The findings indicate that there were no significant first-order or interaction effects. In view of the brevity of the teaching intervention, it is not surprising that learning effects did not hold up over a one month period. Furthermore, this final testing session was held toward the end of the school year which led to some administrative difficulties due to conflicts with school examinations. Because of this conflict, students might have been less concerned with their learning performance in this session, than in the previous session, so that experimental variables may have had less scope for their operation. In fact, only two-thirds of the subjects present in the first post-testing session appeared for the final testing session.

It is necessary to consider the further possibility that the one month interval between the initial learning session and the final learning post-test was too great to allow for

any clear differential effects due to the independent variables. The learning performance scores in this final testing session were generally lower than those obtained in the first testing session. Since there was greater scope for high scorers in the first post-test to forget, as compared to low scorers, it is possible that the length of the interval between these two testing sessions may have led to the gradual elimination of differences among experimental groups. Clearly, in a study of this type, it is necessary to select an interval between learning and testing sessions which is sufficiently long to allow for independent variables to operate differentially on the retention of learned material, but not so long as to make the effects of forgetting too great for even the best learners. Tomlinson and Hunt (1971) employed one day and one week intervals, and also found that the Conceptual Level x Environmental Structure interaction effect was evident only in the one week post-test. The findings of this latter study in conjunction with the present findings suggest, therefore, that the one week learning-testing interval may be the optimal one for Conceptual Level studies involving learning tasks of this type. Further research, involving for example two and three week intervals would be necessary to obtain a more precise specification of this optimal interval.

It is clear that the obtained CL x I-E x Environmental Structure interaction effect for learning performance did not

follow the expected disordinal pattern for subjects whose locus of control expectancies were congruent with their Conceptual Level. A crossover interaction pattern of this type would have resulted, if high CL-internals were maximally effective in low structure and minimally effective in high structure, while low CL-externals were maximally effective in high structure and minimally effective in low structure. An ordinal interaction pattern was actually obtained, the failure to obtain the crossover pattern being attributable largely to the learning performance of low CL-externals in high structure. Low CL-externals learned much more poorly in the high structure treatment than previous research had suggested. In the Tomlinson and Hunt (1971) study, the learning performance of the low CL group in high structure was equivalent to the learning performance of the high CL group in low structure. McLachlan and Hunt (1973) also reported "integration" scores (relating to subjects' ability to synthesize the components of a painting by Picasso) which were almost as high for low CL subjects in the high structure (lecture) condition, as for high CL subjects in the low structure (discovery) condition. The absence of significant crossover interactions in both these studies was due to the lack of differentiation in the learning performance of high CL subjects in different environmental structures. } In the Tomlinson and Hunt study, high CL subjects were only slightly inferior in concept learning in high

structure as compared to low structure. The findings of McLachlan and Hunt showed that high CL subjects actually obtained slightly higher integration scores in the high structure as compared to the low structure environment.

The findings from these previous studies indicated that the demonstration of a disordinal interaction between Conceptual Level and environmental structure would require high CL subjects to learn significantly less in high structure than in low structure, as predicted by the "preferential" model. It was felt that this difference would be obtained if the internal-external control variable were used in conjunction with Conceptual Level, to enable finer discrimination among high CL subjects. The present findings indicate that this analysis was substantially accurate, since the learning performance of high CL-internals was significantly worse in a high structure treatment, as compared to a low structure treatment. This study therefore succeeded in providing the first clear empirical demonstration that a low structure environment could represent the best match for high CL subjects. However, a disordinal interaction did not materialize, due to the unexpected pattern of learning performance displayed by low CL subjects.

A more detailed examination of the Tomlinson and Hunt study, on which the present study was methodologically based, provides some possible explanations for the unexpected pattern



of concept learning scores obtained by low CL-external subjects. Three degrees of environmental structure were employed in the aforementioned study: low, intermediate, and high (as in the present study, high CL subjects showed superior learning performance, regardless of environmental structure). Comparison of the concept learning scores of subjects in low and intermediate structure indicates that these environmental treatments had almost identical effects on subjects' learning performance. The experimental manipulations employed in the present study to define low and high structure were very similar to those used by Tomlinson and Hunt to define the same environmental treatments. However, it is possible that students in the present study were more familiar with high structured teaching environments and therefore might have perceived the more highly structured environment as intermediate in structure, relative to the low structured environment. If this were the case, then the findings of Tomlinson and Hunt suggest that there would have been little difference in the learning performance of low CL students in these two environments. Furthermore, high CL-internal students would have been more closely matched to their environment than low CL-external students, and therefore more likely to perform in accord with prediction.

Equivalence in the definition of degree of environmental structure is a pervasive problem within the Conceptual Level matching model literature. Where different methodologies are

used, it is difficult to compare results, because environments which are described as high or low structured in one study are not necessarily equivalent to environments similarly labelled in another study. One way of replicating or extending findings is to employ similar methodology (the present study took this alternative). Another useful way might be to elicit subjects' ratings of the perceived degree of structure. Ultimately, it would be desirable to develop an objective method for differentiating environments precisely, in terms of degree of structure.

The Conceptual Level scores obtained by subjects in the present study were generally lower than those reported by Tomlinson and Hunt. The absolute levels of one week post-test learning scores were also generally lower in the present study. Possibly, the lower learning scores obtained in the present study as compared to the Tomlinson and Hunt study were the result of subjects' generally lower levels of conceptual differentiation. The learning scores obtained by low CL students might have been uniformly too low to allow for significant differentiation in learning performance between low CL-external and low CL-internal students. It is also possible that there exists some minimum level of conceptual differentiation which subjects must possess, in order to obtain concept learning scores in the high structure environment which would be sufficiently high to yield a disordinal interaction between CL and environment.

The Conceptual Level literature has tended to focus almost exclusively on performance rather than affective or satisfaction variables. Tomlinson and Hunt did include an interest measure in their study, but there were no significant effects involving it. McLachlan and Hunt assessed students' preferences for environmental structure by means of a projective measure. They reported that preference for low structure was correlated .29 with integration scores in a discovery (low structure) condition, and -.34 with integration scores in a lecture (high structure) condition. These authors reported some preliminary findings in another study, which indicated that low CL subjects felt lectures were of greater value in learning than did high CL subjects. However, there were no differences between CL groups in terms of which environment was "liked best". It is important to examine satisfaction as well as performance outcomes for students undergoing different educational treatments. This information gives a more complete understanding of the effects of different educational environments, and therefore enables matching for different kinds of educational goals. In view of the increasing student determination of educational options, it is becoming increasingly necessary to investigate patterns of students' educational preferences, and their relation to learning performance (cf. Hunt, 1971).

Three questionnaire items were included in the present

study, which were designed to obtain measures of students' estimated performance, interest in the learning task, and subjective importance of good performance of the learning task. A factor analysis of responses to these items indicated that these items were all highly correlated and could be described by a general factor labelled "Satisfaction", accounting for more than 70% of the total common variance.

The greater general satisfaction of high CL as compared to low CL subjects is consistent with the results obtained for learning performance. It appears that a higher degree of conceptual differentiation is associated with greater positive affect, as well as superior cognitive performance, in both low and high structured environments, in spite of the lack of positive correlation between learning performance and satisfaction. The greater satisfaction of external compared to internal students may be due to their generally greater submissiveness to authority (Lefcourt, 1973). Their reactions to the study (endorsed by the school authorities) and the experimenter were therefore likely to be more positive. Furthermore, externals would be more likely than internals to react positively to the externally imposed tasks which constituted this study (even in the low structure condition).

The greater satisfaction of subjects in the high structure compared to the low structure environment suggests that this sample of subjects may have been more familiar with the former type of environment. This finding is consistent with

suggestion made earlier that the high structured environment might actually have been perceived by subjects as intermediate in structure.

The interaction effect between Conceptual Level and environmental structure for subjects' satisfaction scores exhibits a pattern which is similar to the interaction pattern that was obtained for concept learning scores. High CL subjects were more satisfied in low than in high structure, and were more satisfied in low structure than low CL subjects. Low CL subjects were more satisfied in high than in low structure, and less satisfied than high CL subjects in high structure. The presence of this CL x Environmental Structure interaction effect for satisfaction scores though not for learning scores was probably due to the greater overall influence of CL on satisfaction, as compared to learning performance. In terms of matching for satisfaction outcomes, a low structure environment provided the best match for high CL subjects, and a high structure environment the best match for low CL subjects, regardless of degree of internal-external control.

The several significant interaction effects involving schools and the Satisfaction factor indicate that there were some complex higher-order effects of schools on satisfaction. These interaction effects appear to have been caused by the lesser satisfaction of subjects in the low structure condition

at Riverside, compared to other experimental groups. Presumably, this effect was due to some differences in the general teaching policies of the schools, causing Riverside students to be particularly dissatisfied in a low structured type of environment. It is possible that Riverside students are generally more familiar with high structured teaching methods, and therefore perceived the low structure environment in the present study as more threatening, compared to Herman students.

It is necessary to exercise care in drawing conclusions from the findings of the present study, regarding the usefulness of I-E as a predictive variable in educational environments. The environmental treatments utilized in this study may have failed to make differences in environmental locus of control a salient situational characteristic. Both the high and low structured environments involved a relatively high degree of external control. Students were instructed to learn a particular rule, which was new to them, and their learning strategy was also imposed upon them by situational factors outside their control. Although an attempt was made to vary the locus of control characteristics of the two learning strategies, such that subjects in the low structure environment possessed a greater degree of control over their learning experiences than did subjects in the high structure environment, it seems likely that students may have perceived both

environmental treatments as basically externally controlled. Furthermore, it may be that the overall environmental context of this study (that is, the school setting) possessed predominantly external control connotations for students. This wider environmental context may have been a larger influence on subjects' perceptions of environmental control, than the limited environmental context which the experiment represented. The finding that externally controlled subjects were more satisfied than internally controlled subjects across both environmental conditions appears to be consistent with the suggestion that the locus of control in the experimental environments was basically external. It would be useful in further educational research involving locus of control, to obtain more direct evidence concerning students' perceptions of control, perhaps by means of self-ratings.

Generally, the I-E variable as compared to the CL variable exhibited relatively little predictive power with respect to environmental performance. This may have been due to the suggested failure of the environmental manipulations to strongly engage differential expectancies regarding environmental locus of control, with both environments being perceived as basically externally controlled. In the previous studies which have obtained clear-cut disordinal interactions between internal-external control and environment (e.g., Hrycenko & Minton, 1974; Watson & Baumal, 1967), the differential locus of control

aspects of environments were more explicitly manipulated. Rhett's (1972) has emphasized that in order to obtain aptitude-treatment interactions, it is necessary to define task and environmental characteristics very explicitly, so that the appropriate personality variables may be used. In the present study, it appears that the environments may have been constructed in such a way that Conceptual Level was a more relevant individual difference consideration than internal-external control. That is, in a matching sense, the environment was more closely matched to the CL construct, than to the I-E construct. In spite of this, the findings indicate that I-E did provide some discrimination of learning performance, as demonstrated by the differentiation among high CL subjects, such that internally controlled-high CL subjects performed worse in the high structure environment than in the low structure environment. This was the first clear demonstration in the literature of students with high CL performing worse in a high structure as compared to a low structure environment. It is a finding which extends the usefulness of Hunt's (1970) Conceptual Level matching model conceptualization. Up to the present time, this model has tended to have more to say about improving the performance of low CL students, with high CL students considered to be relatively capable performers in any environment. For this reason, there is a tendency to associate low CL with the notion of the "disadvantaged



student". The Conceptual Level matching model has therefore appeared to offer the greatest payoffs for such disadvantaged learners, which is in accord with Jensen's (1968) suggestion that pupil-instruction interactions were a major consideration in attempting to equalize educational opportunities for the disadvantaged. The demonstration that high CL as well as low CL students exhibit differential performance in differently structured environments -- high CL students' performance also being subject to deterioration in a mismatched environment -- widens the scope of application of the Conceptual Level matching model to a considerably larger population.

The findings of this study offer strong support for an interactive approach to educational theorizing. Educational treatments were clearly differentially effective, depending on students' personality characteristics, and independent of differences in intellectual ability. The development of a more detailed characterization of the learner, by considering a combination of several personality dimensions instead of just one, appeared to lead to more effective matching procedures with the environment. Cronbach and Snow (1969) in their review of Aptitude-Treatment-Interaction studies, suggested that one reason for the sparsity of significant findings was the excessive simplicity of the personality variables employed. One way of remedying the tendency to construct excessively simplistic conceptualizations of the individual in relation to

the complexity of the educational environment, involves the provision of a more multidimensional characterization of the learner. In Hunt's (1970) terms, it is necessary to increase the number of learner accessibility channels which are taken into consideration in the process of individual-environment matching. It is clear that in the present study, further differentiation of high CL students in terms of locus of control expectations enabled more effective educational matching. Even more effective matching might have been achieved if the environments had been more clearly differentiated in terms of locus of control.

To return to a specific issue arising from the methodology of this experimental study, it was difficult to construct an environment empirically, which made both locus of control and structural characteristics equally salient. The environmental treatments employed were originally designed by Tomlinson and Hunt (1971) on the basis of structural considerations alone. Some minor modifications to these environments were made in the present study, in the hope of also tapping locus of control expectancies in learners. However, it may be that this type of complex environmental differentiation, along more than a single dimension, requires a longer period of time for all dimensions to become salient. Longitudinal studies in actual educational settings would seem to offer the most promising research method for achieving this. The individual difference

characteristics which affect reactions to each of the relevant environmental dimensions may be determined in a series of empirical studies. The findings of these studies could then be used as the basis for designing more complex field studies to investigate the interactions between these combinations of personality and environmental variables. This multidimensional conceptualization of pupil-instruction matching appears to approximate practical realities more closely than a simple unidimensional approach, and ultimately must be employed if maximal educational outcomes for every student are to be achieved. The attainment of such matching prescriptions for different developmental levels, and the different sexes, would eventually provide an effective basis for decision-making about educational problems.

## REFERENCES

- Asch, S.E. Forming impressions of personality. Journal of Abnormal and Social Psychology, 1946, 41, 258-290.
- Bracht, G.H. Experimental factors related to aptitude-treatment interactions. Review of Educational Research, 1970, 40, 627-646.
- Butterfield, E.C. Locus of control, test anxiety, reactions to frustration, and achievement attitudes. Journal of Personality, 1964, 32, 355<sup>3</sup>-370.
- Collins, B.E., Martin, J.C., Ashmore, R.D., & Ross, L. Some dimensions of the internal-external metaphor in theories of personality. Journal of Personality, 1973, 41, 471-492.
- Cromwell, R., Rosenthal, D., Shakow, D., & Zahn, L. Reaction time, locus of control, choice behaviour, and descriptions of parental behaviour in schizophrenic and normal subjects. Journal of Personality, 1961, 29, 363-379.
- Cronbach, L.J. The two disciplines of scientific psychology. American Psychologist, 1957, 12, 671-684.
- Cronbach, L.J. How can instruction be adapted to individual differences? In R.M. Gagne (Ed.), Learning and individual differences. New York: McMillan, 1967.
- Cronbach, L.J., & Snow, R.E. Project on individual differences in learning ability as a function of instructional variables. Annual Report No.2, United States Office of Education, School of Education, Stanford University, 1968.

- Dewey, J. The child and the curriculum. Chicago: University of Chicago Press, 1902.
- Endler, N.S., Hunt, J.McV., & Rosenstein, A. An S-R inventory of anxiousness. Psychological Monographs, 1962, 76, (17, Whole No. 536).
- Festinger, L. A theory of cognitive dissonance. New York: Row Peterson, 1957.
- Grimes, J.W., & Allinsmith, W. Compulsivity, anxiety, and school achievement. Merrill-Palmer Quarterly, 1961, 7, 247-271.
- Harvey, O.J. System structure, flexibility and creativity. In O.J. Harvey (Ed.), Experience, structure and adaptability. New York: Springer, 1966.
- Harvey, O.J. Conceptual systems and attitude change. In C.W. Sherif, & M. Sherif (Eds.), Attitude, ego-involvement, and change. New York: Wiley, 1967.
- Harvey, O.J., Hunt, D.E., & Schroder, H.M. Conceptual systems and personality organization. New York: Wiley, 1961.
- Hrycenko, I., & Minton, H.L. Internal-external control, power position, and satisfaction in task-oriented groups. Journal of Personality and Social Psychology, 1974, In Press.
- Hunt, D.E. A conceptual level matching model for coordinating learner characteristics with educational approaches. Interchange, 1970, 1(3), 68-82.

- Hunt, D.E. Matching models in education. Toronto: Ontario Institute for Studies in Education, 1971.
- Hunt, D.E. Learning styles and teaching styles. Paper presented at the Canadian Psychological Association Annual Convention, Windsor, June, 1974.
- Hunt, D.E., Lapin, S., Liberman, B., McManus, J., Post, R., Sabalis, R., Sweet, S., & Victor, B.J. Manual for coding paragraph completion responses for adolescents. Unpublished manuscript, Syracuse University Youth Development Center, 1968.
- Hunt, J.McV. Intelligence and experience. New York: Ronald Press, 1961.
- Hunt, J.McV. Traditional personality theory in the light of recent evidence. American Scientist, 1965, 53, 80-96.
- Jahoda, M. A social psychological approach to the study of culture. Human Relations, 1961, 14, 23-30.
- Jensen, A. Social class, race and genetics: Implications for education. American Educational Research Journal, 1968, 5, 1-42.
- Joe, V.C. Review of the internal-external control construct as a personality variable. Psychological Reports, 1971, 28, 619-640.
- Kagan, J., & Kogan, N. Individuality and cognitive performance. In P.H. Mussen (Ed.), Carmichael's manual of child psychology, Vol. 1. New York: Wiley, 1970.

- Kohlberg, L. The development of children's orientation toward a moral order: I. Sequence in the development of moral thought. Vita Humana, 1963, 6, 11-33.
- Kohlberg, L. Moral education in the schools: A developmental view. School Review, 1966, 74, 1-30.
- Lefcourt, H.M. Internal versus external control of reinforcement: A review. Psychological Bulletin, 1966, 65, 206-220.
- Lefcourt, H.M. Internal versus external control of reinforcement revisited: Recent developments. In E.A. Maher (Ed.), Progress in experimental personality research, Vol. 6. New York: Academic Press, 1973.
- Lefcourt, H.M., & Telegdi, M. Perceived locus of control and field dependence as predictors of cognitive activity. Journal of Consulting and Clinical Psychology, 1971, 37, 53-56.
- Lefcourt, H.M., Gronnerund, P., & McDonald, P. Cognitive activity and hypothesis formation during a double entendre word association test as a function of locus of control and field dependence. Canadian Journal of Behavioural Science, 1973, 5, 161-173.
- Lewin, K. Dynamic theory of personality. New York: McGraw-Hill, 1935.
- Loevinger, J. The meaning and measurement of ego development. American Psychologist, 1966, 21, 195-206.

McLachlan, J.F., & Hunt, D.E. Differential effects of discovery learning as a function of conceptual level. Canadian Journal of Behavioural Science, 1973, 5, 152-160.

Minton, H.L. Power and personality. In J.T. Tedeschi (Ed.), The social influence processes. Chicago: Aldine-Atherton, 1972.

Nowicki, S., & Strickland, B.R. A locus of control scale for children. Journal of Consulting and Clinical Psychology, 1973, 40, 148-155.

Pervin, L.A. Performance and satisfaction as a function of individual-environment fit. Psychological Bulletin, 1968, 69, 56-68.

Piaget, J. The moral judgement of the child. London: Routledge & Kegan Paul, 1952.

Rhetts, J.E. Attribute-treatment interactions and individualized instruction: A conceptual framework and an example from project Plan. In L. Sperry (Ed.), Learning performance and individual differences. Glenview, Illinois: Scott, Foresman & Co., 1972.

Rotter, J.B. Generalized expectancies for internal versus external control of reinforcement. Psychological Monographs, 1966, 80, (1, Whole No. 609).

Rotter, J.B., & Mulry, R.C. Internal versus external control of reinforcement and decision time. Journal of Personality and Social Psychology, 1965, 2, 598-604.



- Schneider, J.M. Skill versus chance activity preference and locus of control. Journal of Consulting and Clinical Psychology, 1968, 32, 333-337.
- Schroder, H.M., Driver, M.J., & Streufert, S. Human information processing. New York: Holt, Rinehart, & Winston, 1967.
- Snow, R.E. Research on media and attitudes. Paper given at Conference on Research on Instructional Media. Indiana University, Bloomington, Indiana, June, 1969.
- Standing, E.M. Maria Montessori: Her life and work. Fresno, California: Academic Library Guild, 1957.
- Sullivan, E.V., McCullough, G., & Stager, M. A developmental study of the relation between conceptual, ego, and moral development. Child Development, 1970, 41, 399-412.
- Torrance, E.P. Different ways of learning for different kinds of children. In E.P. Torrance & R.D. Strom (Eds.), Mental health and achievement: Increasing potential and reducing school dropout. New York: Wiley, 1965.
- Watson, G. Social psychology: Issues and insights. New York: Lippincott, 1966.
- Watson, D., & Baumal, E. Effects of locus of control and expectation of failure control upon present performance. Journal of Personality and Social Psychology, 1967, 6, 212-215.

APPENDIX A

The Nowicki-Strickland Locus of Control Scale

SOCIAL REACTION INVENTORY

This is a questionnaire to find out the way in which certain important events in our society affect different people. We are particularly interested in examining how the attitudes and opinions of different aged students differ depending on their age. Each item consists of a question. Please respond to each question by placing either a Yes or a No in the appropriate place on the answer sheet which has been given to you. If your answer is Yes, then blacken the space under A on your answer sheet; if your answer is No, blacken the space under B on your answer sheet. Be sure to give the answer which actually represents your beliefs, rather than the answer you think you should choose or the one you would like to be true. This is a measure of personal belief. Obviously there are no right or wrong answers.

Please put your name on the answer sheet now, then finish reading these directions. Do not open the booklet until you are told to do so. Your responses will be kept completely confidential. We are interested in comparing the beliefs of groups differing in age, rather than the beliefs of individuals.

Please answer the items carefully but do not spend too much time on any one item. Be sure to answer every item. Also try to respond to each item independently; do not be influenced by your previous answers.

1. Do you believe that most problems will solve themselves if you just don't fool with them?
2. Do you believe that you can stop yourself from catching a cold?
3. Are some kids just born lucky?
4. Most of the time do you feel that getting good grades means a great deal to you?
5. Are you often blamed for things that just aren't your fault?
6. Do you believe that if somebody studies hard enough he or she can pass any subject?
7. Do you feel that most of the time it doesn't pay to try hard because things never turn out right anyway?
8. Do you feel that if things start out well in the morning that it's going to be a good day no matter what you do?
9. Do you feel that most of the time parents listen to what their children have to say?
10. Do you believe that wishing can make good things happen?
11. When you get punished does it usually seem like for no good reason at all?
12. Most of the time do you find it hard to change a friend's (mind) opinion?
13. Do you think that cheering more than luck helps a team to win?
14. Do you feel that it's nearly impossible to change your parent's mind about anything?
15. Do you believe that your parents should allow you to make most of your own decisions?
16. Do you feel that when you do something wrong there's very little you can do to make it right?
17. Do you believe that most kids are just born good at sports?
18. Are most of the other kids your age stronger than you are?
19. Do you feel that one of the best ways to handle most problems is just not to think about them?
20. Do you feel that you have a lot of choice in deciding who your friends are?

21. If you find a four leaf clover do you believe that it might bring you good luck?
22. Do you often feel that whether you do your homework has much to do with what kind of grades you get?
23. Do you feel that when a kid of your age decides to hit you, there's little you can do to stop him or her?
24. Have you ever had a good luck charm?
25. Do you believe that whether or not people like you depends on how you act?
26. Will your parents usually help you if you ask them to?
27. Have you felt that when people were mean to you it was usually for no reason at all?
28. Most of the time, do you feel that you can change what might happen tomorrow by what you do today?
29. Do you believe that when bad things are going to happen they just are going to happen no matter what you try to do to stop them?
30. Do you think that kids can get their own way if they just keep trying?
31. Most of the time do you find it useless to try to get your own way at home?
32. Do you feel that when good things happen they happen because of hard work?
33. Do you feel that when somebody your age wants to be your enemy there's little you can do to change matters?
34. Do you feel that it's easy to get friends to do what you want them to?
35. Do you usually feel that you have little to say about what you get to eat at home?
36. Do you feel that when someone doesn't like you there's little you can do about it?
37. Do you usually feel that it's almost useless to try in school because most other children are just plain smarter than you are?
38. Are you the kind of person who believes that planning ahead makes things turn out better?
39. Most of the time, do you feel that you have little to say about what your family decides to do?
40. Do you think it's better to be smart than to be lucky?

## APPENDIX B

### Five Narrative Examples of Cognitive Dissonance

John is on a shopping trip with his older brother. They go into a clothes store and start looking around. John figures that his brother wants to buy some clothes for himself, so that when his brother asks him which of several shirts he prefers, he picks one out, although personally he doesn't like any of them. John is surprised when his brother tells him that he will buy that particular shirt for him. Looking at this shirt again, John begins to feel that he really had not looked at it carefully before, and that actually it is a pretty good shirt, much better than the others.

Bill likes to smoke, but does it secretly, because he knows there would be trouble if his father found out. One day however, his father catches his younger brother smoking, and he asks Bill to help him explain to his brother the disadvantages of smoking, and the potential harm it can cause. Rather than admit to his father that he is a smoker too, Bill goes along with things and comes out with the same statements to his brother that his father has often made to him. After this incident however, Bill finds that he now has less urge to smoke, and finally gives it up altogether.

Dan wants to make some extra spending money, so he lines up a couple of odd jobs for Saturday. One of these jobs is to cut a lawn around a big house, and he gets two dollars for doing this, which takes him most of the afternoon, and is pretty hard work. After this, he cleans a car belonging to a nice old lady, who gives him five dollars for this job, which takes less than an hour. Talking about these jobs with his friends later that evening, John says that he actually prefers mowing lawns to cleaning cars, it is pleasant work, and time goes by without noticing, while car-cleaning although less hard, is very boring work.

Jack is really interested in baseball, and wants to join a baseball team which plays against teams from different parts of town on weekends. He has heard that it is a lot of fun and that pretty well everyone gets to play. Before he can join, he is put through some tough trials, but he comes through and makes the team. However, during the whole season, he hardly ever gets to play, because there are several other guys who play his position better. Talking about the season later with some friends, he says he actually enjoyed it a lot, even though he was on the bench most of the time. He says it was a lot of fun to be part of the team, and he felt he really shared in the victories and the defeats.

Ian's best friend is Jim. They seem to like and dislike the same kinds of things, and spend a lot of time together. One day, Ian meets a new kid, Chuck, who has just moved into the neighbourhood. They talk for a while, and Ian finds that he really likes Chuck. A few days later he happens to mention Chuck to Jim, and is surprised when Jim gets very angry. It becomes clear that Jim and Chuck have already met and have had some kind of argument, because Jim really seems to dislike Chuck. Ian begins to wonder if Chuck is really the way he appeared to be. Maybe he was just putting on an act, and hiding some ugliness underneath the friendly outward appearance.

The Questionnaire

7

Please answer the following three questions by checking the scale-mark above the statement which most accurately describes your reaction to each question. Be sure to place your check marks exactly on the scale-marks, not between scale-marks.

How well do you think that you learned the principle of Cognitive Dissonance?

Very Well	Moderately Well	Slightly Well	Neither Well Nor Badly	Slightly Badly	Moderately Badly	Very Badly
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How interested were you in the learning task?

Very Interested	Moderately Interested	Slightly Interested	Neither interested nor disinterested	Slightly disinterested	Moderately disinterested	Very disinterested
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How important was it to you to do well in the learning task?

Very Important	Moderately Important	Slightly Important	Neither important nor unimportant	Slightly unimportant	Moderately unimportant	Very unimportant
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Write down below a definition of Cognitive Dissonance in your own words.



APPENDIX D

Scores<sup>a</sup> on the Satisfaction Factor

Personality	High Structure				Low Structure			
	Herman		Riverside		Herman		Riverside	
	Mean Score	n	Mean Score	n	Mean Score	n	Mean Score	n
High CL-Internal	0.126	9	-1.100	3	-0.736	5	0.203	4
High CL-External	-0.956	6	-0.143	4	-0.569	5	-0.656	4
Low CL-External	-0.235	5	-0.488	7	0.048	7	0.918	4
Low CL-Internal	0.408	11	0.073	5	0.356	6	1.302	8

<sup>a</sup>Increasing negative scores denote greater satisfaction.

APPENDIX B

Questionnaire Responses and Learning Scores for Individual Subjects

High Structure

Herman

High CL-Internal					High CL-External				
1	Items		Learning Scores		1	Items		Learning Scores	
	2	3	1 week	1 month		2	3	1 week	1 month
2	2	3	0.66	0.66	2	1	3	1.33	1.00
3	3	3	0.00	0.33	2	1	1	3.00	3.00
2	2	1	0.33	1.00	4	2	3	1.00	1.00
3	2	2	2.66		2	2	2	3.00	
2	4	7	1.00	0.66	1	1	2	2.66	
3	3	5	0.00		2	1	1	1.66	2.00
2	3	3	3.00	1.66					
2	2	3	1.33						
3	3	3	2.00	2.00					

Low CL-External					Low CL-Internal				
1	Items		Learning Scores		1	Items		Learning Scores	
	2	3	1 week	1 month		2	3	1 week	1 month
2	2	2	0.33	0.00	3	4	3	1.00	
3	2	2	1.33	2.00	3	3	3	0.00	
2	2	2	1.66	1.66	4	4	4	1.00	
2	2	2	0.66		3	3	4	2.00	2.00
6	3	3	0.66		4	3	7	1.00	1.00
					2	2	3	1.00	0.33
					1	1	1	1.33	1.33
					3	4	2	0.00	0.00
					3	4	4	2.00	
					2	2	3	1.00	
					3	3	3	1.33	1.33

## High Structure

## Riverside

High CL-Internal					High CL-External				
1	Items		Learning Scores		1	Items		Learning Scores	
	2	3	1 week	1 month		2	3	1 week	1 month
2	2	2	2.00	1.66	2	2	3	0.33	0.33
1	1	1	2.00	2.00	3	3	5	1.33	1.00
2	2	2	1.66	1.66	2	2	2	0.66	0.66
					2	2	3	2.00	

Low CL-External					Low CL-Internal				
1	Items		Learning Scores		1	Items		Learning Scores	
	2	3	1 week	1 month		2	3	1 week	1 month
4	1	2	0.66	1.33	2	3	3	2.00	1.33
2	3	2	1.66	2.00	2	2	2	1.00	1.00
3	3	3	0.33	0.00	3	4	4	0.66	0.66
1	1	1	1.00	1.00	3	3	3	2.66	3.00
2	1	2	2.33	2.00	1	3	3	2.00	
3	3	3	1.33	1.33					
3	2	2	1.66						

Low Structure

Herman

High CL-Internal					High CL-External						
1	Items			Learning Scores		1	Items			Learning Scores	
	2	3	1 week	1 month	2		3	1 week	1 month		
1	2	2	3.33		2	2	2	0.66			
3	2	2	1.33	1.33	3	3	2	2.00			
2	2	1	0.33	0.33	2	2	2	0.33	0.66		
2	2	3	2.66		1	2	2	1.33			
2	2	2	3.00	2.00	2	3	2	1.00	1.00		

Low CL-External					Low CL-Internal						
1	Items			Learning Scores		1	Items			Learning Scores	
	2	3	1 week	1 month	2		3	1 week	1 month		
2	3	3	0.00		5	4	6	1.66	1.33		
3	3	2	0.66	0.00	2	3	2	2.00	2.00		
2	3	5	0.00	0.00	3	3	2	0.00			
2	3	3	1.33		3	2	2	0.66			
3	3	1	1.00	1.00	2	3	3	1.00	1.00		
3	3	3	2.00		3	3	3	2.33			
2	2	3	1.00								

## Low Structure

## Riverside

## High CL-Internal

## High CL-External

1	Items		Learning Scores		1	Items		Learning Scores	
	2	3	1 week	1 month		2	3	1 week	1 month
2	4	2	1.00	1.00	1	2*	2	1.66	1.00
3	3	4	3.00	3.00	2	1	2	0.00	0.00
2	2	2	0.66	0.66	2	2	2	1.00	1.00
3	4	3	3.00		3	3	3	1.33	1.33

## Low CL-External

## Low CL-Internal

1	Items		Learning Scores		1	Items		Learning Scores	
	2	3	1 week	1 month		2	3	1 week	1 month
4	4	4	1.00	1.33	4	4	4	0.33	0.00
3	5	4	2.00	2.00	5	1	5	1.66	0.66
3	3	3	0.00	0.00	2	3	2	1.00	1.00
3	3	3	1.66		3	2	3	0.66	1.00
					5	4	6	0.66	0.66
					2	3	4	0.00	0.33
					6	4	4	1.33	
					7	5	6	1.00	

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