THE EFFECT ON BEHAVIOR OF THE QUALITATIVE ATTRIBUTES OF THE ELEMENTS THAT DEFINE AN EDUCATIONAL ACTIVITY SPACE

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ABSTRACT

THE EFFECT ON BEHAVIOR OF THE QUALITATIVE ATTRIBUTES OF THE ELEMENTS THAT DEFINE AN EDUCATIONAL ACTIVITY SPACE

by Stuart W. Rose

Problem Statement

The purpose of the study was to determine the effect that variations in the qualitative characteristics of a space may have on the behavior of learners that are performing an educational activity in the space. The educational activity consisted of performing a series of educational tasks (with measurable objectives) by means of small group discussion. The behavior of the learners, which was the dependent variable, consisted of task achievement, quality and quantity of interaction, and attitude expression towards the activity and the activity subject matter. The qualitative characteristics of the space, which were the independent variables, included the position, form, color, contrast and textural attributes of the space

establishing elements (i.e. the wals, floor and ceiling of the space).

Method of Study

Attitudes toward attributes of space establishing elements and towards the activity were measured in the Pre-test, employing a semantic differential attitude measurement instrument. By meanse of a process described at length in the text, two spaces were designed and constructed for the Treatment; one was hypothesized to reinforce the quality of the activity. The groups met in their respective spaces for two weeks, during which time they performed the programmed tasks; their interaction was recorded and analyzed. Attitude measurement after the Treatment comprised the Post-test. Behavioral differences between groups in the two spaces were compared in relation to task achievement, interaction quantity and quality, and attitude toward the activity and the subject matter.

Major Findings

With certain expressed reservations, the hypotheses were supported by the data. The findings, however, did not achieve statistical significance and were therefore concluded not to be reliable in terms of

predictability. The results suggested that the quality of educational spaces can be employed as a tool in aiding the quality of educational activities. The study also suggested that a process by which desirable spatial qualities may be reliably determined is possible, and could be the process indicated in the study, pending added substantiation.

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by

Stuart W. Rose

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I INTRODUCTION

The purpose of this study was to determine the effect that variations in the qualitative characteristics of a space may have upon the behavior of learners who are performing an educational activity in the space. The educational activity consisted of performing a series of educational tasks (with measurable objectives) by means of small group discussion. The behavior of the learners, which was the dependent variable, consisted of (1) the task achievement, (2) the quality and quantity of interaction, and (3) the attitude expression toward the activity and the activity subject matter. The qualitative characteristics of the space, which were the independent variables, included the position, form, color, and textural attributes of the space establishing elements (i.e. the walls, floor and ceiling of the space.)

STATEMENT OF THE PROBLEM

This study examined the interaction between man and his physical environment from a stimulus-response point of view. The stimulus was considered

to come externally to man from the physical environment, while the response was considered to come internally to man in the form of behavioral motivations. In the interaction the desire for comfort is assumed, such that if the environmental stimulants vary from a point of comfort in one direction, the behavioral response would vary from comfort in the other direction so as to produce a comfortable balance. For example, if the environmental stimulants include a degree of heat beyond the point of comfort, the behavioral response would tend to cause cooling (such as sipping a tall, cool drink or turning on an air-conditioning system or a fan, etc.).

Viewing the qualitative attributes of space establishing elements as environmental stimulants, the following process suggests a means by which the use of such stimulants may be directed to help facilitate desired behaviors.

(1)

Identify the desired behavior. In this study, the semantic differential attitude measuring instrument was employed to record the profile of the meaning attached to the behavior desired.

(2)

Assuming the neutral axis of the semantic differ-

ential as an approximation of the comfort balance, a mirror-image of the desired behavior profile was constructed. This latter profile was assumed to be a balancing profile, to which the meaning attached to the environmental stimulants should conform.

(3)

Employing stimulants that conform to both the profile of desired behavior (i.e. "Consonant Stimulants") and those that conform to the balancing profile (i.e. "Dissonant Stimulants"), the space designed by incorporation of the balancing "Dissonant Stimulants" should produce the desired behavior.

Four terms critical to the understanding of the hypotheses that follow are:

(1)

Profile "A" or the Behavior Profile, which is the profile of the behavior desired.

(2)

Profile "B" or the Balancing Profile, which is the mirror-image of the Behavior Profile.

(3)

Space "A" or the Consonant Space, which is the space designed by the incorporation of Consonant Stimulants (or environmental stimulants conso-

nant with the Behavior Profile).

(4)

Space "B" or the Dissonant Space, which is the space designed by the incorporation of Dissonant Stimulants (or environmental stimulants dissonant with the Behavior Profile and consonant with the Balancing Profile).

Given a strongly similar series of student groups performing identical educational activities, the following hypotheses were asserted:

(1)

Task achievement will be greater in Space "B", the Dissonant Space, (a space that evokes an attitude opposite to the occupants' attitude toward the activity).

(2)

Interaction will be greater in quality and quantity in Space "B", the Dissonant Space, (a space that evokes an attitude expression opposite to the occupants' attitude toward the activity).

(3)

Space "B", the Dissonant Space, will tend to shape attitudes toward the activity in the di-

rection of Profile "A", the Behavior Profile, (i.e. the attitudes toward the small group discussion activity will tend to be shaped in a direction opposite to that of the attitude expression evoked by the space).

(4)

Attitudes toward the small group discussion activity will be closer to the attitudes toward the subject matter at the completion of the activity than at the start of the activity.

IMPORTANCE OF THE PROBLEM

"Like a fish in water, man also moves in a physical milieu, and as long as he is alive he cannot physically transcend it. To live is to function as an animate organism, or system, in an interdependent relationship with an all-encompassing larger organic system."[1]

Many of the stimulae present in the environment (e.g. cold, rain, glare, etc.) are not congruent with man's needs; dissonance caused by such aversive stimulae may be reduced by modifying the interaction effect (e.g. by introducing some filter, shield, wall, etc.). As Philip Thiel indicated,

"Modification of stimulae as available at any series of points constitutes the common basis

for any act of envirotecture."[2]

However, while man has been confronted with, and has for thousands of years, dealt with, the problem of modifying his interaction with the physical environment, criteria for performing such modifying acts are still virtually non-existent. While research has provided some insights as to how spaces and objects are perceived, how density of population in a space affects behavior, how seating arrangements and related spatial proportioning affect social behavior, and even how preferences toward certain objects or color attributes of a space establishing element affect movement through a space, virtually no knowledge exists which relates the qualitative attributes of space establishing elements to human behavior in the performance of a given activity. As David Bonsteel and Robert Sasanoff indicated,

"The design professions have long lacked a means for objective analysis and prediction of behavior in architectural space."[3]

The critical need for this type of research was again illustrated when they stated,

"With increasing environmental complexity and ever more rapid change, the design professions are faced on the one hand with more complex variations of existing problems that require ever more rapid solutions, and on the other hand with new problems without previous experience for prediction."[4]

This study is the first in which human behavior in the performance of an activity is the dependent variable, and the qualitative characteristics of the elements that define the activity space are the independent variables. It is perhaps the first time that a process has been considered which stipulates the use of occupant responses as a key to the design of the space, and in which the accommodation of the activity can be guaranteed, and a shaping effect upon attitude can be predicted.

DELIMITATIONS OF THE STUDY

Limitations were, for a variety of reasons, imposed upon this study; such limitations might be best understood in relation to the research design.

Five basic limitations were evident during the pre-test phase of the study. The first was the quality of the attitude measurement instrument which had been tested thoroughly by Charles Osgood in a variety of situations, but had never been employed with the particular purposes for which it was used in this study. The second limitation during the pre-test was the number of participants, which was just above the minimum required to insure reliability of results. The

third limitation was the quality of simulation of the concepts; such qualities as color accuracy were limited by photographic technology. The fourth limitation in the pre-test was the time of exposure; the impact of a color over a period of time may differ from the impact of the same color over a period of only a minute or so. The fifth limitation was the number of concepts employed, which was the result of the fatigue that was found to occur after a length of testing; two or more sittings were not possible to arrange.

Six basic limitations were evident during the treatment phase of the study. The first was the treatment of the qualitative characteristics of the space establishing elements as a composite; because of time and fund limitations, each characteristic could not be treated independently as the permutations expanded too quickly. The second limitation was the flexibility of construction of the spaces; fund limitations and restrictions imposed by the physical plant department of the University provided for spaces that could not be specially constructed for the treatmant, and only for temporary modifications of existing spaces. The third limitation was the number of participants available for each group,

which was six rather than the preferred seven. The fourth limitation was the number of groups that were formed, which was also limited to availability of participants; while five groups per space was assumed to be sufficient to provide reasonable reliability of results, several times that number would have been preferred. The fifth limitation was the amount of time, in terms of the numbers of group meetings, that was able to be scheduled; a result of the schedules of the student participants and the amount of funds available to pay for extended participation. The sixth limitation was the mode of observation employed to record the interaction of the groups. Because the meeting rooms could not be specially constructed for the study, observation booths were not available and interaction measurement had to be done from tape recordings.

The major limitation involved in the post-test was the quality of the attitude measurement instrument, as discussed previously.

DEFINITION OF TERMS

Several terms employed commonly in this report were defined for clarity and ease of communication.

Space Establishing Elements:
Surfaces, Objects, and Screens which, through their perceived relationships, establish a space.

Qualitative Characteristics of Space Establishing Elements:
The position, shape, color and textural attributes of the space establishing elements.

Texture:
The structure of the surface of any body, (particularly as it relates to the characteristic of touch, its tactile quality).

Shape:
The quality of a thing depending upon its outline or external surface; the form of a particular thing.

Contrast:
To set in opposition in order to show unlikeness, particularly as related to juxtaposition of different light values.

Hue:
That property of a color by which the various regions of the spectrum are distinguished, as red, blue, etc.

Value:
The degree of lightness or darkness of a color.

Chroma:
Purity of color; intensity of distinctive hue, or saturation of a color.

The remainder of this report was divided into four sections. The first, Chapter II, contains a review of literature related to the study, which was used both in development of the hypotheses for this study and as an aid in the development of the research design and the tools for the study. The second section to follow, Chapter III, consists of an outline of the logical and procedural details of the research design. The third

section, Chapter IV, contains a report of the findings of the study, and the fourth section, Chapter V, was constructed to summarize the study and to suggest further areas for investigation.

II REVIEW OF LITERATURE

This review consisted of three segments. The first involved the role of behavior in the process of designing the physical environment. The second concerned evidence of a relationship between the physical environment and human behavior. The third segment employed existing theoretical assertions in order to establish a basis for hypotheses concerning the nature or direction of effect that the qualitative characteristics of the space establishing elements would have upon behavior.

A BEHAVIORAL DESIGN APPROACH

One way to summarize the state of the practiced environmental design process historically is as pseudo-scientific artistry. Designers of the environment have appeared to avoid the alleged dehumanizing influences of the machine and computer age, and appear to have generally attempted to maintain an image of aesthetic judge or environmental artist. However, as Raymond Studer and David Stea indicated,

"....review customarily concludes with a cataloging of the failures of current architectural efforts, and the assertion that either designers ought to understand people, or that people ought to understand designers, or both."[5]

Interestingly, Wassily Kandinsky, an artist known for his imaginative, impressionistic, and pioneering expressions, was also one of the few heretics to suggest a new approach to design.

"I should like to remark finally that, in my opinion, we are fast approaching a time of reasoned and conscious composition, in which the painter will be pround to declare his work constructional - this in contrast to the claim of the impressionists that they could explain nothing, that their art came by inspiration. We have before us an age of conscious creation, and this new spirit of painting is going hand in hand with thought towards an epoch of great spirituality."[6]

"The innate feeling of the artist is the biblical talent which must not be buried in the earth. And for this reason it is necessary for the artist to know the starting-point for the exercise of his spirit. The starting-point is the study of color and its effects on man."[7]

More recently, Studer and Stea have advocated that behavior should have a somewhat different role in the process of environmental design.

"Suppose, for example, we change the precept to environment follows function, and specify as the class of relevant variables the requirements of the participating humans."[8]

"A.E. Paar has hinted at this kind of 'functionalism' for some time in suggesting that elements in the environment be chosen in response to psychological variables as well as other (" functional ") ones."[9]

A.E. Paar, a psychologist, reinforced this approach when he stated,

"Its is high time to insist that the behavior of men, and the needs of the human mind, be also made the first objects of study in planning the environments in which our minds must function and our lives will be contained."[10]

Studer and Stea summarized, for the most part, this approach to the design of the environment.

"Assuming that we understand the correlations (and this is a bit of wishful thinking) between the behavioral units and the physical units in the designed environment, a behavioral system specified according to the above criteria yields a related system of physical contingencies (quantitative and qualitative)."[11]

"When these operations are complete, the designed environment or architecture can be said to have been programmed to accommodate a specific set of behaviors."[12]

Thus the primary need in this approach appeared to be a means for correlating behavior and elements of the physical environment.

A perceptual psychologist, Faber Birren, suggested the possibilities of such correlations in what he referred to as "physiognomic perception."

"In physiognomic perception there is a dynamization of things. Perception (and experience) adds to what it sees. The viewer becomes an artist in his own right, in that he takes part

in what he views. And the artist is great who can create pleasurable reactions."[13]

Birren suggests that correlations between physical and behavioral elements does exist.

"It is quite easy for the average person to translate thoughts, feelings, and moods into design forms. Pointed things may be sharp and cruel. Sagging things may be tired or lazy. Bulging things may be soft or jolly."[14]

Summarizing, Birren indicates,

"What is important is simply this: man has an inherent and dynamic interest in what he beholds. Nature may teach him lessons in beauty, but essentially he has an intuition of his own. The art of the future could well become physiognomic and, in so doing, create forms and effects which would break with and surpass the best traditions of the past. It could be majestically original."[15]

Thus Birren appeared to advocate not only the value of relating or correlating behavior (reactions) with elements of the physical environment, but also suggested that such translations were readily obtainable. The next concern of this study was for evidence of linkages that may have been shown to exist between attitude, behavior and the physical environment.

EFFECT ON BEHAVIOR

A perceptual psychologist, James J. Gibson, indicated that objects, (such as space establishing

elements), cause particular responses to be formed and that such responses may be correlated with other stimulae.

"But it becomes possible to refer to the stimulus-correlate of an object and to understand how a response can be a constant function of an object."[16]

These stimulae can then be translated to their effect upon behavior.

"The so-called stimulus-objects for behavior are the stimulus-correlates of the literal visual world."[17]

Gibson also related his comments to behavior in a defined space.

"The so-called cues for behavior are certain invariants of stimulation which yield objects with color constancy, shape constancy, and size constancy."[18]

The objects defined included the space establishing elements, thereby having formally linked the qualitative attributes of space establishing elements to behavior, as the following passage of Gibson's indicated.

"Spatial behavior and spatial perception are coordinate with one another."[19]

Two research projects with some similarities to this one were done by Robert Bechtel, of the Environmental Research Foundation of Topeka,

Kansas. In both projects the dependent variable was human movement through a space. In the first project preference toward particular displays was the independnet variable.[20] In the second project, reaction to the color attributes of the space establishing elements was the independent variable.[21] In both projects results indicated significant variation in the dependent variable as a result of variation of the independent variable.

Douglas H. K. Lee commented upon the role of attitude in relation to behavior of people in various environmental situations.

"Attitude operates upon and is affected by both physiological and psychological mechanisms."[22]

In addition, Lee indicated,

"....Attitude plays a very important role in the adjustment of people to environmental conditions."[23]

The role of attitude was also indicated to be greatest under "average" or "normal" conditions, when stress is not at an extreme point.

"....Attitude is the most influential when stress is moderate."[24]

Thus attitude can be linked to behavior, which may be most useful for purposes of establishing

a mode for prediction of behavior.

Gibson asserted,

"Meanings and spatial properties are not entirely separable from one another; meaning is not wholly detachable from color, form, and texture."[25]

In relation to measurement of meaning for purposes of predicting behavior, Robert Sommer, a sociologist, indicated,

"People in other professions, including the behavioral sciences, have been interested in finding ways to explore the meaning that people attach to concepts. Probably the best instrument developed for this purpose is the semantic differential technique pioneered by Charles Osgood at the University of Illinois."[26]

Thus, the meaning that people attach to different concepts, (such as the qualitative characteristics of space establishing elements), was assumed to be both measurable and linked to their behavior in relation to those concepts; through this linkage meaning can be measured and behavior predicted.

DIRECTION OF EFFECT

The next task required formulation of a direction in which behavior in an activity could be, at least hypothetically, predicted in response to particular environmental stimulae. Studer and

Stea suggested one approach to formulation of a direction when they stated,

"....for to be functional the designed environment, as it interacts with the human participants would be in a state of equilibrium, with all the difficult implications such a proposition entails."[27]

The above propositions might be viewed in terms of a balancing of forces required to produce an equilibrium, the source of one force being the external physical environment and of the other the internal non-physical human reaction to the external forces which results in, or leads to, behavioral responses. Rudolph Steiner, the founder of the anthroposophic movement, referred to these forces when he mentioned,

"One sensation causes us pleasure, another displeasure. These are the stirrings of our inner life, our soul life. In our feelings we create a second world in addition to that which works on us from without. And a third is added to this - the world of the will. Through the will we react to the outer world, thereby stamping the impress of our inner being upon it."[28]

A similar natural phenomenon exists in relation to physical human responses to various forces alien to the human physical system, (such as responses to germs, heat or cold, darkness or bright light, etc.). When foreign bodies enter the human system, the system attempts to control those bodies and to produce antibodies that

will neutralize or destroy those foreign bodies; a major portion of medical treatment, such as vaccinations and other medications, is based upon this natural phenomenon. When external conditions cause the natural equilibrium to be disturbed by an excess of heat or cold, the body responds with perspiration for cooling purposes or shaking for heating purposes; resulting behavior may also include decreasing or increasing the amount of clothing on the body, or adjusting the environmental conditions by partitioning an envelope of space and either cooling or heating that envelope. When lighting is reduced or increased, the pupil of the eye opens or closes, respectively, thereby responding in a direction opposite in thrust to the external forces in order to maintain or reestablish the equilibrium condition.

The same balancing or compensating phenomenon also occurs in response to visual phenomena. For example, the eye creates an "after-image" in response to an exposure to a color of one extreme or another; the response is opposite in direction to the original stimulus. (e.g. If the eye is exposed to a red surface for a time, and then to a white surface, a green image will

be seen instead of white.) Rudolph Arnheim, a perceptual psychologist, mentioned that

"Goethe described the phenomenon by saying that complementary colors 'demand each other'. They do so because the eye demands completeness."[29]

If an extremely large and significant structure, such as a magnificent cathedral, is entered, the internal response, in terms of feeling and behaviors resulting from that feeling, may be that of smallness and insignificance; however, the external response, in terms of verbal expression of the experience, may be that of awesomeness and magnificance, reflecting the nature of the external forces.

The above behavioral responses to external stimulae may be, at least in part, explained by Leon Festinger, who, when describing a theory of cognitive dissonance, indicated that (1) two elements, (such as a given behavior and a given physical environment,) exist in a dissonant relation if the obverse of one follows from another, (such that the balance or equilibrium discussed above would be disturbed); (2) the presence of dissonance gives rise to pressures to reduce that dissonance; (3) the strength of the pressure to reduce the dissonance is a function of the magnitude of the dissonance; (4) to reduce the disso-

nance, one or more of the elements involved in the dissonant relation must be changed; and (5) if the dissonance relates to the behavior, behavior changes in line with cognitions, (such that if the environmental element in the dissonant relation can not be changed, then behavior must be changed in response to the environment in order to reduce the dissonance).[30]

Thus, the direction of behavior was hypothesized to be in opposition to the external forces, as represented by the physical environmental stimulae.

SUMMARY

The above discussion was thereby employed as a foundation for the hypotheses and design for this study. The approach to the study of the physical environment was assumed as behaviorally based. Attitude was assumed to be linked to behavior, to exist in response to environmental stimulae, and to be measurable. The physical environment was believed to have an effect on behavior and on attitude. And, finally, the behavioral response to stimulae of the physical environment was assumed to exist in an opposing or balancing manner.

III RESEARCH DESIGN

The description of the research design was best accomplished in four segments. The first was comprised of an explanation of the general approach or strategy involved in the design. The second segment consisted of a description of the sources of data. The third contained an outline of the method of procedure. The fourth segment was concerned with the treatment of the findings.

GENERAL APPROACH

By employing measurement of attitude expression as an intermediate linkage or common medium between the internal forces that lead to behavioral outputs and the external forces that result from physical environmental stimulae, the following process was established in which the design of the space hinged upon behavioral input and in which the designed space would cause predictable behavioral output.

(1)

Measurement of the attitudes of occupants toward a given activity, the content of the activity

and an array of alternative attributes of space establishing elements, (e.g. various colors, textures, etc.).

(2)

Determining and recording of the attitude profile toward the activity, and the opposing, or balancing attitude profile toward the activity, (i.e. the Behavior Profile and Balancing Profile.)

(3)

Determining and recording the attitude profile toward each of the alternative attributes of space establishing elements.

(4)

Matching the profiles of the attitudes toward the alternative attributes of the space establishing elements to the Behavior Profile and the Balancing Profile.

(5)

Determining the particular alternative attributes (i.e. the particular colors, textures, etc.) whose profiles most closely match the Behavior Profile and the Balancing Profile.

(6)

Creation of two spaces, (Space "A" and Space "B"), each containing those attributes whose

profiles were found to match the two activity attitude profiles, (the Behavior Profile and the Balancing Profile.)

(7)

Conducting of the (small group discussion) activity in the two spaces, half of the occupants in one space and half in the other.

(8)

Measurement of behavioral outputs, in terms of activity achievement, content achievement, and attitude shaping.

(9)

Determining whether or not statistically significant differences occurred between behavior in the two spaces, and whether or not those differences were in the direction predicted, (the greater achievement being predicted for occupants in Space "B", designed according to the Balancing Profile.

SOURCES OF DATA

The sources of data for this study were human student participants. Volunteer participants were solicited from five class sections of Education #200, "The Individual and the School", an

educational psychology course conducted during the 1968 summer quarter at the College of Education of Michigan State University. (See distributed form for solicitation of participants, Appendix A). Each student was asked to volunteer for both the pre-test and the treatment phases of the study, and was told that he would be selected for only one of the two phases and that he would be paid a specified sum of money for his participation; eighty-two students volunteered to participate in the research project. Of the eighty-two volunteers, twenty-two were randomly selected for the pre-test phase. Of the remaining sixty volunteers, thirty were randomly assigned to one space and thirty to the other. The thirty were further divided into five groups of six students each, according to availability as dictated by their submitted schedules of committments (such as classes, part-time jobs, etc.). Thus, the pre-test group of twenty-two and the ten groups of six were, through randomization, assumed to be similar.

(Psychological personality trait tests were not conducted to discern whether or not the randomization process had, in fact, randomized. Visual perception of personal traits suggested that

visible qualities, such as sex, age, race, etc., were randomized. Thus, on the basis of the probability of randomization, and the visual check, randomization was assumed to have occurred.)

METHOD OF PROCEDURE

The twenty-two volunteers who were assigned to the pre-test were assembled at various times convenient to them on Monday, June 24th, the second week of the summer quarter. The semantic differential instrument prepared for the study, (see Appendix B,) was explained to them. Their attitudes toward forty concepts, (see Appendix C), were obtained by means of displaying photographic slide transparencies of the concepts on a screen and asking the volunteers to mark their reactions to the concept on one of the distributed semantic differential forms. Each slide was displayed until all participants had completed and submitted their responses. When the responses to each of the firty concepts had been collected from each of the twenty-two participants, the pre-test was concluded.

Employing the results of the data collected during the pre-test phase, the two spaces in which the treatment phase was to be conducted

were designed and constructed. (See Chapter IV, Findings, Tables I-IV for data: Appendix G for the description of the spaces.) On Monday, July 29th, the sixth week of the summer quarter, each group of six participants was assembled in its assigned room according to the time scheduled. At the start of the first meeting each group was given a sheet of paper containing the general instructions for the group, (see Appendix D,) and a set of programmed tasks, (see Appendix E,) each task being located in a separate envelope. Each group then began work on their set of tasks until the end of the fifty minute meeting period, at which time their tasks were returned to their containers until the next meeting. A total of ten meetings were conducted, beginning on Monday, July 29th, and concluding on Friday, August 9th, the sixth and seventh weeks of the summer quarter. Each of the first nine meetings was tape recorded in order to facilitate analysis of interaction at a later time.

The post-test was conducted at the tenth meeting of each group. The semantic differential instrument prepared for the study, (see Appendix B,) was explained to the participants. Their

attitudes toward three concepts, (see Appendix F,) were obtained by means of reading a written statement of the concept to the group and asking the participants to mark their reactions to the concept on one of the semantic differential forms. When the responses to each of the three concepts had been collected from the participants in each group, the post-test was concluded.

TREATMENT OF FINDINGS

The pre-test data were employed to determine (1) which colors, forms, values (i.e. light-to-dark gradient), degrees of contrast and scale evoked responses most nearly the same as the attitude responses evoked by the small group discussion activity concept (i.e. which matched the Behavior Profile most closely), and (2) which were most nearly the same as the opposite of the attitude response evoked by the small group discussion activity concept (i.e. which matched the Balancing Profile most closely).

The semantic differential instrument contained twelve variables; the mean score of the twenty-two responses was determined for each variable. For concept responses that were to be compared to the small group discussion activity concept

response, the differences between each of the variable scores of the two compared concepts were summed; the color concept response with less difference than other color concept responses was considered most similar to the small group discussion activity concept response, etc. Thus the colors, textures, forms, values, contrast and scale degrees with the lowest differences were considered to evoke the most similar responses to the small group discussion activity response.

The opposite response to the small group discussion response was determined by subtracting the mean score for each of the twelve variables from the number four, the middle or "neutral" score on the instrument, and adding that difference to the number four. In this way the "mirror-image" response about the neutral axis was determined and was considered as the opposite or balancing response to the one evoked by the small group discussion activity concept. Comparison to other concepts was accomplished by the same process as described above in relation to the response to the small group discussion activity concept.

The treatment data were employed to determine

(1) the quantity and quality of interaction, and (2) achievement on a series of programmed educational tasks. The quantity of interaction was determined by counting the number of separate responses initiated. The quality of interaction was examined by means of a category system developed by Bales.[31] Due to instability in group organization during the early meetings, data were considered for both the nine day period of measurement and for the last seven meetings only. The achievement on the programmed series of education tasks was determined by a summation of the scores attained on each task, as described in the task instruction sheet, (see Appendix E).

The post-test data were employed to determine (1) the effect of the treatment on attitudes toward the educational psychology subject matter and the small group discussion activity concept , and (2) the similarity between the responses evoked by the spaces and the responses, (Behavior Profile,) and the opposite responses , (Balancing Profile,) toward the small group discussion activity concept determined at the pretest. The mean of each variable in the responses toward the small group discussion activity concept, the educational psychology subject matter

concept, and the meeting place was determined for the participants who met in each space. The Fisher-Student "t" test for statistical significance was employed to determine whether or not the differences, if any, between the responses of the participants in the two spaces was reliable.

Employing the source of data, method of procedure and treatment of data described above, the pre-test, treatment and post-test phases of the study were conducted and completed.

IV FINDINGS

Following are the findings of the study, organized in order of the execution of the study, (i.e. pre-test, treatment and post-test). The statistical "t" values and the levels of significance are included in all tables of findings.

PRE-TEST

The following tables indicate: Table 1, the mean scores of the responses toward forty concepts, plus the "mirror-image" of the response toward the small group discussion concept; Table 2, the summed differences between the mean response toward the small group discussion activity concept and the mean response toward each of the concepts related to the qualitative attributes of space establishing elements; and Table 3, the summed differences between the mean response toward the "mirror-image" of the small group discussion activity concept and the mean response toward each of the concepts related to the qualitative attributes of space establishing elements. Based upon the results shown in the

tables, limitations imposed upon construction techniques (discussed earlier) and availability of materials, the two treatment spaces were constructed as indicated in Table 4. (See photographs of each space in Appendix G.)

TREATMENT

The following tables indicate: Table 5, the characteristics of interaction for the five groups in each room, (see interaction data for each group per day in Appendix H); and Table 6, the task achievement for each group.

POST-TEST

The following tables indicate the mean attitude scores of the five groups in each space toward: Table 7, the educational psychology subject matter; Table 8, the small group discussion activity; and Table 9, the space in which the group met.

Employing the findings of the treatment and post-test phases of the study, conclusions regarding the validity of the hypotheses were formulated.

TABLE 1

MEAN SCORES OF RESPONSES TOWARD FORTY CONCEPTS

concept number		semantic differential item number 1	2	3	4	5	6	7	8	9	10	11	12
1	triangle	3.57	2.67	4.19	3.71	1.90	4.05	3.57	3.47	4.62	3.38	4.86	3.10
2	square	4.00	3.05	4.57	3.95	2.57	3.76	3.86	2.24	4.76	3.52	4.05	3.67
3	circle	2.24	3.62	3.33	2.67	5.71	4.14	2.67	5.00	3.24	2.86	6.19	5.43
4	angularity	4.33	3.19	2.10	3.57	2.10	3.33	4.10	3.95	3.24	4.52	2.24	1.71
5	rectangularity	2.62	2.95	3.81	3.71	2.57	4.05	2.95	3.38	3.42	3.57	4.00	4.00
6	curvilinearity	4.05	5.24	3.62	3.57	5.57	3.90	3.86	4.71	3.29	4.43	5.00	5.43
7	high contrast	3.24	1.86	3.19	3.29	2.19	4.52	3.38	2.71	4.00	3.24	3.90	2.43
8	medium contrast	3.95	4.76	5.00	4.57	4.81	4.33	4.05	4.86	4.52	4.29	4.95	4.81

TABLE 1 (continued)

9	low contrast	4.48	5.48	6.10	5.58	5.52	4.71	4.52	4.24	5.05	4.57	5.10	5.71
10	literature	2.43	3.19	3.48	3.62	3.86	3.90	2.62	3.95	2.67	2.00	4.10	4.38
11	art	1.67	2.05	1.86	2.29	3.38	3.81	1.95	3.90	2.19	1.48	4.33	4.48
12	educat- psych.	3.52	3.76	3.05	3.57	3.14	4.19	3.67	3.95	2.57	2.48	3.57	3.90
13	mathematics	4.67	2.43	3.14	4.14	1.76	4.10	4.43	2.43	2.86	2.00	2.81	2.43
14	bright green	1.71	2.62	2.86	1.67	4.81	5.14	1.62	5.24	2.67	2.24	5.38	5.52
15	muted green	4.38	4.86	5.57	4.86	4.90	4.67	4.57	3.86	4.81	4.71	3.90	4.90
16	muted red	3.81	4.14	3.90	3.81	4.19	3.05	3.67	3.71	3.43	3.76	3.81	3.76
17	bright red	2.81	1.43	1.52	2.62	1.90	1.71	2.90	2.33	2.95	3.14	3.24	2.00
18	bright blue	1.48	2.05	3.33	3.05	4.33	5.29	1.95	3.14	3.38	2.33	4.81	5.29

TABLE 1 (continued)

19	muted blue	2.57	4.29	4.57	3.19	5.19	5.24	3.00	4.76	4.14	3.38	5.14	5.57
20	muted orange	3.90	4.14	5.29	4.62	4.19	3.90	4.05	3.38	4.62	4.19	3.29	4.57
21	bright orange	2.33	1.86	1.52	1.95	2.95	2.48	2.38	3.29	2.43	2.86	4.19	3.05
22	bright purple	3.86	3.67	4.19	4.29	4.29	4.71	3.90	3.24	3.90	3.57	4.71	4.19
23	muted purple	5.62	6.14	6.52	6.00	5.62	5.14	5.62	4.71	5.81	5.05	5.05	5.14
24	muted yellow	4.33	4.29	4.67	4.71	3.95	4.00	4.52	3.95	4.57	4.52	3.90	3.95
25	bright yellow	2.19	1.90	2.05	1.62	4.10	2.57	2.33	5.29	2.38	2.43	5.48	3.14
26	white	2.76	3.67	3.90	3.05	4.33	4.95	2.71	5.57	3.62	3.19	5.81	4.62
27	light grey	4.48	5.62	5.95	5.38	5.33	5.05	4.62	4.24	5.33	4.43	5.10	5.19
28	dark grey	5.10	4.05	5.10	5.86	4.33	5.05	4.86	2.95	5.29	4.62	4.95	4.71
29	black	3.95	1.67	3.90	5.14	2.24	4.43	4.10	1.81	4.62	3.05	4.38	3.38

TABLE 1 (continued)

30	Independent study	3.00	3.43	3.67	3.52	3.48	4.05	3.38	3.10	3.52	2.29	3.48	3.33
31	Small group disc.	2.29	2.90	1.90	2.24	3.76	3.52	2.57	3.86	2.38	2.48	3.62	4.00
32	Med. group recit.	3.81	4.91	4.33	3.95	3.57	3.67	4.10	3.24	4.33	3.81	3.52	3.57
33	Large group lect.	3.95	4.14	5.33	4.14	4.10	4.00	4.10	3.81	4.52	3.76	4.00	5.29
34	glossy	2.14	3.24	4.05	2.71	3.00	5.29	2.19	4.57	3.57	3.00	6.62	5.19
35	smooth	3.14	4.00	5.05	4.00	3.90	4.52	3.62	4.57	4.19	4.19	5.43	5.05
36	rough	2.90	3.52	3.05	2.62	4.90	4.48	2.48	4.86	3.57	3.14	3.29	4.86
37	coarse	5.00	2.05	3.48	4.48	1.90	3.95	4.76	2.43	4.10	3.67	1.38	2.43
38	small scale	5.05	3.43	3.76	5.29	3.05	3.14	5.29	3.67	4.38	5.00	3.76	2.95
39	medium scale	4.10	4.00	4.10	4.33	3.33	4.10	4.19	4.19	4.05	4.29	3.90	3.43
40	large scale	3.76	4.14	4.33	4.10	3.67	4.86	3.95	4.05	4.14	4.05	4.33	4.14

TABLE 2 SUMMED DIFFERENCES BETWEEN RESPONSES TOWARD SMALL GROUP DISCUSSION ACTIVITY CONCEPT AND OTHER CONCEPTS RELATED TO ATTRIBUTES OF SPACE ESTABLISHING ELEMENTS

Concept Number	Concept Name	Summed Difference
5	rectangularity	8.86
3	circle	11.68
4	angularity	13.90
1	triangle	14.43
2	square	14.76
6	curvilinearity	16.67
7	high contrast	13.09
8	medium contrast	19.38
9	low contrast	25.54
21	bright orange	6.31
25	bright yellow	7.61
14	bright green	11.20
18	bright blue	11.21
16	muted red	11.24
17	bright red	11.65
22	bright purple	12.24
26	white	12.66
24	muted yellow	13.94
19	muted blue	15.53
20	muted orange	16.24
29	black	17.99
15	muted green	20.47
28	dark grey	22.11
27	light grey	25.20
23	muted purple	30.90
36	rough	8.97
34	glossy	12.58
35	smooth	16.14
37	coarse	20.02
40	large scale	14.18
39	medium scale	14.49
38	small scale	17.91

TABLE 3 SUMMED DIFFERENCES BETWEEN RESPONSES TOWARD THE "MIRROR-IMAGE" OF THE SMALL GROUP DISCUSSION ACTIVITY CONCEPT AND OTHER CONCEPTS RELATED TO ATTRIBUTES OF SPACE ESTABLISHING ELEMENTS

Concept Number	Concept Name	Summed Difference
6	curvilinearity	15.99
2	square	16.48
1	triangle	17.45
5	rectangularity	19.44
4	angularity	22.10
3	circle	23.66
9	low contrast	8.26
8	medium contrast	10.92
7	high contrast	22.61
23	muted purple	7.06
28	dark grey	7.69
15	muted green	7.99
27	light grey	8.14
24	muted yellow	9.12
20	muted orange	11.48
22	bright purple	13.56
16	muted red	15.44
29	black	17.81
19	muted blue	18.76
26	white	20.38
18	bright blue	25.29
14	bright green	28.70
21	bright orange	29.19
25	bright yellow	29.50
17	bright red	32.83
35	smooth	13.96
37	coarse	20.85
36	rough	21.29
34	glossy	24.25
38	small scale	11.71
40	large scale	12.00
39	medium scale	12.57

TABLE 4 — CHARACTERISTICS OF THE TREATMENT SPACES

Space "A", the Consonant Space:

designed according to closeness of response to small group discussion activity concept, (i.e.to the Behavior Profile).

Space "B", the Dissonant Space:

designed according to closeness of response to "mirror-image" of small group discussion activity concept, (i.e. to the Balancing Profile).

Qualitative Attribute	Space "A" Consonant Space	Space "B" Dissonant Space
size	15 x 18 feet 8½ foot ceiling	8½ x 11½ feet 8½ foot ceiling
shape	rectangular	oval
contrast	high	low
textures	rough	smooth
colors		
walls	bright yellow bright orange	medium grey
ceiling	white with black trim	muted purple
table	4½ foot diam. white	4½ foot diam. muted green
chairs	white upholstery with silver metal trim	muted blue or green upholstery with medium grey metal trim
floor	bright blue	muted green

TABLE 5

GROUP INTERACTION IN EACH OF THE TREATMENT SPACES

Interaction Characteristics	Consonant Space (A)	Dissonant Space (B)	"t"	Level of Significance
Days 1-9				
Qualitative category: (%)				
I Pos. Socio-Emot. Area	35.89	36.79	0.0349	0.9730
II Pos. Task Area	39.13	39.64	0.0180	0.9860
III Neg. Task Area	18.73	15.11	0.2981	0.7733
IV Neg. Socio-Emot. Area	6.24	8.46	0.4859	0.6954
Quantity:				
Number Interactions Init.	4941.60	4615.20	0.0952	0.9265
Days 3-9 only				
Qualitative category: (%)				
I Pos. Socio-Emot. Area	36.86	38.05	0.1907	0.8535
II Pos. Task Area	38.38	38.11	0.2412	0.8154
III Neg. Task Area	18.36	14.94	0.6669	0.5236
IV Neg. Socio-Emot. Area	6.40	8.90	0.4338	0.6759
I and IV (Socio-Emotional)	43.24	46.95	0.1408	0.8915
IIandIII (Task Areas)	56.74	53.05	0.3711	0.7202
Quantity:				
Number Interactions Init.	4048.80	3704.80	0.1237	0.9046

TABLE 6 TASK ACHIEVEMENT OF THE GROUPS IN EACH TREATMENT SPACE

Group Number	Consonant Space (A)	Dissonant Space (B)
1	186.00 points	70.00 points
2	217.00 points	87.00 points
3	72.00 points	140.00 points
4	253.00 points	147.00 points
5	126.00 points	83.00 points
Mean Score	170.80 points	105.40 points

"t" = 0.6134

significance level = 0.5566

TABLE 7 ATTITUDE OF GROUPS IN TREATMENT SPACES TOWARD EDUCATIONAL PSYCHOLOGY SUBJECT MATTER

Semantic Item	Consonant Space (A)	Dissonant Space (B)	"t"	Significance
1	2.92	2.68	0.1164	0.9102
2	3.45	2.70	0.3336	0.7473
3	3.00	2.75	0.1218	0.9061
4	3.18	3.22	0.0158	0.9877
5	3.84	3.65	0.0718	0.9445
6	4.24	3.58	0.2351	0.8200
7	3.15	3.37	0.0912	0.9296
8	4.18	3.48	0.2529	0.8067
9	3.27	2.83	0.1952	0.8501
10	2.37	2.58	0.1125	0.9132
11	3.84	3.83	0.0044	0.9966
12	5.02	4.83	0.0528	0.9592
	11.62	11.85	Summed Evaluative (1,4,7,10)	
	15.31	13.66	Summed Potency (2,5,8,11)	
	15.53	13.99	Summed Activity (3,6,9,12)	

TABLE 8 ATTITUDE OF GROUPS IN TREATMENT SPACES TOWARD SMALL GROUP DISCUSSION ACTIVITY

Semantic Item	Consonant Space (A)	Dissonant Space (B)	"t"	Significance
1	2.12	2.18	0.0373	0.9712
2	2.88	2.78	0.0439	0.9661
3	2.12	2.13	0.0062	0.9952
4	2.58	2.38	0.1017	0.9215
5	4.32	4.37	0.0136	0.9895
6	3.58	3.08	0.2077	0.8406
7	2.53	2.30	0.1240	0.9044
8	4.16	3.70	0.1626	0.8749
9	2.86	2.55	0.1566	0.8794
10	2.40	2.20	0.1197	0.9077
11	4.03	4.38	0.1141	0.9120
12	5.66	5.27	0.0981	0.9243
	9.63	9.06	Summed Evaluative (1,4,7,10)	
	15.39	15.23	Summed Potency (2,5,8,11)	
	14.22	13.03	Summed Activity (3,6,9,12)	

TABLE 9 ATTITUDE OF GROUPS IN TREATMENT SPACES TOWARD THE SPACE

Semantic Item	Consonant Space (A)	Dissonant Space (B)	"t"	Significance
1	2.03	2.60	0.3360	0.7455
2	2.78	3.48	0.3114	0.7634
3	2.38	4.32	0.7713	0.4627
4	1.89	3.43	0.7713	0.4603
5	4.65	5.13	0.1391	0.8928
6	3.29	3.27	0.0120	0.9907
7	2.11	2.65	0.2978	0.7734
8	4.29	4.32	0.0072	0.9945
9	2.80	3.82	0.4162	0.6882
10	3.08	2.98	0.0423	0.9673
11	4.68	5.03	0.1036	0.9201
12	5.66	5.80	0.0332	0.9744
	9.11	11.66	Summed Evaluative (1,4,7,10)	
	16.40	17.96	Summed Potency (2,5,8,11)	
	14.13	17.21	Summed Activity (3,6,9,12)	

V CONCLUSIONS

The conclusions were derived from the study findings, related to the hypotheses for purposes of substantiation, and finally employed to examine the implications of this study and to suggest avenues for additional research.

FINDINGS

The first conclusion that was observed in relation to the findings was that none of the findings was statistically significant, in terms of demonstrating reliability of the findings for purposes of prediction. Because of the small number of groups employed in the study caused by limitation of financial resources, the variance in the data generated by the groups in each space would have to be exceedingly small; such was not the case. Thus, all ensuing conclusions must be regarded with an eye towards their lack of predictional reliability.

Task

The groups in the Consonant Space (A) achieved a

mean score of 170.80, while the groups in the Dissonant Space (B) achieved a mean score of only 105.40. Thus, the groups in the Consonant Space (A) were concluded to have had a higher task achievement, (about 62% higher,) than the groups in the Dissonant Space (B).

Interaction

The conclusions related to interaction varied according to the particular interaction characteristic. The following interaction conclusions were based upon the findings of the interaction from days three through nine (3-9) in preference to the findings from days one through nine (1-9) resulting from instability of group activity during the first day or so. The groups in the Consonant Space (A) achieved, in their quantity of interaction, a mean of 4048.80 combined interactions initiated per day, while the groups in the Dissonant Space (B) achieved a mean of 3704.80 combined interactions initiated per day. Thus, the groups in the Consonant Space (A) were concluded to have had a higher quantity of interaction, (about 9.3% higher,) than the groups in the Dissonant Space (B).

Two factors were examined in relation to quality

of interaction: (1) those interactions which were fundamentally related to the task and (2) those related to socio-emotional (or non-task oriented) characteristics. The groups in the Consonant Space (A) had a mean of 56.74 percent of their interactions related to the task area, while the groups in the Dissonant Space (B) had a mean of 53.05 percent of their interactions related to the task area. Thus, the groups in the Consonant Space (A) were concluded to have devoted a higher percentage of their interactions, (about 7.0 percent higher,) to the task area; this would tend to support the higher achievement on the task scores. The groups in the Consonant Space (A) had a mean of 43.24 percent of their interaction related to the socio-emotional area, while the groups in the Dissonant Space (B) had a mean of 46.95 percent of their interactions related to the socio-emotional area. Thus, the groups in the Dissonant Space (B) were concluded to have had a higher percent of their interaction, (about 8.6 percent higher,) devoted to the socio-emotional area.

Attitude

The conclusions concerning attitude shaping were related to the three attitudes measured, (1) the

educational psychology subject matter, (2) the small group discussion activity, and (3) the space in which the group met. The conclusions were also considered in relation to the three dimensions of the semantic differential instrument, (1) the evaluative, or items 1, 4, 7, and 10, (2) the potency, or items 2, 5, 8, and 11, and (3) the activity, or items 3, 6, 9, and 12.

Attitudes toward the subject matter of educational psychology were found to vary within the three dimensions. The groups in the Consonant Space (a) had a mean of 2.91, (a sum of 11.62,) in the evaluative dimension, while the groups in the Dissonant Space (B) had a mean of 2.98, (a sum of 11.85,) in the same dimension. Thus, the groups in the Consonant Space (A) were concluded to have a greater liking or higher regard for the subject matter of educational psychology, (about 3.7 percent more,) than the groups in the Dissonant Space (B). The groups in the Consonant Space (A) had a mean of 3.83, (a sum of 15.31,) in the potency dimension, while the groups in the Dissonant Space (B) had a mean of 3.42, (a sum of 13.66,) in the same dimension. Thus, the groups in the Dissonant Space (B) were concluded to feel that the subject matter of educational

psychology was more potent, (about 17.0 percent more potent,) than the groups in the Consonant Space (A). The groups in the Consonant Space (A) had a mean of 3.88, (a sum of 15.53,) in the activity dimension, while the groups in the Dissonant Space (B) had a mean of 3.50, (a sum of 13.99,) in the same dimension. Thus, the groups in the Dissonant Space (B) were concluded to feel that the subject matter of educational psychology was more active, (about 15.2 percent more active,) than the groups in the Consonant Space.(A). Summarizing, the groups in the Consonant Space (A) were concluded to have a greater regard, or liking, for the subject matter of educational psychology than the groups in the Dissonant Space (B), while the latter had a more potent and active feeling about the subject matter than the groups in the Consonant Space (A).

Attitudes toward the small group discussion activity were consistent within all three dimensions, the groups in the Dissonant Space (B) feeling a higher regard, greater potentcy and greater sense of activity toward the small group discussion activity than the groups in the Consonant Space (A). In the evaluative dimension, groups in the Dissonant Space (B) had a mean of

2.27, (a sum of 9.06,) while the groups in the Consonant Space (A) had a mean of 2.41, (a sum of 9.63). Thus the groups in the Dissonant Space (B) were concluded to have had a greater liking or higher regard, (about 11.0 percent greater,) for the small group discussion activity than the groups in the Consonant Space (A). In the potency dimension, groups in the Dissonant Space (B) had a mean of 3.81, (a sum of 15.23,) while the groups in the Consonant Space had a mean of 3.85, (a sum of 15.39). Thus the groups in the Dissonant Space (B) were concluded to have had a feeling of greater potency, (about 1.4 percent greater,) for the small group discussion activity than the groups in the Consonant Space (A). In the activity dimension, groups in the Dissonant Space (B) had a mean of 3.26, (a sum of 13.03,) while the groups in the Consonant Space (A) had a mean of 3.56, (a sum of 14.22). Thus, groups in the Dissonant Space (B) were concluded to feel a greater sense of activity, (about 13.3 percent greater,) for the small group discussion activity thean the groups in the Consonant Space (A).

Attitudes toward the space in which the group met were consistent in all three dimensions, with the groups in the Consonant Space (A) feeling

a higher regard, greater potency and greater sense of activity toward the space in which they met than did the groups in the Dissonant Space (B). While the responses toward the two spaces were not identical to the pre-test response and mirror-image response (i.e. Behavioral Profile and Balancing Profile) upon which the design of the two spaces was based, the direction intended was identical, (i.e. a feeling of greater liking, potency and activity was intended to be evoked by the space designed consonant with the Behavior Profile). Thus, despite designer influence in combining the elements selected in the pre-test, and a likely difference in response resulting from measurement based upon thirty second exposure versus two week exposure, the spaces were concluded to have evoked the desired direction of response.

Summary

In attempting to explain the above conclusions, an assumption was employed in order to determine whether or not the findings would be consistent with that assumption, and would, therefore be more clearly explained by means of that assumption. The assumption was, merely, that the subject matter of educational psychology

was not the subject matter of greatest concern to the participants, (i.e. given a free choice of subjects in which to become involved, educational psychology was not likely to be freely selected a majority of the time). If the groups met in a space in which their desire to become involved in their small group discussion activity was greater than their desire to pursue an assigned package of programmed tasks dealing with educational psychology, then a higher percent of their interaction would relate to the non-task, or socio-emotional area. In addition, their personal involvement might tend to cause the groups to respond with greater feelings of potency and activity, but a somewhat lesser liking for the assigned educational psychology subject matter. This description appeared consistent with the behavior of the groups meeting in the Dissonant Space (B). Conversely, if groups met in a space in which they sensed little desire for involvement in discussion with one another, they might tend to lean more directly upon the programmed task material presented to them, and relate their interaction more exclusively to that material. Such groups might tend to achieve more on the tasks, feel a greater regard for the subject matter of the task, have a greater percent

of interaction related to the tasks, but feel less liking for the activity and generally a lesser sense of potency and activity. This description appeared consistent with the behavior of the groups meeting in the Consonant Space (A).

One unexplained item of data related to the above explanation remains. The quantity of interaction which was greater for the groups in the Consonant Space (A) than in Dissonant Space (B), did not appear to have been explained by the above assumption. If interaction related to the task material generally involved a greater number of short comments, while interaction related to subjects selected by the group involved lengthier comments (and, hence, a fewer number of comments initiated per unit time,) the data related to quantity of interaction would be explained. Informal comments made by persons listening to the taped recordings of the group meetings for purposes of interaction analysis suggested that the groups in the Consonant Space (A) appeared somewhat quiet or timid, and that a noticeable amount of "dead air" between comments was common, but that the comments appeared to occur in short "flurries", (e.g. a large number of one or two word comments offerred by many of the group members). Such comments also suggested that the

groups in the Dissonant Space (B) appeared somewhat more "heated" in their discussions and had a more continuous flow of conversation, although individual interactions were often quite lengthy, (particularly, for example, references to some personal episode being related by a group member, or treatises related to some of the political figures who were then campaigning). Also, persons employed to start and stop the group discussions, start and stop the tape recorders, etc. indicated that groups in the Consonant Space (A) ceased discussion and began their exit almost as soon as the person entered the space in order to stop the tape recorder; groups in the Dissonant Space (B) tended to remain after the tape recorder was stopped, often continuing until the next group entered the space. While the informal comments made by the persons analyzing the interaction and those starting and stopping the discussions tended to explain the differences in interaction quality and quantity, the comments were not supported by any precise form of measurement and were not, therefore, formally employed in the development of the study conclusions.

On the basis of the above conclusions regarding attitude differences, quality of interaction

and achievement, (and employing the stated assumption as a clarifying model), the groups in the Dissonant Space (B) were concluded to have had a "better" small group discussion activity. The Dissonant Space (B) was therefore concluded to have been the more suitable space for small group discussion for those particular occupants.

HYPOTHESES

Employing the above conclusions as a basis for substantiating or rejecting the stated hypotheses of this study, conclusions were formulated in relation to each of the four hypotheses.

(1)

Task achievement will be greater in Space "B" the Dissonant Space, (a space that evokes an attitude opposite to the occupants' attitude toward the activity).

This hypothesis was concluded to be unsubstantiated, inasmuch as the greater task achievement occurred in the space that evoked an attitude response similar to the occupants' attitude toward the activity, (i.e. in the Consonant Space (A)). The rejection of this hypothesis was qualified, however, as a result of the possible

difference in behavior that may exist between a situation in which the subject matter is assigned, and one in which it is freely selected by the participants in the group. The assumption that the subject matter involved in the task was of strong concern to the group participants in the discussion groups, or, that any imposed subject matter would necessarily be influenced by the quality of performance of the activity did not appear to have been a valid assumption.

(2)

Interaction will be greater in quality and quantity in Space "B", the Dissonant Space, (a space that evokes an attitude expression opposite to the occupants' attitude toward the activity).

This hypothesis was concluded to be substantiated in relation to quality of interaction, but unsubstantiated for previously stated reasons with respect to quantity of interaction. Interaction was concluded to have been "better", overall, in the Dissonant Space (B), which supports the hypothesis.

(3)

Space "B", the Dissonant Space, will tend to

shape attitudes toward the activity in the direction of Profile "A", the Behavior Profile, (i.e. the attitudes toward the small group discussion activity will tend to be shaped in a direction opposite to that of the attitude expression evoked by the space).

The hypothesis was concluded to be substantiated with regard to all three dimensions of attitude measurement: evaluation, potency and activity.

(4)

Attitudes toward the small group discussion activity will be closer to the attitudes toward the subject matter at the complation of the activity than at the start of the activity.

This hypothesis was concluded to be substantiated with regard to two of the three dimensions of attitude measurement, potency and activity, but unsubstantiated with regard to liking or regard (i.e. evaluation) of the subject matter. The conclusion was qualified to refer only to those subjects imposed upon the group, as opposed to subject areas selected by the group.

IMPLICATIONS

When approximations of building costs are generated over the life of a building, the initial cost of construction appears to be about two percent of the total; maintenance costs about six percent of the total; and, cost of salaries, etc. of the building occupants about ninety-two percent of the total. To date most criteria for building design decisions have related to initial and maintenance costs plus whatever general and very apparent human considerations appeared to require satisfaction (based upon the judgment of the designer and client). The effect of the quality of the space upon the occupant of that space has either been disregarded, dismissed due to budget "limitations", or subjectively dealt with by the designer. Yet, while such considerations have received little care, their implications in terms of cost alone....if not in terms of aiding to fulfill human life functions ....would suggest a criterion rating forty-six times that of decisions related to initial building costs, and fifteen times that of decisions related to maintenance costs. This study may have been the first in which the effect upon behavior of the occupant was, indeed, the foremost design criterion.

Another implication stems from the observation related to group involvement with the imposed task. Some educators have been setting as one of their goals the development of learners who are self-actuating, inquiring, exploring, etc. Many studies in educational psychology appear to suggest that motivation is increased when the learner feels a personal interest or need in a given area. The conclusions of this study suggest that when a space is created for purposes of improving the quality of the activity, such as a small group discussion, the learners may tend toward rejection of imposed subject matter and acceptance of subject matter of interest to and selected by the group. If the quality of the activity is increased, external control over the content of the activity may decrease. This phenomenon suggests that if educators do desire as one of their goals, to heighten the quality of human activity, the particular needs or interests of the learner must be expressed, recognized and employed as the principal curricular foundation from which all educational activity should evolve.

This study was intended to be a "seed" study, in that it might suggest a need, an approach, some techniques and some initial findings from which

additional studies could be generated. This particular study, because of the nature of the findings but lack of statistical significance, should be repeated with a larger number of groups and without some of the other limitations indicated by "lack of resources". Areas for further exploration may include treatment of each spatial characteristic as a sole independent variable, improvement of measuring instruments for increasing the precision and reliability of the process, measurement of numerous other basic life activities, variations of attitude and behavior of various occupant types, and a host of other directions which may be contingent upon needs, priorities or interests in a given situation.

Until designers of space can demonstrate that the effects of spatial attributes upon the behavior of occupants is significant in terms of helping occupants to fulfill their life activities, and that the process by which they arrive at behavioral types of decisions is measurable and predictable, designers will remain in the ornamental fringe of society.

FOOTNOTES

[1] Philip Thiel, "Notes on the Sensory Basis of Environmental Interaction" (Seattle: University of Washington, 1967), (Mimeographed.)

[2] Ibid.

[3] David L. Bonsteel and Robert Sasanoff, An Investigation of a Televised Image in Simulation of Architectural Space (Architecture/Development Series Number 6. Seattle: University of Washington, 1967), p. 1.

[4] Ibid.

[5] Raymond G. Studer and David Stea, "Architectural Programming, Environmental Design, and Human Behavior," Journal of Social Issues, Volume XXII, Number 4 (October, 1966), 129.

[6] Wassily Kandinsky, Concerning the Spiritual in Art (New York: George Wittenborn, Inc., 1912), p. 77.

[7] Ibid.

[8] Studer and Stea, loc. cit.

[9] Ibid.

[10] A.E. Parr, "Psychological Aspects of Urbanology," Journal of Social Issues, Volume XXII, Number 4 (October, 1966), 45.

[11] Studer and Stea, op. cit., p. 132.

[12] Ibid.

[13] Faber Birren, Color, Form and Space (New York: Reinhold Publishing Corp., 1961), p. 67.

[14] Ibid.

[15] Ibid.

[16] James J. Gibson, The Perception of the Visual World (Boston: Houghton Mifflin Co., 1950), p. 216.

[17] Ibid.

[18] Ibid.

[19] Ibid., p. 225.

[20] Robert B. Bechtel, "Human Movement and Preference" (Topeka: The Environmental Research Foundation, 1967), (Mimeographed.)

[21] Rajendra K. Srivastava, Human Movement as a Function of Color Stimulation (Topeka: The Environmental Research Foundation, 1968).

[22] Douglas H.K. Lee, "The Role of Attitude in Response to Environmental Stress," Journal of Social Issues, Volume XXII, Number 4 (October, 1966), 87.

[23] Ibid., p. 90.

[24] Ibid.

[25] Gibson, op. cit., p. 212.

[26] Charles Osgood, Measurement of Meaning (Urbana: University of Illinois Press, 1957).

[27] Studer and Stea, op. cit., p. 129.

[28] Rudolph Steiner, Theosophy (New York: Anthroposophic Press, 1946), p. 12.

[29] Rudolph Arnheim, Art and Visual Perception (Berkeley: University of California Press, 1954), p. 348.

[30] Leon Festinger, Theory of Cognitive Dissonance (Stanford: Stanford University Press, 1957).

[31] Michael Brill, "The Performance Concept: Its Application to Design and Programming" (paper read at the A.I.A. Architect-Researcher's Conference, Lake Delton, Wisconsin, September 25, 1968).

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APPENDIX A

FORM FOR SOLICITA-
TION OF PARTICIPANTS

A-1

To: Students in Educational Psychology #200

From: Stuart W. Rose, Dept. Administration and Higher Education

Subject: Participation in a Research Project

This summer a research project is being conducted which requires the participation of many students in order to be carried out. The participation is of two types:

1. one fifty (50) minute meeting per day for a period of ten days (July 29,30,31, August 1,2 and August 5,6,7,8,9) in which the participant will be involved in an enjoyable activity related to the subject matter of the course and will be paid $15.00 for his participation; and
2. one ninety (90) minute meeting in which the participants will be asked to complete some forms, and for which they will be paid $3.00 for participating.

While participation will consist of only one or the other type, the student must volunteer for both; selection of who participates in which type of activity must be done by the research staff.

Benefits that students gain from participation (particularly of the first type) include:

1. remuneration for time invested,
2. an opportunity for interaction with other students in the course,
3. extra and enjoyable involvement with the course subject matter, which may benefit the student in relation to his course performance, and
4. a contribution to a research project that may have a significant influence on one facet of educational planning, and which could be strongly felt by educators in all schools.

Because knowledge of the nature of the research project would tend to bias the results, participants will not be informed about the study until after their participation is completed. After all data is collected, a presentation can be made in

A-2

which the ideas, techniques, impact of results, etc. will be discussed with participants.

If it is at all possible for you to participate in this study, please complete the following schedules and information blanks. Thank you.

Ed. #200 Class Time_____ Name_____

Please mark class periods of second half of summer quarter with a "C".

	8:00	9:10	10:20	11:30	12:40	1:50	3:00	4:10
Mon.	____	____	____	____	____	____	____	____
Tue.	____	____	____	____	____	____	____	____
Wed.	____	____	____	____	____	____	____	____
Thu.	____	____	____	____	____	____	____	____
Fri.	____	____	____	____	____	____	____	____

I have the following time interval open on Monday, June 24th:

8:30 - 10:00_____ 10:20 - 11:50_____

12:40 - 2:10_____ 3:00 - 4:30_____

APPENDIX B

ATTITUDE MEASUREMENT

B-1

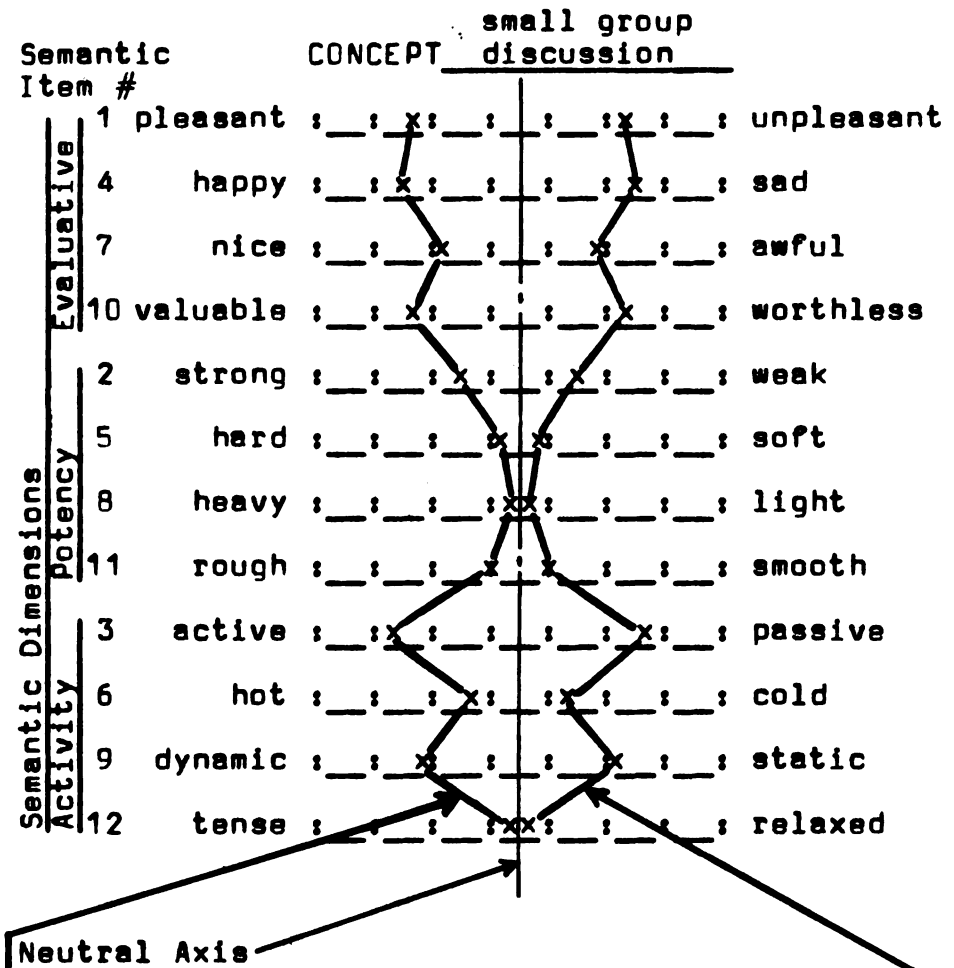
Attitude Measurement Instrument

(Semantic Item #)		CONCEPT_____	
(1)	pleasant	:__:__:__:__:__:__:__:	unpleasant
(2)	strong	:__:__:__:__:__:__:__:	weak
(3)	active	:__:__:__:__:__:__:__:	passive
(4)	happy	:__:__:__:__:__:__:__:	sad
(5)	hard	:__:__:__:__:__:__:__:	soft
(6)	hot	:__:__:__:__:__:__:__:	cold
(7)	nice	:__:__:__:__:__:__:__:	awful
(8)	heavy	:__:__:__:__:__:__:__:	light
(9)	dynamic	:__:__:__:__:__:__:__:	static
(10)	valuable	:__:__:__:__:__:__:__:	worthless
(11)	rough	:__:__:__:__:__:__:__:	smooth
(12)	tense	:__:__:__:__:__:__:__:	relaxed
		(1)(2)(3)(4)(5)(6)(7) (column number)	

The above instrument, a semantic differential, was employed in order to measure attitudes toward various concepts (listed in Appendices C and F). (The above explanatory markings, in parentheses, were not part of the actual form employed.) Mean scores on various semantic items refer to the column number base, (e.g. a mean score of 1.50 refers to a point midway between columns one and two).

B-2

Attitude Profiles Toward Activity



Profile of mean scores of attitude measurements toward the small group discussion activity (Attitude Profile "A", the Behavior Profile)

Profile of opposite or "mirror-image" of profile of mean scores of attitude measurements toward the small group discussion activity, (Attitude Profile "B", the Balancing Profile)

Semantic Items were re-arranged above for convenience of grouping by Dimension.

APPENDIX C

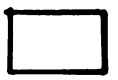
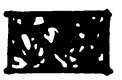
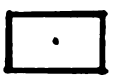
FORTY PRE-TEST CONCEPTS

C-1

The following concepts were displayed to the pre-test group by means of photographic transparencies.

1		(triangle)	11	ART
2		(square)	12	EDUCATIONAL PSYCHOLOGY
3		(circle)	13	MATHEMATICS
4		(angularity)	14	5.0 G 5/8 (bright green)
5		(rectangularity)	15	5.0 G 5/4 (muted green)
6		(curvilinearity)	16	5.0 R 5/6 (muted red)
7		(high contrast)	17	5.0 R 4/14 (bright red)
8		(medium contrast)	18	5.0 B 4/8 (bright blue)
9		(low contrast)	19	5.0 B 5/4 (muted blue)
10	LITERATURE		20	5.0 YR 5/6 (muted orange, brown)

C-2

21	5.0 YR 6/12 (bright orange)	31	SMALL GROUP DISCUSSION	
22	5.0 P 4/12 (bright purple)	32	MEDIUM GROUP RECITATION	
23	5.0 P 5/6 (muted purple)	33	LARGE GROUP LECTURE	
24	5.0 Y 7/6 (muted yellow)	34		(glossy texture)
25	5.0 Y 8/12 (bright yellow)	35		(smooth texture)
26	(white)	36		(rough texture)
27	(light grey)	37		(coarse texture)
28	(dark grey)	38		(small scale)
29	(black)	39		(medium scale)
30	INDEPENDENT STUDY	40		(large scale)

The concept numbers and words in parentheses were not shown on the transparencies. Concepts 38, 39, and 40 were accompanied by the verbal statement, "How would you feel if you were the dot in the square?" Colors are here designated by means of the Munsell Color Notation System.

APPENDIX D

GENERAL INSTRUCTIONS FOR PERFORMING PROGRAMMED TASKS

D-1

GENERAL INSTRUCTIONS

Your goal, as a group, is to complete as many tasks with as high a proficiency in each task as possible. Read each task requirement carefully; credit will be given for all efforts that meet the stated requirements, but no credit will be given for efforts that do not meet the requirements or are beyond the requirements stated.

All answers must be agreed upon by a concensus of the group membership. Write all answers on the paper provided, numbering each answer.

When one task is completed to the satisfaction of all members of the group, place the answers in the task envelope and go on to the next task envelope. The time required to complete a task may vary from only a few minutes to a few sessions. If a task is only partially completed at the end of a session, place it in its envelope and retrieve it at the start of the next session.

D-2

Answers of the kind involved in this exercise are not of the factual type, as found in a text; rather, they are the expressed opinions of those providing the answers and are not judged as necessarily right or wrong.

APPENDIX E

PROGRAMMED TASKS

E-1

Instruction Sheet for Specific Tasks

TASK INSTRUCTION SHEET

A. I. List as many practical applications of (concept listed in this space) as you feel could and/or should be implemented in a school.

II. Assign each of your applications to one of the following three categories:

(1) Extremely important

(2) Reasonably important

(3) Slightly important

III. List at least two reasons for assigning each answer to the particular category.

B. List as many practical instances as you can in which the application might be improperly used, (that is, used when it should not be used). List at least one reason which justifies the labeling of the application as a misuse.

Two points will be given for each application answer that meets the requirement in section "A"; one point for each answer in section "B".

E-2

Task Concepts

Task Number	Concept
1	Operant Conditioning
2	Self Concept
3	Learning to learn
4	Readiness
5	Systematic attempts to account for individual differences
6	Attitude formation
7	Attitude change
8	Classroom climate (Autocratic/Democratic)
9	Educating the socially disadvantaged learner
10	Problem solving
11	Instructional strategies for motivation
12	Factors affecting retention
13	Factors affecting transfer training
14	General instructional strategies
15	Concept formation
16	Piaget's description of cognitive development
17	Critical periods hypothesis
18	Developmental tasks
19	Interpretation of standardized test scores

APPENDIX F

POST-TEST CONCEPTS

F-1

At the final meeting of each group, the participants were instructed on procedures for the completion of the semantic differential attitude measurement form. The following three sentences were read to the participants, a semantic differential being completed after the reading of each sentence was completed.

1 Please indicate your attitude, or feelings, toward the subject matter of educational psychology, particularly as related to the discussions in your group.

2 Please indicate your attitude, or feelings, toward the activity of small group discussion, particularly as related to your experiences in your group.

3 Please indicate your attitude, or feelings, toward the room in which your group met.

APPENDIX G

DESCRIPTION OF TREATMENT SPACES

G-1

Space "A" The Consonant Space

Approach from Corridor

View from Entry

Overall View

Discussion Table

G-2

Space "B" The Dissonant Space

Approach from Corridor

View from Entry

Overall View

Discussion Table

APPENDIX H

INTERACTION DATA

H-1

Groups 1 and 2 Meeting Time 9:10-10:00 AM

Group 1 Dissonant Space (B)

Day	Interaction Category I	II	III	IV	Total
1	39	173	40	9	261
2	171	193	59	28	451
3	162	155	61	22	400
4	117	107	71	16	311
5	170	185	70	22	447
6	188	164	97	27	476
7	152	156	75	31	414
8	180	138	85	23	426
9	163	152	136	33	484

Group 2 Consonant Space (A)

Day	Interaction Category I	II	III	IV	Total
1	179	218	112	46	555
2	218	242	156	40	656
3	333	332	170	83	918
4	258	254	142	17	671
5	330	293	200	48	871
6	185	180	92	6	463
7	229	344	170	47	790
8	303	185	181	40	709

H-2

Groups 3 and 4 Meeting Time 10:20-11:10 AM

Group 3 Dissonant Space (B)

Day	Interaction Category I	II	III	IV	Total
1	114	131	70	22	337
2	190	255	93	35	573
3	174	288	74	41	577
4	199	238	53	43	533
5	196	197	101	45	539
6	216	269	148	53	686
7	374	198	27	11	610
8	183	185	128	33	529
9	192	206	149	38	585

Group 4 Consonant Space (A)

Day	Interaction Category I	II	III	IV	Total
1	70	140	56	12	278
2	230	231	118	54	633
3	237	121	80	17	455
4	198	203	61	10	472
5	222	207	108	44	581
6	214	193	97	51	555
7	219	191	46	69	525
8	269	201	198	83	751
9	294	215	155	50	714

H-3

Groups 5 and 6 Meeting Time 11:30-12:20 PM

Group 5 Dissonant Space (B)

Day	Interaction Category I	II	III	IV	Total
1	109	173	72	25	379
2	127	163	55	12	357
3	148	124	49	18	339
4	197	195	82	23	497
5	245	132	49	101	527
6	278	148	40	50	516
7	177	262	112	25	576
8	226	205	76	37	544
9	195	137	65	16	413

Group 6 Consonant Space (A)

Day	Interaction Category I	II	III	IV	Total
1	70	143	56	15	284
2	175	278	101	18	572
3	159	212	87	12	470
4	287	203	112	14	616
5	298	314	109	28	749
6	179	286	99	21	585
7	165	132	96	27	420
8	204	248	65	25	542
9	185	217	89	14	505

H-4

Groups 7 and 8 Meeting Time 12:40-1:30 PM

Group 7 Dissonant Space (B)

Day	Interaction Category I	II	III	IV	Total
1	160	203	72	70	505
2	210	223	72	42	547
3	225	263	91	48	627
4	191	322	72	28	613
5	256	243	75	85	659
6	70	163	19	40	292
7	171	149	105	27	452
8	74	228	68	81	451
9	180	115	16	13	324

Group 8 Consonant Space (A)

Day	Interaction Category I	II	III	IV	Total
1	158	192	103	17	470
2	156	144	86	8	394
3	311	283	145	39	778
4	162	256	74	53	545
5	318	285	104	83	790
6	153	172	40	20	385
7	166	155	148	32	501
8	262	273	93	75	703
9	151	146	30	3	330

H-5

Groups 9 and 10 Meeting Time 1:50-2:40 PM

Group 9 Dissonant Space (B)

Day	Interaction Category I	II	III	IV	Total
1	107	282	82	20	491
2	194	304	107	41	646
3	275	336	94	53	758
4	143	166	56	25	390
5	238	214	36	55	543
6	415	321	96	167	999
7	308	229	61	142	740
8	166	199	24	175	564
9	190	278	144	76	688

Group 10 Consonant Space (A)

Day	Interaction Category I	II	III	IV	Total
1	69	76	46	8	199
2	98	209	86	30	423
3	106	174	59	32	371
4	95	200	79	24	398
5	104	96	37	8	245
6	175	203	73	74	525
7	207	233	103	53	596
8	126	213	81	19	439
9	142	231	124	21	518

H-6

Interaction Scoring Form

I SOCIAL-EMOTIONAL AREA: POSITIVE REACTIONS	1	Shows solidarity, raises other's status, gives help, reward.
	2	Shows tension release, jokes, laughs, shows satisfaction.
	3	Agrees, shows passive acceptance, understands, concurs, complies.
II TASK AREA: ATTEMPTED ANSWERS	4	Gives suggestion, direction, implying autonomy for others.
	5	Gives opinion, evaluation, analysis, expresses feeling, wish.
	6	Gives orientation, information, repeats, clarifies, confirms.
III TASK AREA: QUESTIONS	7	Asks for orientation, information, repetition, confirmation.
	8	Asks for opinion, evaluation, analysis, expression of feeling.
	9	Asks for suggestion, direction, possible ways of action.
IV SOCIAL-EMOTIONAL AREA: NEGATIVE REACTIONS	10	Disagrees, shows passive rejection, formality, withholds help.
	11	Shows tension, asks for help, withdraws out of field.
	12	Shows antagonism, deflates other's status, defends or asserts self.