R E P O R T R E S U M E S

ED 014 204 EF 000 088

PLANNING STUDY--BEHAVIORAL FACTORS IN DENTAL SCHOOL DESIGN. SUMMARY PROGRESS REPORT.

BY- MYRICK, RICHARD

PUB DATE OCT 65

EDRS PRICE MF-$0.25 HC-$1.24 29P.

DESCRIPTORS- *BUILDING DESIGN, *DENTAL SCHOOLS, *PHYSICAL DESIGN NEEDS, *PSYCHOLOGICAL DESIGN NEEDS, CLASSROOMS, CLINICS, CORRIDORS, DESIGN PREFERENCES, DINING FACILITIES, LABORATORIES, LEARNING, MOTIVATION, PERCEPTION, SPACE RELATIONSHIPS,

THIS REPORT DISCUSSES ENVIRONMENTAL CONSIDERATIONS IN THE DESIGN OF DENTAL SCHOOL FACILITIES AS RELATED TO THE EDUCATIONAL NEEDS OF STUDENTS AND FACULTY. TWO TYPES OF NEEDS ARE IDENTIFIED--(1) PHYSICAL, INCLUDING A FUNCTIONAL ANALYSIS OF THE PHYSICAL NEEDS IMPOSED BY THE TASKS TO BE DONE, AND (2) PSYCHOLOGICAL, INCLUDING MOTIVATIONAL, SOCIAL, AND PERCEPTUAL ASPECTS. THREE PILOT STUDIES WERE CONDUCTED, CONSISTING OF INTENSIVE INTERVIEWS AND QUESTIONNAIRES GIVEN TO STUDENTS AND FACULTY ON A NUMBER OF DENTAL SCHOOLS. THE STUDIES IDENTIFIED FACTORS IN THE ARCHITECTURAL ENVIRONMENT RELATED TO THE SATISFACTION OF VARIOUS PHYSICAL AND PSYCHOLOGICAL NEEDS. THE RESULTS INCLUDED (1) LOCATIONS FOR INFORMAL LEARNING, (2) PERCEIVED SATISFACTION OF NEWER BUILDINGS AS HIGHER IN BOTH TYPES OF NEED, AND (3) FACULTY SATISFACTIONS AND INTERACTIONS AS RELATED TO SCHOOL LAYOUT. THE CONCLUSIONS DISCUSS THE SOCIAL FUNCTIONS OF ARCHITECTURE IN TERMS OF INFORMAL INTERACTIONS IN THE FRAMEWORK OF ROUTES, NODES, ZONES, AND MIXES. A BIBLIOGRAPHY IS INCLUDED. (MM)

Summary Progress Report

on the

Planning Study: Behavioral Factors in Dental School Design

Richard Myrick, Ph. D.
The George Washington University
Washington, D. C. 20006

October 1965

This investigation is supported by Public Health Service Grant DH-00042-01A1, from the Division of Dental Public Health and Resources.

SUMMARY PROGRESS REPORT
on the
PLANNING STUDY: BEHAVIORAL FACTORS IN DENTAL SCHOOL DESIGN

INTRODUCTION

This report describes the first eight months of work, from January through August 1965. It attempts to formulate some of the problems and needs in dental education, and to describe three pilot studies which have been done. A summary of our present theoretical position is then presented.

SOME PROBLEMS AND NEEDS IN DENTAL EDUCATION

One may begin by noting that essentially there are two kinds of architectural requirements which, to simplify terminology, are referred to in this report as Type I and Type II requirements. Type I requirements consist of those that deal with the physical needs imposed by the tasks to be done. One way to describe these requirements is to list the parts of the building that would be needed by the users: classrooms, lecture halls, offices, clinics and laboratories. Various functional relationships between the parts or components of a building would be included in these specifications. Other physical requirements are expressed in numerical terms, and might include the dimensions of various counters and benches, the amount of surrounding space necessary, and the number of units desired. A very keen awareness of Type I requirements already exists in institutional architecture.

Type II requirements deal with psychological needs. The basic underlying consideration here is that the student using the building must be able to learn and to integrate subject matter of his educational program over a four-year period, must develop certain technical skills, and must acquire certain professional attitudes. To help meet these needs, various relations are necessary between one student and another, between student and teacher, and between teachers. These relations between people play an important part in the communication aspects of

learning, and constitute the social requirements of the learning situation. In addition, there are relations between present learning and future goals that help provide continuity between different learning activities; and the student needs to gain a comprehensive understanding of them. These are perceptual requirements, for they have to do with perceiving the organization of the building and its activities as these relate to the student's educational and occupational goals.

An example of a Type I or physical requirement is the need for a waiting room in a dental training facility, that is big enough for a receptionist and a certain number of patients, and is located near the patients' entrance and the Department of Oral Diagnosis. There is a compelling logic in developing a full requirement statement along these lines, for it identifies the components that are needed and the relations between them. The drawback to this approach is that it is limited to making some assumptions about the space that is required, and to giving a detailed description of how the space is arranged. If the assumptions are wrong, or if they are simply a restatement of spaces in current use, then the chance of making new and improved designs is lost.

Thus, there is a problem-solving aspect to architectural planning which should be given more emphasis: one first must state the problem, which might be to identify certain activities which one expects to occur, and then one must move to the solution, which might be to provide appropriate spaces for the activities. An architectural planning effort that begins by describing the spaces that are needed has skipped the crucial step of stating the problem, and has reached the solution prematurely.

A better way to deal with Type I requirements, and the one commonly used, is to think about the functional aspects of the school. This is one method currently used by some institutional architects. Usually a functional analysis deals with

the task to be done, the people, and the equipment involved. The advantage of the functional analysis is that it concentrates attention on the problem phase by stating the architectural requirements, and allowing the solution to come later. In the example of the waiting room, questions having to do with the specific space might not even be answered, since these answers bypass the basic question of where people should wait for treatment, thus excluding other possible solutions to the problem. A functional analysis of the inherent tasks and activities might even conclude that waiting rooms should be broken down into a number of different spaces, perhaps a television room for children, a reading room for adults, plus a liberal sprinkling of departmental waiting rooms.

The functional analysis of Type I requirements can be carried further and becomes a kind of operations research study. This kind of study is sometimes carried out as a part of the planning of a building. An operations research study attempts to describe how operations are performed in order to increase efficiency. Rather than considering a single area of activity at a time, the starting point of the architectural planning might be to examine the whole patient flow system. It might include how many people wait for treatment at certain hours, for how long, how they get to the appropriate room for treatment, whether they are available when the dentist is ready for them, how long they spend in the dentist's chair once he takes over, and so on. Such information can make a contribution to the problem of the proper size and location of the waiting room. For example, it might be found that while patients waited downstairs, there was a shortage of patients in some of the clinics upstairs. A reorganization based on this information might reduce waiting time as well as the amount of space needed for waiting.

But the functional analysis, while valuable, is only one means of reaching certain other more important goals. The goal is not just to have the patients

and dental charts flow smoothly through the system, or even to move dental students through a series of training activities, but also to develop the student into a professional man. If a person goes through the four-year program and fails to develop a feeling for the importance of excellence in learning, research, and service, and if he fails to understand the broad concepts of diagnosis and treatment, he is not truly a professional. To build a new, glistening, well-lighted building, packed with the newest equipment, does not automatically insure the development of a professional. With this introduction, consideration is now directed to the second set of architectural requirements, Type II requirements, which deal with psychological needs of the users of the building.

Some of these requirements are described, after which a few specific suggestions are made for meeting them. Since Type II requirements apply to the user's needs, three of these user groups are focused on here: students, teachers, and patients. (Others who are important, but who have been excluded in the interest of simplifying the problem, include the administrative staff, research staff, nurses or dental assistants, clerks and secretaries, and maintenance personnel.) The needs of each group are classified under three headings: motivational aspects, social aspects, and perceptual aspects.

An important motivational aspect for the student is the development of professional attitudes. While the student must develop technical competence in knowing <u>how</u> to provide dental care, it is also desirable that he develop the judgment to determine <u>what kind</u> of care is needed, and <u>what standards</u> should accompany this care. This concept goes beyond diagnosis in the limited sense of the word, because it means an understanding of the structure and function of the whole body as it relates to oral health and disease. It also means that with the graduate who enters private practice, the lack of an external supervisory

monitoring system that was provided formerly by the school must be balanced by the inner control that comes with the development of professional attitudes.

While these motivational considerations have implications for the architecture of dental facilities, social considerations have an even greater number of implications. The major social considerations, on which we are concentrating in our development of theoretical concepts, are those that promote or accompany informal learning. Informal learning occurs through conversations between students, and between students and teaching staff, dealing with the sharing of learning experiences and reactions to them. For example, one student might tell another about a lecture which gave him a sudden insight into the relationship between certain concepts. Only certain kinds of learning can occur within the formal setting of classrooms and clinics. These include the presentation of factual material and methods as well as practical applications. The job of reinforcing, clarifying, discussing, and generalizing what has been heard in lectures or classes can often best be done on a spontaneous, informal basis. Further, the process of developing professional attitudes is partially achieved by informal talks or contacts between faculty and students. Therefore, the architecture of dental facilities should encourage contacts of the kind that lead to informal learning and the development of professional attitudes.

Turning now to the perceptual needs of the building's users, we begin to see how these relate to the broad motivational needs. For example, the student must be helped to perceive a series of relations between basic sciences and clinical experiences. Further, he must see how his educational program and training as a student relates to his professional aims. In relating these different activities, it is easier to see the relations between those that are close together, either because of occurring within the same time period, or because of dealing with similar subject matter.

The needs of the two other user groups, teachers and patients, are considered only briefly in this report. But a few needs may be suggested. For the teaching staff, two of the important motivational needs are to find a challenge in teaching and to develop an interest in research. Under the social heading, come needs for social interactions with students, other faculty members, and the school community. Under the perceptual heading, it is desirable for the teacher to see how his present activities relate to his long-range professional goals.

In the instance of the patient, doubtless his chief motivational needs are a reduction in his fear, and a feeling of assurance that he will get good care. Also, stemming from the patient's situation are two important perceptual needs: that he <u>feels</u> he is being treated as an individual and not a number, and that he <u>sees</u> he is receiving good care through an effective combination of a student-teacher team. As these perceptual requirements are met, the social interaction that occurs between patients before and after treatment becomes a meaningful way of reducing fear and establishing the reputation of the school among the patient population.*

RESULTS OF THREE PILOT STUDIES

Three pilot studies are summarized in this second part of the report. Pilot study #1 is closely related to the problems and needs in dental education described above. This pilot study attempted to identify specific examples of architectural solutions which would help meet some of the Type II needs. Pilot study #2, using a questionnaire, was conducted in order to gain a substantial volume of information about student attitudes toward the buildings they worked in and toward the teaching and administrative staff. Pilot study #3 dealt with attitudes of the teaching faculty toward their students, and the buildings with which they had had experience.

---

* Parts of this section are drawn from an article by the Investigator, "New Concept in the Architectural Planning of Schools of Dentistry" to be published in <u>The Journal of Dental Education</u>.

Pilot Study #1: Some Relationships between Certain Desired Behaviors and Architecture

Purpose and Method -- The purpose of this study was to identify specific architectural examples, drawn from existing dental schools, which led to the satisfaction of motivational, social, and perceptual needs of the users of these buildings. Three user groups were considered: students, teachers, and patients. To collect this data, extensive interviews were conducted with seven individuals, three of them upper division students from one school, four of them recent graduates from four different schools.

Results and Theoretical Implications -- With respect to motivational and social aspects, the interviews indicated that informal social interactions leading to improved learning and the development of professional attitudes are particularly likely to occur in the cafeteria or coffee shop, in the laboratory which is used in connection with the clinic, and in the hallways near classrooms and clinics. More extensive interviewing would probably identify additional places. In examining these findings, it can be observed that such interactions are likely to occur where space is provided for them. But how can the quality or subject matter of these interactions be improved?

Having a pleasant and convenient cafeteria is not the entire answer, because this in itself does not lead to promoting conversations about dentistry rather than about other topics. It appears that one way to encourage conversations about dental problems is to have students and faculty sitting together. A cafeteria convenient to faculty offices may help encourage this situation. In a school where the basic sciences faculty is full-time, and the clinical faculty is largely part-time, it may be that a priority should be given to the basic sciences faculty, and some other arrangement should be made for the clinical group.

Conversely, the laboratory situation seems to provide a sufficient focus on dental problems so that it is not necessary to worry about keeping the conversation in educational channels. Perhaps the goal should be to have the individual student's work visible to as many of his classmates as possible. For example, work spaces should be open, and possibly both sides of work benches should be utilized.

The possible contribution of hallways to informal learning should not be overlooked, as a large volume of interactions occur there, even though only for short periods. At present, there are no data to suggest the critical architectural variables that should be considered. One can speculate that it would be desirable to have hallways wide enough to accommodate standing groups, or a lay-out which would give students time to talk rather than oblige them to hurry to another classroom a considerable distance away. In addition, the shape of hallways may also contribute to interactions by having bays or other irregularities which provide "parking spaces" out of the main stream of traffic.

Turning to the possible ways that the architectural environment may help meet the perceptual requirements of students in a dental facility, very few solutions have been found to be in current use. There were signs that at nearly every point in the student's four-year program he is mainly occupied with the specific task at hand, and has difficulty in sensing broader relations. A number of dental school administrators have considered these problems and are making efforts to improve the situation in part through curriculum changes.

To speculate on how the architecture of a dental facility might contribute to solving this problem, we might consider what school activities and inter-relationships between them are made visible to the student as he goes through the curriculum. For example, the freshman student may enter the building, go directly to the basement to his locker, and then go elsewhere in the basement to his first class.

As he learns more about the building, he may ascertain what activities occur in certain places, but it is doubtful if he can see the totality. Possibly some compromise could be made with the practice of locating laboratories in one area, classrooms in another, and clinics in a third area in order to make possible certain encounters between students and activities that would lead to a more integrated picture. Similarly, research activities might be made more visible. Lectures on research are excellent, but a continuing visual exposure to research areas might be more meaningful to students.

Interviews with the teaching staffs and patients could provide data about their user needs similar to that which can be obtained from students. It is particularly interesting to consider the beneficial effects of increased social interaction between patients as a means of dealing with fear. A simple reorganization of the seating arrangements in a waiting room, from rows to U-shaped areas might facilitate the desired conversations. The patient's perception of the dental school might also be considered. There are differences of opinion among administrators on the advisability of letting patients see the clinical area while waiting for treatment. If the purpose is to let the waiting patients become more familiar with the clinical situation, that value would seem to be limited. Conversely, if the purpose is to show the patients that the clinic is efficiently operated and provides superior care -- and if there is some chance of achieving this purpose -- it might be desirable to locate the waiting room so as to afford a view of the clinic.

Pilot study #1 shows that there are some connections between architecture and behavior. Further research in this area is needed to identify more specifically how architecture influences the desired behaviors, and what critical variables are involved.

Pilot Study #2: A Survey of Student Attitudes in Old and New Dental Buildings

Purpose and Hypotheses -- The basic purpose was to compare new and old dental school buildings as to the amount of satisfaction provided for the physical and psychological needs of students. It was hypothesized that students who worked in older buildings would perceive them as being warm and friendly, as well as helping students see important relationships between different parts of their work and training. These two factors are viewed by us as very important in satisfying the psychological needs of students in-so-far as the architecture can make a contribution. Conversely it was hypothesized that students who worked in newer buildings would perceive them as being more efficient and better suited to meeting physical needs, possibly at the expense of meeting a lesser amount of the students' psychological needs.

A second pair of hypotheses dealt with the question of whether student dissatisfaction would manifest itself toward the building or toward the faculty and administrative staffs. It was hypothesized that old buildings provided a ready-made object of dissatisfaction for the students; while in new buildings, with this object removed, there would be a displacement of dissatisfaction from the building to the faculty and administrative staffs, with a greater amount of griping directed at them.

Method -- A questionnaire was developed to answer these questions, with the following specifications:

a. it contained items dealing with the satisfaction of physical and psychological needs,

b. it contained items dealing with the student's perception of the building, the faculty, and the administration, and

c. the items were written as multi-choice questions, and, after each item, space was provided for comments.

An analysis of the content-distribution of the questionnaire follows:

	Building	Teaching Staff	Administration
Physical Needs	Items 1,3,&4 deal with convenience and adequacy of space.	Item 8 deals with the number of instructors available.	Item 11 deals with school costs.
Psychological Needs	Items 2,5, &6 deal with the friendliness and warmth of atmosphere of the building, and its contribution to informal learning.	Items 7 & 9 deal with the relationship between student and teacher.	Item 10 deals with the relationship between student and administration.

The questionnaire was pretested on a group of dental school students, and appropriate modifications were made. A particularly important modification was that the instructions were made sufficiently explicit to permit administration of the questionnaire by mail.

A number of deans of dental schools were then contacted, and asked if they would be willing to participate in this pilot study by allowing the questionnaire to be given. As a result, a sample of nine schools was obtained, with five schools housed in old buildings and four in new buildings. The "new" buildings were less than 15 years old; the "old" ones were generally over 30 years old. The distinction between old and new buildings applied to the building which housed the clinic, which is where much of the 3rd year training occurs. (A number of dental schools use a campus-type layout in which some of the buildings are old and some new.) The schools were asked to administer the questionnaire to their entire Junior class. The total number of completed questionnaires was 384.

The questionnaire is reproduced on the next two pages, pp. 12 and 13.

Dental Student Questionnaire

We are asking your cooperation in filling out this questionnaire, which is part of a study of dental schools, conducted by the George Washington Research Staff and financed by the Dental Public Health Service. Please draw a circle around the answer which, based on your experience, conveys your general impression of the adequacy of the building, the teaching and the administrative staff of the school you are now attending. After each question, please write a brief comment which will make your answer more explicit.

Since the results are confidential, please do not sign your name.

1. How convenient is the location of the main units of the school, including the lecture rooms, clinics, labs, the cafeteria, student lockers and so forth?

very convenient	pretty convenient	so-so	pretty inconvenient	very inconvenient

Comment: _____

_____

2. How much does the general layout help you integrate and see relationships between the various parts of your four-year program of study and training?

very much	pretty much	so-so	not very much	not at all

Comment: _____

_____

3. Do you feel the equipment in the clinics and labs is up-to-date?

definitely up-to-date	pretty up-to-date	so-so	pretty outdated	very outdated

Comment: _____

_____

4. Is there adequate space for working and moving around in the clinics and labs?

very adequate	pretty adequate	so-so	pretty inadequate	very inadequate

Comment: _____

_____

5. Does the design of the building give you the impression of being warm and friendly?

very warm and friendly	pretty warm and friendly	so-so	pretty cold and impersonal	very cold and impersonal

Comment: _____

_____

6. How well does the building provide spaces where you can have brief informal conversations with instructors and other students?

very well	pretty well	so-so	pretty poorly	very poorly

Comment: _____

_____

7. How interested in helping the students do you find the instructors to be?

very interested	pretty interested	so-so	pretty disinterested	very disinterested

Comment: _____

_____

8. Do you feel there are enough instructors on the staff to give the individual attention needed in a lab or clinic?

more than enough	about enough	occasionally not enough	often not enough	never enough

Comment: _____

_____

9. Do you think the instructors are fair and objective in giving grades?

very fair	pretty fair	so-so	pretty unfair	very unfair

Comment: _____

_____

10. How cooperative and helpful is the administration with problems that you or other students might have?

very cooperative	pretty cooperative	so-so	pretty uncooperative	very uncooperative

Comment: _____

_____

11. Do you feel that tuition and fees are kept as low as possible by the administration?

definitely kept as low as possible	kept pretty low	kept fairly low	not kept very low	not kept low at all

Comment: _____

_____

12. How much of your work in this school has been in an old building (over 15 years old) and how much in a new building (under 15 years old)?

all work in an old building	most work in an old building	about half and half	most work in a new building	all work in a new building

Results -- The main results are shown in Table I. Each number in the table represents the Mean of responses given by students on that item. Responses were made on a five-point scale, with "1" being the most favorable rating, and "5" being the most unfavorable. It may be seen that in most of these dental schools, whether the buildings are new or old, the physical needs of the students are better satisfied than the psychological needs. It is particularly interesting that newer buildings not only were seen as meeting physical needs better, but also as meeting psychological needs better. The idea that new buildings are cold unfriendly places does not appear to be borne out by this pilot study.

There is some support for the hypothesis that student dissatisfaction about the faculty is greater in new buildings ($t = 5.29$, significant at the .01 level). A possible explanation is that in new buildings the student cannot direct his dissatisfaction at the building, and hence he displaces his dissatisfaction on the faculty. One factor to consider here is the size of the schools in the sample. Some studies of high schools, for example, have indicated that students feel more involvement and loyalty in smaller schools. A similar finding appeared in this pilot study, with smaller schools receiving the most favorable ratings, and the larger schools the most unfavorable ratings.

In analyzing correlations between various items for single schools, there were a number of unexpected results, particularly in the school most favorably rated. Examination of scattergrams showed a high correlation exists between how interested the student found the instructors to be and how much the general layout of the building helped them see relationships in their dental training program. Another high correlation was found between how interested the student found the instructors to be and whether the design of the building gave the impression of being warm and friendly. A possible interpretation here is that when a building helps an individual to see and understand the full range of his training program, he perceives both the

TABLE I

STUDENT RESPONSES TO DENTAL STUDENT QUESTIONNAIRE

		Old Buildings N = 239			New Buildings N = 145	
	School	Physical	Psychological	School	Physical	Psychological
Bldg:	A	2.7	3.1	F	1.5	2.1
	B	2.8	3.3	G	1.5	2.1
	C	2.7	2.8	H	2.9	3.1
	D	3.3	2.9	I	2.0	2.3
	E	2.7	3.7			
	Mean:	2.8	3.3	Mean:	2.0	2.4
Teachers:	A	3.5	2.0	F	2.5	2.4
	B	3.9	3.2	G	3.3	2.4
	C	2.8	2.1	H	3.3	3.8
	D	3.3	2.4	I	3.0	2.1
	E	3.6	2.5			
	Mean:	3.4	2.4	Mean:	3.0	2.7
Admin:	A	1.8	2.0	F	1.3	2.4
	B	2.1	2.8	G	2.3	2.5
	C	2.3	2.0	H	2.8	2.5
	D	4.1	2.3	I	3.0	2.5
	E	3.9	3.5			
	Mean:	2.8	2.5	Mean:	2.3	2.5

Note: Each number in the table represents the Mean of the responses given by students on this item. Responses were made on a five-point scale, with "1" being the most favorable rating, and "5" being the most unfavorable.

building and his teachers in a broader context and becomes more tolerant of the difficulties he encounters.

In analyzing correlations between items for all schools, some understanding of the structure of student attitudes as a whole can be obtained. Table II shows these correlations. The main cluster of items, composed of those with the highest intercorrelations, includes items 1, 4, 5, and 6. These items are:

1. How convenient is the location of the main units of the school, including the lecture rooms, clinics, labs, the cafeteria, student lockers, and so forth?

4. Is there adequate space for working and moving around in the clinics and labs?

5. Does the design of the building give you the impression of being warm and friendly?

6. How well does the building provide spaces where you can have brief informal conversations with instructors and other students?

To describe this cluster, one may say that it deals with the convenience, adequacy and friendliness of the building and its parts. The term convenience appears to mean not only whether rooms and objects are located where they can be used easily, but also whether other people are accessible. There is the implication that as the building facilitates more interaction between faculty and other students, it is seen as being a more warm and friendly building. It is interesting to note that two of these items pertain to the physical aspects of the building, and two of them pertain to the psychological aspects of the building. This relationship supports our notion that satisfaction with the interpersonal relations occurring in a building is in part influenced by the architecture.

An especially useful part of the questionnaire consisted of the comments written by the students. Nearly half the questionnaires contained thoughtful contributions. In dealing with physical needs, the comments pointed out shortcomings of the buildings which must have been well-known to students and administration alike. Students were particularly frank in expressing their attitudes

TABLE II

INTERCORRELATIONS BETWEEN QUESTIONNAIRE ITEMS FOR NINE SCHOOLS, BASED ON SCATTERGRAMS

QUESTIONNAIRE ITEMS	1	2	3	4	5	6	7	8	9	10	11
2	.4										
3	.1	.0									
4	.5	.2	.0								
5	.7	.2	.3	.8							
6	.9	.1	.0	.8	.7						
7	.1	.0	.0	.0	.0	.0					
8	.1	.3	.3	.0	.0	.5	.0				
9	.0	.0	.0	.0	.0	.0	.5	.0			
10	.0	.0	.0	.0	.3	.0	.2	.0	.5		
11	.0	.0	.0	.0	.3	.2	.2	.1	.0	.1	

QUESTIONNAIRE ITEMS

toward the clinical instructors. However, this problem area has already been carefully documented in the recent Survey of Dentistry published by the American Council on Education.

Of more interest here are the comments relating to the psychological needs of students. Comments given in response to item 2 -- "How much does the general layout help you integrate and see relationships between the various parts of your four-year program of study and training?" -- were along the following lines:

Student A: "Not enough integration of medical problems into clinical teaching."

Student B: "Only during lectures and lounging does one meet others than just his small group."

Student C: "The idea of the sophomore being isolated from the remainder of the program has never been adequately understood."

A few comments made in response to item 5 -- "Does the design of the building give you the impression of being warm and friendly?" -- are also of interest:

Student D: "As much as any professional building."

Student E: "The building shows no warmth in its design. It doesn't motivate any 'esprit de corps'."

Student F: "Not very much, because the isolated cubicles tend to reduce warmth and friendliness."

Student G: "There is no integration of upper and lower classmen. There is separation of the faculty and student with separate entrances, parking lots, rest rooms which carries over in conversation in the classroom as well as in extra-curricular activities."

Pilot Study #3: Student-Faculty Problems

Purpose and Method -- This study is part of an effort to redefine the aspects of architectural environment of dental schools in social science terms. Our rationale is that certain factors in the architecture, still largely unknown, play an important part in determining the attitudes, motivations, and social structure, and consequent satisfactions and dissatisfactions, of the people who use a dental school.

A specific student dissatisfaction which served as a starting point for this study was the poor quality of student-teacher relationships, particularly in the clinics. Of fifteen schools which were sampled by questionnaire and interview, nearly all of them indicated this problem to be a serious one. In order to provide a basis for investigation of the problem, three hypotheses were set up:

1. Clinical instructors see themselves as part of a service group doing fairly routine tasks; instead of as a professional group such as might be found teaching the basic sciences (a task hypothesis).
2. Clinical instructors see themselves as belonging to a small somewhat isolated group, belonging to a single department rather than an inter-departmental group (a social interaction hypothesis).
3. Clinical instructors see themselves as working in the less desirable parts of the dental school building (an architectural hypothesis).

Data were collected via extensive interviews with seven staff members representing the administration, the clinic, and the basic sciences.

Results -- In considering the first hypothesis, relating to the task, it appears that most difficulties are in the Operative Department. Interviewees felt that for many clinical instructors, the job is routine, dull, and must be performed in large volume. Because much operative work can be evaluated rather precisely by direct inspection, many of the subtle and more challenging problems of establishing criteria and making evaluations do not exist, with the result that clinical instructors tend to be dissatisfied and feel their work is low on the scientific and medical scale of accomplishment.

When one considers the formal and informal relationships that exist between student and instructor, a further problem becomes evident. The instructors in the Operative Department put in such long hours on the floor, that when this "formal meeting" is ended, neither the instructors nor the students have any

interest in further interchange at the informal level. This situation may be contrasted with that of the instructor in the basic sciences, where the formal hours are fewer, and the interest in and chances of informal conversation are greater.

Also, judged by some standards, the basic sciences have more prestige. Many of these departments contain people with backgrounds and interests similar to those found in medical schools or other parts of universities. Thus, they are a part of a broader society of scholars which goes beyond the dental field. In addition, there is more chance for research in the basic sciences, due to greater access to the necessary time, funds, and laboratory facilities. Thus, on several grounds, support for the first hypothesis was obtained from the interviews.

These findings lead into the second hypothesis, relating to social interaction, which is that the clinical instructors see themselves as belonging to a small and somewhat isolated group. This is less true in schools where the first two years are taught mainly by a medical school faculty, because in the second two years, the clinical part of the program is the school, and could hardly be isolated. But it is especially true in schools where the basic sciences and the clinical work are carried on in the same building, because then the clinical instructors feel themselves to be in more direct competition with the basic science instructors, who have greater prestige. In these schools where the teaching of the basic sciences is integrated with the clinical work throughout the program, the goal of total patient care is emphasized; however in the Operative Departments, where much of the time must be spent in developing motor skills, it is more difficult to make the concept of total patient care meaningful. Thus, there is some support for the second hypothesis that the clinical instructors see themselves as belonging to a small somewhat isolated group.

The third hypothesis, relating to architecture, which is that the clinicians see themselves as working in the less desirable parts of the building, finds little support from the data collected from the interviews. It is true that most operative clinics, being large, hardly provide the instructor with a personal space with which he can identify. Yet some instructors may like being part of the largest unit in the dental training program. Its very size gives it a dominant position in a building. And because so many patients go there, it is also in many ways the center of activity.

Psychological Implications of this Pilot Study -- The dissatisfactions felt by the student about the clinical training situation are well-known. To mention two of them: instructors sometimes reprimand a student in front of his patient, and instructors are sometimes indifferent to the student who is waiting to have his dental work on a patient checked. Only slightly less obvious are the effects on student attitude. The main effect, though hardly one that is found in all students, is that the student loses interest in learning and becomes primarily interested in survival, i.e., getting through the program. As a result of the erosion of the relationship between instructor and student and the decrease in student motivation, thoughtful discussion between instructor and student on the clinic floor becomes rare. The relationship here becomes not unlike that found between manager and worker which is facetiously called the "fairness contract". In this contract, the instructor says to the student, "If you will be fair with me, I will be fair with you." What he means is, "If you will do exactly as I say, perhaps I will give you a passing grade." It is unfortunate that some students who have entered the field simply as a way of making a living will quietly accept the terms of the fairness contract, while the more thoughtful and highly motivated student, who would be particularly valuable in the field, is more

apt to be disenchanted by the friction, and rebel against it with the consequent penalties.

Architectural Implications -- Bearing in mind that the clinical instructors are the chief target of change in order to increase their satisfaction, three needs may be identified:

1. A need for a greater sense of status and satisfying involvement in the work.
2. A need to share in stimulating problems with other departments.
3. A need for facilitation of student-teacher relationships.

The need for a greater sense of status might be satisfied if the architecture permitted the clinics to be organized into smaller rooms. The instructor who covers six chairs in a room of twelve chairs -- in short, half a room -- may have more of a feeling of involvement in his work, than he would in covering six chairs in a room of sixty chairs, or one-tenth of them. A second point here is distinguishability. If there were a series of smaller clinics, it might pay to make each quite different from the other so that, with its distinguishing features, it could develop its own character. Size and different location are two obvious variations. Even the large Operative Clinic might be broken into smaller parts and located in different parts of the building. We recognize that these suggestions may not be as efficient as present arrangements, especially when judged against the need for centrally located dispensaries, labs, offices, and other supporting units. Yet one must bear in mind that part of the problem of teacher and student morale is that buildings have emphasized a factory-like efficiency at the expense of the psychological needs of students and teachers.

The need for stimulation and a more interesting rewarding task, felt by many clinical instructors, might be met by providing options, through the architecture, to meet other members of the faculty. Ideally these interactions should

be informal. Thus the architectural solution is not to provide more lounges and seminar rooms. Instead the solution is through making parts of the basic science facilities accessible both to instructors in the clinic and students by locating these facilities, and particularly their entrances, near each other. The opportunities for gratifying interactions in hallways should not be overlooked. That is, the routes followed by each group in going from the parking lot to their places of work, the lecture halls, and the cafeteria could be located to maximize meeting others. Although the crucial step in these desired interactions may occur when a clinician calls in a basic science person for consultation on a problem of joint concern, this kind of cooperation is unlikely to occur unless the individuals concerned: (1) already know each other, (2) have become somewhat friendly, (3) have a fairly clear understanding of each other's activities, and (4) are located relatively convenient to each other.

As for improving student-teacher relationships, it may be that one of the popular arrangements in the clinic where each student has his own cubicle, "just as if he were in private practice" is actually establishing an inappropriate relationship. The fact is that the student is still working under the supervision of an instructor and is not in private practice. The more the student has his own private space, the more the instructor is excluded. Similarly, the instructor, when he is not instructing, often spends his time in a small office with several other instructors, thus making it a sort of lair in which he is inaccessible to students. If the instructor and the student are to improve relations, it might be desirable to think of a shared space. The student's cubicle and the instructor's office would be eliminated. Desk space for the instructor might be provided within the clinic so as to provide visual contact between the student and the instructor.

A word of caution should be included here about these architectural implications based on Pilot Study #3, for they are not recommendations. They are based on limited data, and as one dental school administrator who reviewed this study pointed out, some suggestions for different space arrangements have been tried and have not provided a full solution. This is why further research on these arehitectural aspects is necessary.

OUR PRESENT THEORETICAL POSITION

Consideration of these three pilot studies and of information gained from other sources has led us to some further formulation of our ideas. If one wishes to talk about the people in a dental school in social science terms, and to relate their activities to the architecture of a dental school, then the architecture must be considered in terms of the social activities it can influence. In other words, the stimulus of the architecture, and the behavioral response by the people who use the architecture, must be expressed in terms that are commensurate. Such commensurate terms have been lacking, causing a stumbling block to researchers interested in studying these problems.

We have been considering the relationship between a number of design factors and behavioral responses, and we have sought to devise some appropriate conceptual terms with which to describe them. Four of these terms are "route," "mix," "node," and "zone." One design factor relates both to the places where important formal learning activities are conducted, and to the "routes" followed by people in going from one location in the school to the next. Routes can make certain learning situations more familiar and accessible, by taking people by "contact points" where there are activities to be seen or people to talk with, in a manner which will contribute to informal learning. The architectural design of the corridors and the general layout of the school can encourage routes that

maximize rather than minimize the number of such "contact points."

Beside functioning as a means of displaying a number of activities, routes can function as meeting places depending on how they overlap or intersect, thus providing places where people can meet or talk. The corridors of buildings are places where one student may see a hundred or more faces in the brief interval between class periods. If these corridors are used by a variety of individuals -- students of different levels, teachers of different departments, and administrators -- they offer the possibility of being used for brief informal learning activities.

Therefore, another kind of architectural factor related to social interaction is the "mix." The term "mix," as used here, refers to various ways in which groups of activities or people may be assembled in one location or along one corridor. Depending on the kind of mix, different goals can be attained. From the standpoint of the Type I requirements, pertaining to the physical needs of the people using the building, it is probably most convenient and efficient to locate all similar activities in one place. For example, one might locate all related departments, or offices, or classes of one grade level near each other. From the standpoint of the Type II architectural requirements, pertaining to the psychological needs of people in the school building, a more heterogeneous mix is usually more desirable, for this provides an enriched social environment in which a greater variety of informal learning activities is possible.

At present, relatively little is known about which individuals in the dental school situation should be brought together to encourage constructive informal learning interactions. Just how heterogeneous the mix of people should be is still an open question. Successful interactions require the mutual satisfaction of needs, and if the individuals have little in common, it is difficult for need-satisfaction to occur. It may well be that students one year apart will

benefit more from a diverse mix leading to increased interactions, than will students who are three years apart. Furthermore, as interest in the benefits of informal learning increases, it must be remembered that social interaction is not always desirable -- as in the case of independent study.

A restricted mix often occurs in dental schools with campus-type layouts, the most obvious example being a situation where most of the freshman and sophomore work is conducted in a building some distance from the clinic and main parts of the school. It is little wonder that students in this situation complain that the first two years of their training are difficult to relate to their clinical work in the last two years.

Another architectural determinant of social interaction is an aspect of buildings which, adapting the terminology that Kevin Lynch applies to cities, may be referred to as "nodes" and "zones." Nodes are points or small areas where people gather. They may be architecturally obvious points such as a student lounge, or less obvious points identifiable as nodes only because people convene there. Zones are larger areas or "territories" to which "ownership" by a group or several groups can be ascribed. Traditionally, classrooms are teacher zones, for the subjects of conversation are largely determined by the teacher. Typically the interactions occurring there are formal and planned. Some hallways are student zones in that these become areas where informal spontaneous student interactions may take place with relatively little interference. It appears likely that each zone carries with it certain expected behaviors. For example, in a city the automobile driver is expected to show behavior appropriate to the zone in which he is driving. In hospital zones he is expected to be quiet, and in shopping zones he is expected to be alert for pedestrians and the sudden stopping and starting of other vehicles. Likewise, in a dental school, different zones or parts of the

school can probably be equated with certain expected behaviors.

It is apparent that these ideas will need further formulation. At this time, to explain how the architecture influences learning, we are currently thinking in terms of four propositions:

1. Informal interactions, whether these occur between scheduled periods or during a lecture, laboratory period or a clinic, are an important aspect of learning.
2. Informal interactions are a function of such social-architectural factors as "routes," "mixes," "nodes" and "zones," and these interactions occur on routes, at nodes, in zones, or with the people available in the mix.
3. Informal interactions are less likely to occur if these involve added effort or inconvenience, i.e., special routes, inappropriate zones or the wrong mix.
4. The routes, mixes, nodes and zones are determined partly by:

   (1) the arrangement of the building which determines the location and characteristics of places where formal obligations are fulfilled, and partly by (2) the administrative scheduling of activities that occur at these places.

As our theoretical position and terminology are refined, it will become increasingly possible to relate various architectural aspects of buildings to the behavior of the people using the buildings, especially the behavior related to more effective learning processes.

BIBLIOGRAPHY

Appleyard, D., Lynch, K., and Myer, J. The View from the Road, M.I.T. Press, Cambridge, Mass., 1964.

Barker, R. "On the Nature of the Environment," Journal of Social Issues, No. 4, 1963, pp. 17-38.

Barker, R. and Gump, P. Big School, Small School, Stanford University Press, Stanford, Calif., 1964.

Educational Facilities Laboratories, Profiles of Significant Schools: a series of reports which provide information on some of the latest developments in school planning, New York, New York, 1962.

Hall, E. The Study of Man's Spatial Relations and Boundaries, prepared for Conference on Medicine and Anthropology, Arden House, Harriman, New York, 1961.

Hereford, K. and Hecker, S. Relationships among School Design, Utilization, Personnel Interaction, and Attitudes, Bureau of Educational Research, College of Education, Michigan State University, East Lansing, Mich., 1963.

Horowitz, H. "The Architect's Program and the Behavioral Sciences," lecture presented at Syracuse University, May 13, 1965, Mimeo.

Lynch, K. The Image of the City, M.I.T. Press, Cambridge, Mass., 1964.

Myrick, R. "How to Win Friends and Influence Students," from The Teaching of Architecture, 1963, AIA-ACSA Teacher Seminar, The American Institute of Architects, Washington, D.C., 1964.

Myrick, R. "A New Concept in the Architectural Planning of Dental Schools," Journal of Dental Education. In press.

Myrick, R., Marx, B., and Cohen, S. "Higher Order Needs in Architecture," AIA Journal. In press.

Sommer, R. and Ross, H. "Social Interaction on a Geriatrics Ward," International Journal of Social Psychiatry, Vol. 4, 1958, pp. 128-133.

Spring, B. "Technology: 'The Plug-in' School," Architectural Forum, 119, No. 2, 1963, pp. 68-74.

Stea, D. "Toward a Psychology of Environmental Design: The Impact of Man-Made Ecology," Stanford University, Mimeo. (undated).