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An inventory of student, faculty and administrator perceptions of various physical environmental factors as an aid in planning vocational-technical school plants.

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AN INVENTORY OF STUDENT, FACULTY AND ADMINISTRATOR PERCEPTIONS OF VARIOUS PHYSICAL ENVIRONMENTAL FACTORS AS AN AID IN PLANNING VOCATIONAL-TECHNICAL SCHOOL PLANTS

A Dissertation Presented

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PREFACE

This dissertation grew out of a larger study of many aspects of vocational education in Massachusetts which was conducted by the Massachusetts Department of Education. As part of the research team, I was chosen to study and make recommendations on vocational facilities. The study was accomplished under the auspices of:

Mr. Walter Markham, Associate Commissioner
Bureau of Occupational Education
Massachusetts Department of Education

Dr. James F. Baker, Assistant Commissioner
Division of Research and Development
Massachusetts Department of Education

Dr. William Conroy, Director
Research Coordinating Unit for Vocational Education
Massachusetts Department of Education

I am indebted to these authorities and their staffs who provided access to all state levels of education. I am especially grateful to Dr. Conroy who spent long hours with the design and pursuit of the study.

The superintendent and his staff in each of the schools in the study candidly provided data concerning their schools and efficiently assisted in the mechanics of the study.

I was priviledged to have an interview with Dr. Harold B. Gores, President of the Educational Facilities Laboratories and was granted permission to use the resources of the Laboratories.

Mr. Sanford Greenfield, President of the Boston Architectural Center, visited the schools with me and criticized the study as it progressed furnishing the necessary point of view of the architect.

Dr. Philip Edgecomb served on the dissertation committee and provided expert opinion on vocational education.

Dr. Lyle Perkins also served on the committee. As an artist and designer, Dr. Perkins was able to give criticism and suggestions on the creativity and sensitivity of the study.

Very special appreciation goes to the three people who were crucial to the reality of this dissertation:

Dr. Jimmie Fortune, who patiently, expertly and cheerfully advised me on the statistical processes in this paper.

Dr. William Griffiths, who as chairman of my committee provided humane and valuable criticism, direction and encouragement not only for this dissertation but for my total program.

My wife, Eunice, who receives my greatest personal indebtedness. Her secretarial skills and enduring self-sacrifice are responsible for the physical existence of this document.

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A DESCRIPTION OF THE STUDY

Introduction

Throughout the United States there is a growing awareness of the increased need for vocational-technical education, both quantitatively and qualitatively. The society continues to become more and more a technological one requiring skilled workers. The population of the United States continues to explode at a magnitude parallel to the growth in our economy, further increasing the demand for highly trained manpower. There is an increasing realization that not all the youth are college material but still are entitled to a meaningful alternative in education. Vocational education offers one of those alternatives. Americans are seriously challenged by the problems of the disadvantaged. Vocational education promises a useful vehicle for solving some of the troubles of disadvantaged youth. A growing recognition of the fact that there is dignity in work is encouraging more young people to enter vocational education.

One of the greatest problems or sources of controversy in the expansion of vocational education is the development of new facilities. The Commonwealth of Massachusetts has recognized its obligations in the area of providing satis-

factory school plants. The State is in the process of a vast building program for Regional Vocational-Technical schools. The capital outlay for the future schools will exceed $150,000,000. This enormous sum is still of secondary importance to the quality of the educational environment that these buildings must make possible. The people charged with the responsibility for planning these institutions are in need of information to assist them in their task. It is believed that this study might produce a method of providing some of the necessary data.

Discussion of the Problem

It is usually conceded that we should not attempt to produce standardized plans and solutions for facility development. Each new school is a unique planning endeavor and inflexible formulae do not adequately resolve the problems. Planning school facilities is an interdisciplinary task involving many parties among whom are; the local community, school administrators, architects, educational consultants, psychologists, curriculum experts, sociologists, teachers and students. The writer would suggest that the last two groups, teachers and students, are important data sources that could be useful in facility planning. Although these sources have been tapped in the past, this researcher believes that this fountain of information can yield much more reliable

data than has been extracted from it heretofore. With this in mind the author has attempted to design an instrument that will record the perceptions that students and teachers hold concerning various facility designs and characteristics. These designs and characteristics are those shown to be important in the review of the school facility literature. In addition a questionnaire has been developed to be administered to the director in each of the schools in which the faculty and student inventories are used. The opinions of the involved architects, designers and various educational experts have been sought in order to refine and validate the faculty and student inventories.

The problem of this study, therefore, is to obtain some data upon the perceptions of the physical environment of the school held by faculties and students in existing vocational facilities in the hope that this data will aid planners in the designing of efficient and pleasant vocational-technical school plants.

The problem appears to have five parts as follows:

1. The development of an instrument that will accumulate data regarding the perceptions held by students and teachers concerning their physical environment.
2. The testing of the instrument for validity and reliability.

3. The application of the instrument to faculty and student groups in several vocational schools and the collection of the data from that instrument.
4. The testing of the data for significance in terms of differences in perceptions of the groups.
5. The derivation of recommendations that will be of use in the planning of future vocational-technical school plants.

Significance of the Problem

This specific problem may not receive the attention warranted by its magnitude and possible usefulness. Beginning with President Kennedy's Panel on Vocational Education in 1963[1] there has been an expanding demand for more vocational education by schoolmen and industry. Of course the expansion of facilities is a necessary part of these recommendations. Great sums of money are being spent and, more importantly, neglected segments of our school population are getting more attention for their educational needs. Also this nation is becoming more and more technology orientated; new skills must be developed and old ones updated. Obviously the demand for appropriate facility planning will be with us indefinitely.

Limitations

The study is limited to the school plant which is made

up of the physical environmental elements that effect the safety, well-being, educational climate and comfort of the individual so that he may be able to learn, teach or administer efficiently according to his role in the vocational-technical schools.

This study is limited to student and faculty perceptions of environmental elements in some of the newer regional vocational schools and some older traditional vocational schools in Massachusetts. It should be noted that these student and faculty perceptions will not tell what is right or wrong but only what is perceived to be right or wrong.

The study does not include an evaluation of the actual machinery and equipment used in the shops. That has been adequately investigated and evaluated by others. The shops included in this study appear to be equipped uniformly and adequately on the whole. Only where machinery and equipment might effect the educational ambience is it considered.

Curriculum discussion is also considered beyond the scope of this study except for the consideration that facility design must be guided by present and future curriculum objectives. Hence an awareness of present and future curriculum must be understood so that curriculum restraints are not built into the plant design.

Assumptions

This writer believes that the assumptions stated below are generally accepted and that they are basic to this study.

Newer school plants attempt with varying degrees of success to provide a better educational environment than can be offered by older facilities.

Among all the parties, federal, state and local, who have an interest in the school plant, it is the students, faculty and administrators who are the prime clients of that facility. It is their lives, performance and aspirations which are effected daily by the level of adequacy of the facility.

Faculty and students will probably achieve their educational goals better in a physical environment which appears positive and adequate to them.

The perceptions held by students and faculty concerning the facility in which they work can provide part of a base for judging the success and adequacy of that facility.

The perceptions of students, faculty and administrators are three different data sources because of the role each plays.

Hypotheses

1. Students from the newer regional schools will view their schools more favorably than students from older traditional vocational schools.

2. Faculty from the newer regional schools will view their schools more favorably than faculty from older schools.
3. Faculty will respond more favorably than students in the various schools.
4. There will be little difference in degree of favorable attitudes among the five new schools.
5. There will be no significant difference in the favorability of responses between male and female students.
6. There will be no significant differences in favorability of responses among juniors, seniors and institute students.
7. There will be no significant difference in the favorability of responses between vocational and academic teachers.

CHAPTER II

REVIEW OF THE LITERATURE

A General Statement

As indicated earlier, the main thrust of this paper is to provide data that might be of assistance to school plant planners. More specifically, this writer is interested in the evaluation of the perceptions of faculty and students as useful data sources for assessing the success of school plants.

A review of the available school facility literature does not provide a sufficiently comprehensive theoretical framework to satisfy the requirements of this study. This is true for two reasons. First, the related literature while copious enough in volume, has not been developed by scientific methods from psychology, sociology or from other fields of knowledge. Secondly, possibly because the first reason has not been treated adequately, this researcher finds he must look in a variety of places for his theoretical framework. These areas include the history of education, the psychology of learning, attitude studies and the environmental literature.

In the history of education, the reader will observe the antecedents of present facility problems and will realize how slowly and ponderously improvement comes in facility improvement. Also it would appear that consideration of the concepts

of educational psychology and the theories of learning would be "sine qua non" to facility planning if the schoolhouse is to be a successful place for teaching and learning.

There is a growing body of literature concerned with the climate of the present times which planners must consider if they hope for positive results while dealing with human problems. For the most part, these deal with sociological issues which are generated from the interactions between the groups that make up American society. In intensity these issues vary from minor problems to life and death struggles. The problems are numerous, some of the more important being the urban issues, racial struggles, the disadvantaged, poverty and affluence, the sometimes uncontrolled technology, ecology and the environment and the nature of the so-called establishment. When the problems are not treated with human compassion violence often is the result.

In nearly all these problems the schools are involved, sometimes very deeply. Schoolmen are often seen as part of the far right attempting at all costs to perpetuate a "status quo" establishment while those on the left are often considered to be violent, revolutionary anarchists. Obviously, neither side is all right or wrong. The crises are so urgent that men of good intent on all sides of the issues can ill-afford to lose any time in establishing meaningful communication with

one another in an attempt to arrive at viable solutions.

Some answers might be found in the proposals and suggestions of contemporary sociologists. A very promising source is the environmental studies which have attracted so much attention lately. This science, if it may be called that, is quite broad and is still being defined. This paper is not deeply concerned with all of it, but it is concerned with that area that deals with the effects of the physical environment on human beings. Writers and researchers are learning that the effects of the school environment encompasses far more than shelter from the elements. In this new approach, psychologists, sociologists, architects and educators are pooling their expertise in confronting problems. This cooperation may offer the greatest hope for a happier and more productive American Schoolhouse. It is a promising aid in the development of a theoretical framework for studies of this type. Evolution and change are facts of life. Recent events are disconcerting to many but humanity can only continue to exist by adapting to the inevitable. This writer believes that the following literature review bears out these contentions.

Some Historical Observations

Early in the last century efforts were made to study and evaluate school buildings. In the thirties and forties

of that century, both Horace Mann and Henry Barnard made school facilities part of their investigations. According to Edwards and Rickey,[2] Mann found inadequately trained teachers, teaching in schoolhouses that were unbelievably bad, lacking necessary facilities and having no libraries. Before mid century Barnard had published his School Architecture[3] in which he found some progress had been made but much remained to be done.

In the year 1848 the Quincy Grammar School was built in Boston. The building became a prototype for years to come. It was a solid building that housed 660 pupils in twelve identical classrooms with fifty-five children in fixed seats in each room. This school was considered to be very innovative in its time; it had proper lavatories and an auditorium. It was of durable construction and housed its many students economically on less than an acre of ground. However, it was crowded and reflected little understanding of any theories of learning.[4] Schoolhouses that followed did not improve greatly, exteriors often became grandiose and over ornamented. The interiors remained sterile, fixed and little attempt was made to design them to suit their function. In the latter part of last century a few attempts were made to make school buildings more relevant to their purpose. Frank Lloyd Wright's Hillsdale Home School[5] built at the turn of the century broke

with the past stereotypes. Louis Sullivan at this time was making his architectural argument that "form follows function." Isolated small gains in design were made early in the twentieth century but the impact of forward looking designers was not really felt until schools such as Saarinen's Crow Island School in Winnetka were built as we emerged from the Great Depression. Lawrence Perkins, an associate of Saarinen wrote that the planning represented "months of study on the part of teachers, architects and administrators."[6] This statement records an early approach in using the expertise of these groups. Since Barnard's School Architecture, there has been a growth in literature on school buildings, increasing in geometric proportions since World War II. Since the thirties much of this literature is good and should not be overlooked. However, it is limited in the strict terms of educational research. Also, it must be noted that in spite of apparent progress the Quincy School and many like it still exist for economic or expediency reasons which are often educationally costly.

The State of the Literature

Nystrand and Bertolaet reporting on the more recent research and literature on school buildings made several observations including those that follow. There is a dearth of systematic research. The literature is dominated by

descriptive and testimonial reports based on schools in single school districts. Few researchers examined effects or associative relationships of decisions to allocate resources for particular types of schoolhouses. They further noted that most facility studies have:

> "(a) lacked theoretical orientation, (b) employed limited samples, (c) applied the experimental treatment for only a short time before attempting to measure results, (d) failed to introduce necessary controls for extraneous variables, and (e) focused upon learning outcomes to the neglect of other possible dependent variables. The multifaceted ambiguity which continues in the wake of these studies indicated the need for new designs and methologies in research on allocative strategies. However the trend toward recognizing and interrelation of pupil, staff and housing variables combined with increasing computer capabilities and the development of systems models suggest that greater clarity may soon be forthcoming."7

F.G. Cornell (1960) in reviewing the literature for the Encyclopedia of Educational Research makes similar evaluations. He asserts much of the literature is not strictly research but may be research orientated, strongly colored by the imaginative and creative qualities of architects, educational planners and consultants.[8] Both studies mentioned above indicated that we now have data, means and interest to find solutions based on more empirical methods. These points are emphasized here because this study will attempt to produce

some facility information based on research methods. The seeking of interrelationships between student, staff and housing variables is a central issue in this investigation. Also, the author will be cautious to avoid the research errors noted above. Difficulty has been experienced in finding a solid theoretical framework in the facility literature from which the writer could project assumptions and hypotheses. Nevertheless he does believe that there are enough pragmatic studies by reputable people to provide some basis for authority. Notable among these studies are those by the Educational Facilities Laboratory and the National Council on Schoolhouse Construction. The Ohio State University has done good work, specifically treating vocational training facilities. These and other works are noted later in this chapter and in the bibliography. In addition it is believed that other areas and discipline, especially psychology, can provide some of the theoretical base. These areas are explored later in this paper.

F.G. Cornell finds that a considerable amount of research and literature has been accumulating under the following headings:

> "(a) evaluating or determining the adequacy of physical facilities for educational purposes: (b) assessing services related to the operation, maintenance, and management of educational facilities;

> (c) determining features of various spaces in buildings so that they may best accommodate the educational activities to be assigned to them; and (d) planning educational facilities so that they will be of the proper kind, of the right amount and in the right locations for efficient use." 9

Items a, c and d are the more important ones to this study since this work centers on the school plant itself. In summary it can be said that a great volume of facility literature exists but tends to fall short as scientific educational research. This inadequacy has been noted by researchers and schoolmen and attempts are being made to correct it with the use of scientific methods and modern resources such as computors and other instruments.

Educational Psychology and School Facilities

The primary function of educational facilities is to support and stimulate learning. Critics and contributors to the facility literature have long complained that facility planning has progressed with little regard for the principles of educational psychology. Roth observed: "The development of school buildings up to the present time must be considered faulty for, indeed, it has not achieved the standard required by sound and valid pedagogic principles."[10] Undoubtedly, many facility innovations of recent years were partially inspired by these principles. However, there is still no

evidence of a planned systematic program to design schools on these principles.

Basil Castaldi has been attempting to make improvements in this area. In his recent book[11] he devotes a chapter to the relationship between educational facilities and the principles of learning. In that chapter he asks the question, what implications do the findings of educational psychologists have for school plant planning? He attempts to answer the question by examining a number of psychological considerations in three ways, one leading to the next:

> "(1) A summary of the findings related to a given principle of learning that may have some bearing on school building design; (2) A discussion of its implications for the educational program; and (3) Specific ideas related to building design to guide educators and architects in their quest for school buildings that are pedagogically sound and educationally functional."

The author states that conceptional school plant planning requires the establishment of a set of conditions, requirements or goals derived from pedagogical principles. An intermediate step is suggested as necessary; that is the translating of the learning concepts into human activities or needs before it is reflected in facility spaces.

The psychological principles and the methods of utilizing them is not considered to be exhaustive or complete but rather

to introduce and suggest a method that might provide part of a scientific framework for decision making in school plant planning. The author's method can be restated simply as a discussion of each principle in terms of (1) its psychological aspects, (2) its educational implications and (3) the implications expressed in terms of school facilities. In the following pages this writer will review the several concepts that Castaldi has discussed.

Social Needs

Consideration of social needs is a paramount factor in setting a favorable learning environment.

Psychological aspects.-- Many psychologists agree that the feeling of belongingness and security is a necessary catalyst for the learning climate. The rejected and insecure student is at a serious disadvantage. According to Ruch: "Man everywhere seems to have certain basic psychological needs which he expresses through the social patterns of his particular culture. Among these are the need for security, the need to respond to others through the exchange of love and esteem, the need for new experience and greater knowledge, and the need for approval and some degree of prestige."[12]

This researcher finds that Ruch's identification of the needs for security, esteem, approval and prestige has an important bearing on this paper. Among other things an

attempt is being made to demonstrate that the newer schools, built with the students' welfare and educational progress in mind, will provide for these sociological needs which in turn will make the desired quality education possible.

Jersild pointed out that: "One of the strongest motives of a child's life is the desire to be accepted, to belong.."[13] Horrocks also echoes similar observations on security and belonging.[14]

Educational implications.-- Castaldi admits that there are many other social needs which are important but belongingness and security are the most important to this writing. There are several promising innovations that might be employed to produce the desired effects. The school might be organized into smaller groups to give a feeling of belongingness. While there are already various clubs more emphasis could be placed on creating groups associated with learning such as the biology club or debating society. Larger group activities could also serve the purpose including popular music groups and school rallies. Finally, social minded students might form groups that could encourage isolates to join them or other groups.

School facility implications.-- Conference rooms to house small groups might be provided. Other facilities might include an outdoor assembly area or an area with a fireplace or a pool or a fountain as a center. These outdoor areas

could be used for picnics and music programs. A gourmet club could operate in a special section of the home economics division. All these areas could be supervised by the creative use of the faculty already in the area or by the use of closed-circuit television.

Larger schools could be divided into clusters. Separate spaces within each cluster for assembly and work projects would add to the feeling of unity for each group. A lobby area in the cafeteria or creative use of hallway space would be useful. Any attempt to arrange spaces that systematically foster the feeling of belongingness and security is almost certain to be beneficial.

Individual Differences and Group Similarities

Although psychologists have been successful in identifying individual differences they feel much is still to be learned about group similarities.

Psychological aspects.-- According to Cronbach, "Every learner is different from his fellows in interests, social effectiveness, ability and the sort of errors he makes."[15] The method and rate of learning depends on a number of characteristics of each individual, Castaldi and others identify the following qualities as among the most important in which an individual differs from his fellows; physical growth rate, maturity rate, rate of learning, sensory

perceptions, speech, social and emotional adjustment, attitudes, interests, response to stimuli and general intellectual ability. For the purposes of this thesis consideration of attitudes, interests and adjustment are key factors because it is reasoned that a positive development can be cultivated in these characteristics by a good physical environment provided by well planned school facilities.

Research findings on group similarities is not widespread because so much of it is obvious, however before proper breakthroughs can be made here a more scientific and systematic approach must be employed. We do know certain needs are experienced by all human beings such as the need for air, food, liquid, reasonable temperature, activity and rest, for security, love and prestige among others. It is readily apparent that these basic social, biological and psychological needs should be determinants in any attempt to produce successful physical facilities.

Educational implications.-- The curriculum should be provided for the various individual differences as well as for group similarities within the range of the average student. The special needs of the anomalous student can be met as special cases for that relatively small group of individuals. For the larger groups, faculty and curriculum planners could seek programs for large and small group instruction that would provide for individual differences and group similarities.

Machines and self instruction might supplement the usual classroom teaching, remedial teachers and paraprofessionals could be employed and more flexible groupings could be utilized. Groups could be broken down into sub-groups more sensitive to the needs of the individual as opposed to the more conventional grouping used presently in most schools.

School facility implications.-- One of the most obvious provisions that should be made for individual differences would be in the instructional resource center which might be located in or adjacent to the library. This center would contain tape recorders, tapes, closed circuit television, teaching machines and a variety of other audio-visual resource material. Much of this could be supervised by paraprofessionals or other non-certified staff. A work shop might be provided where teaching devices could be designed and constructed.

Testing is a necessary part of identifying and diagnosing individual differences. Therefore, testing facilities and spaces must be provided, conference rooms for guidance personnel as well as provisions for data processing equipment would be necessary. Space could be provided, for the school psychologist, the school nurse, the speech specialist, and for other remedial instruction. Classrooms that can be divided by the use of folding partitions or similar devices could easily be adjusted to larger or smaller groups.

Grouping for Effective Instruction

Psychological aspects.-- After decades of groping with this problem researchers have not been able to discover an optimal group size. The problem is that ideal group size depends on a number of factors in addition to the traditional chronological age criterion. These factors do include ability, social maturity, pupil readiness, interest and aptitudes. Obviously, this problem is related to the psychological area of individual differences and group similarities discussed above.

The principle of least-group size.-- Thalen stated, the optimal group size should be "... the smallest group in which it is possible to have represented at a functional level all the socialization and achievement skills required for the particular learning activity at hand."[16] This principle anticipates a new way of determining group size not by the traditional methods of groups or sub-groups within a class. The new group would be identified by its functional purpose and social characteristics.

Educational implications.-- The least-group size represents a new breakthrough in education limited only by the creativity and imagination of educators. Groups could be of several hundreds, or a group of one or something in between. Of course appropriate curriculum change is a prerequisite for determining new groups. Team teaching might be employed

with the group, in which case students are grouped and re-grouped for effective instruction. This grouping-regrouping process would still be possible where the self-contained classroom is favored. However, the writer of this paper believes that much care would have to be exercised in the utilization of these innovations in order to keep their costs within the financial ability of the community.

School facility implications.-- The concept of least-group size demands spaces designed to accommodate the various sized groups. Castaldi offers as an example a rather complicated cluster of four rooms with a teaching station at the center, each section separated from the other by a double glazed partition. For large groups, these would have a common teacher with a closed circuit television set up. To convert these spaces back to conventional classrooms, moveable opaque dividers could be drawn over the glass. For smaller groups of five or six, he suggests space in the proposed instructional material section.

The Multi-stimuli Effect

Psychological aspects.-- Cronbach[17] and Estes[18] along with other educational psychologists have been concerned with the relationship of the retention of learning and the number and types of stimuli applied. Learning occurs as a result of the experiences of the individual. These experiences are

perceived by the individual through stimuli received by the various senses. Stimuli that are involved in learning are usually received by sight or hearing; sometimes through touch and taste but seldom through the sense of smell. The multi-stimuli effect refers to the receiving of stimuli through two or more of the senses, more or less, simultaneously.

Two laws of learning.-- The strength of a reflex may be increased through the presentation of a second stimulus, which does not itself elicit the response. This is called the "Law of Facilitation." The second is the "Law of Conditioning of Type R" which indicates that if the occurrence of an operant is followed by the presentation of a reinforcing stimulus, the strength is increased.[19] These laws infer that multiple-stimuli can increase the effectiveness of retention.[20] Cronbach indicates that forms of review that repeat the same stimuli have value. Obviously curriculum planners must consider type, sequence and timing in presenting initial and follow-up learning experiences. Learning can be improved by appealing to more than one of the senses.

School facilities implications.-- School facilities should be designed to provide for multiple-stimuli effects. Lighting effects, color and sound effects could be used in the room's atmosphere to add to the effect. For example, temperature and humidity could be controlled to suggest a tropical, desert or arctic environment. This researcher has

noted many successful multi-media presentations designed to create a memorable experience situation that made retention of the experience almost undeniable. The ever expanding audio-visual field is rapidly becoming a multi-stimuli area, utilizing all the senses in a variety of ways for more penetrating learning encounters. It would appear that much emphasis should be placed on developing and using multi-media centers in the schools, the scope of which is only limited by the creativity of the planners and teachers.

Attending and Learning

Psychological aspects.-- According to Castaldi,[21] the relationship between attention and learning has been recognized for a long time but only recently have educational psychologists studied its implications scientifically. As a result more reliable findings concerning attending and attention span have been discovered. The amount of time an individual can concentrate on a simple object is extremely short, five or six seconds. When an activity is involved the span can be expanded to several minutes. Also attention span increased with age.

Experiment.-- The following experiment will demonstrate the limited duration of one's attention span. The subject is asked to observe the diagram below.[22] After a short time the image goes from convex to concave and vice versa. This

apparently changing image is attributed to the attention span.

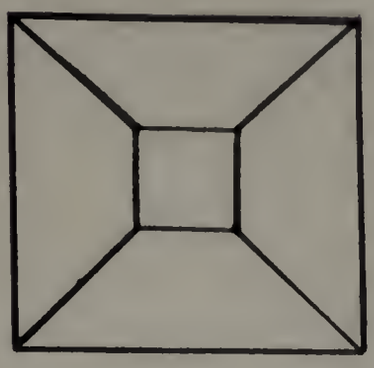

Figure 1. Attention Span Diagram

On a complex problem an individual can concentrate for an hour or two. However, he is not dealing with a single simple problem but rather he is considering the several aspects of the same multi-faceted problem. Griffith points out that objects in school are more complex than concentrating on a single object and that attention span for complex objects varies with the type of material.[23] Edwards has noted that the best attention appears to be when there is some distraction. The author of this paper has learned that some architects believe that a working environment is more stimulating when there is something to "work against". Also, Benjamin Franklin is reputed to have done his serious reading on

Boston Common against all the hubbub of the city.

The curriculum should take these theories into consideration. The duration of a learning experience should not exceed the attention span of the learner. Breaks in activities are advisable. Multi-sensory appeals will increase the attention span especially in the young.

Facility implications.-- Spaces should be designed to allow the teacher to shift from one activity to another within the attention span of the students, also rooms could be divided and new groups could be formed. Strategically placed furniture could help in providing a new learning environment in the same room. Since attention is improved when the action shifts between mental and physical activities, provision for taking students outdoors for occasional breaks might be effective. Since minor distractions seem to stimulate concentration, window strips overlooking pleasant vistas might provide a pleasant and stimulating distraction. One architect suggested to this writer that a "not too quiet ventilating system is not necessarily bad." Absolutely ideal conditions can be dull.

Transfer of Learning

Psychological aspects.-- In the past many erroneous ideas concerning the transfer of learning existed. For example it was postulated that the study of Latin helped in

the writing of English and that the study of Geometry taught students to reason. Educational psychologists have disproved many of these concepts and have discovered scientific facts concerning the transfer of learning. Psychologists agree that the transfer of learning takes place whenever one learning experience is applied in another learning situation or performance. Cronbach states, "Transfer of a behavior pattern to a new situation is likely to occur whenever the person recognizes the new situation as similar to other situations for which the behavior has been appropriate."[24]

However these similarities in situations do not in themselves guarantee the transfer of learning; the student must recognize the similarities. Also learning transfers better when the learning is related more closely to stated educational goals. Cronbach has identified the following types of responses as among those which transfer beyond the original learning situation:

1. Specific actions or programs of motor response. Being able to move each finger to a given spot is a prerequisite to typing...

2. Specific facts or associations. A single fact may clarify many situations. The pupil learns that pre means before. He studies the examples preview, predict and prepare. Then he can transfer this response to preheat...

3. Broad concepts and generalizations. A gardener learns to cope with new insects by classifying them as chewing insects and sucking insects...

4. General techniques of analyzing situations. In its simplest form, this consists of becoming aware that certain types of cues are significant...

5. Attitudes toward subjects or situations. A boy will not do well in repairing machinery if he assumes that he can locate a difficulty only by trial and error, testing each part in turn. If he believes he can save time by stopping to reason from the symptoms the machine shows, he will do better...

6. Attitudes toward one's self, a self-concept. A pupil develops confidence that he can fix machinery, handle machinery, use tools skillfully, etc. He develops willingness to take a chance. He learns to voice his own opinions when he doubts an authority.25

To summarize the important concepts involved in the optimal transfer of learning, Castaldi has identified the following; the student's recognition of the similarities in the new and old learning situation, motor responses, specific facts and associations, broad concepts and generalizations, general techniques of analysis and finally the student's attitudes toward himself and toward the subject. The belief that the learning which occurred in school will transfer to life situations is a fundamental assumption in education. Obviously, learning situations must be designed that will use these principles to guarantee, as much as possible, that this transfer will take place, as nearly as possible, on a life time basis for the student.

School facilities for the transfer of learning.-- It is apparent from the above findings that the more nearly the

learning experience is to the real situation the greater will be the transfer of knowledge. School facilities can be designed to facilitate such situations. As Bruner has observed, a boy studying physics progresses better when he acts like a physicist. Therefore, the school would do well to make the laboratory in which the boy works as much like a professional laboratory as possible. Shops, special rooms, home economics kitchens and other physical learning environments could be made more like their counterpart in the everyday world. Also once several common motor skills are identified, the practicing of them might be included in a physical education program. Things such as display areas for charts, models and pictures might be used to aid in the transfer of specific facts, generalization and broad concepts. Technique of analyzing concepts and situations could be illustrated by the creative use of audio-visual aids in periodic reviews.

This writer has observed that much is already being done in the schools involved in this study. The vocational schools, do especially well with their related science courses. Also the shops, particularly in the new regional schools, resemble more and more the actual facilities in the real world. Progressive schools are placing students out in industry in apprentice roles as part of their education. Obviously, spaces and facilities must be designed that will provide an optimal environment for the transfer of learning according

to principles recognized in the psychologists' findings.

Readiness for Learning

Psychological aspects.-- It might be stated that a student learns more effectively when he is ready for such learning. This is an oversimplified view as readiness is a much more complex psychological condition, dealing with the physical, social, emotional and intellectual status of the individual. Simpson states the case:

> "In the broad sense of the term, readiness to learn requires that the child be prepared not only in the mental prerequisites--materials of the curriculum--but also in the emotional, social and physical prerequisites... Lack of all-round readiness for learning constitutes a formidable barrier to a child's efficiency in school."[26]

Young people will respond to learning better if it fits their needs and interests. Hughes makes the simple statement that the best time to teach children is when they feel the need for being taught.[27] Cronbach develops these ideas further when he suggests that the study of readiness should not result in forecasting student success or failure but rather should result in "an attempt to match instruction to pupil characteristics."[28]

The school can do much to promote readiness in a positive way. Schoolmen must develop instruments and techniques to determine the individual's state of readiness. Through the use of diagnostic techniques, curriculum planners can design

programs so that no student is forced into a learning situation for which he not ready. Remedial programs could correct readiness deficiencies. This does not suggest a massive program of individual instruction but rather it does suggest individualized programs within the group instruction framework.

Implications for school facilities.-- Facilities could be designed to provide for non-graded classes. Clusters of rooms could provide grades within grades. Specially designed spaces might be provided for emotionally disturbed or socially immature pupils. In addition to the traditional classroom layout, provisions could be made for sub areas for self instruction and for individual or small group instruction, through the use of movable partitions, special work areas for art or music, carrels for independent reading, small conference areas, and the imaginative use of vertic1 surfaces. These areas would provide the individualized instruction areas that would augument the group instruction facilities in terms of pupil readiness.

Motivation

Psychological aspects.-- Educational psychologists identify two types of motivation in learning; extrinsic and intrinsic. Extrinsic motivation for learning has no direct relationship to the material to be learned but still acts as an energizing factor in learning. It involves such things as

grades, awards, eligibility for teams, recognition and the like. Intrinsic motivation comes from a student's desire to learn something for its own sake. While extrinsic motivation may produce a necessary spark it is intrinsic motivation which has the greater power. As Ruch asserts "...both learning and remembering tend to be better when the motivation is intrinsic."[29]

Blair[30] indicates neither the school nor the teacher can motivate students directly. Motivation is a self-actuated force which arouses the individual to a learning action. However, educators can provide situations and environmental conditions which tend to release this energizing force. Curriculum planners should attempt to include all these forces in the educational program. The teacher's enthusiasm and knowledge of the subject coupled with the imaginative choice and use of instructional material helps assure success in this approach.

School facilities and motivation.-- The school could allow spaces for posting honor rolls. Class projects and art work might be displayed in corridor display areas such as wall cases and little galleries. Intrinsic motivation could be stimulated by the creative use of audio-visual aids which have already been discussed in this paper. In a recently completed school at Amherst, Massachusetts, the boiler room has one glass wall so that students may observe it in

operation. Several of the new Massachusetts regional vocational schools have structural members of the buildings exposed which stimulate interest in these principles. A great number of mechanical facilities and equipment which are part of today's life style are in use in school buildings and could be exposed to the student's view instead of housing them within opaque walls or hiding them in dull containers.

The writer of this paper is very much concerned with buildings which, because of the lack of humaneness in their design, tend to "turn off" students and consequently kill the motivation spark. It is imperative that the total physical environment of the school as well as the individual facilities that make it up should be planned to "turn on" the students in order to attain the greatest educational impact possible. Then the schools would be much happier and stimulating places for all those concerned with them.

Some Other Psychological Factors

Four areas of concern.-- Castaldi has discussed in some detail the following four psychological elements:

Incidental Learning
Activity and Learning
Fatigue and Learning
The Anomalous Student

This writer believes that Castaldi's development of a psychological framework for the design of school facilities has been demonstrated sufficiently in the previous discussions

in this paper. Therefore, it has been decided to summarize briefly Castaldi's final observations which are concerned with the four elements mentioned above.

Incidental learning.-- According to Shaffer, "... the concept of unconscious learning represents a very great discovery of modern psychology, for which we are indebted to Sigmund Freud."[31] School facilities can be designed to encourage this incidental learning. Open storage areas for scientific instruments, possibly with brief descriptions of the instruments placed beside them would be worthwhile. Current event displays might be provided as well as many other types of displays. Many of the educational materials, and processes discussed under the audio-visual aids and motivation headings are mutually useful here. Obviously, any informal attempt that could be made to use the school plant as an informational resource would have this kind of value.

Activity and learning.-- Planned student activity is an essential part of the learning process. Hildreth states; "... unless skills are learned while being put to use, they are uninteresting and difficult to learn, the resulting learning may not be applicable to real problem-solving and the learning may not be permanent."[32] There is evidence that children have a need for activity which manifests itself in curiosity, bodily movements, exploration, games and problem-

solving. Pupil activities in these areas would reduce felt needs and would promote learning.

A good school plant would provide much equipment and proper places for its use in order to provide opportunities for the student to become actively involved with the principles being learned. Proper storage for a wide variety of aids must also be provided. It would also be useful if tools and suitable spaces were available to permit the student to make some of his own learning equipment. In short, facilities that would stimulate student curiosity, and then provide some means for satisfying that curiosity that would allow for bodily movement activities in the learning process and that would provide equipment and facilities that would permit problem-solving activities, all would be effective in an action-centered program.

Fatigue and learning.-- Castaldi recognizes three distinct types of fatigue; physical fatigue, psychological or mental fatigue and pedagogical fatigue. One of these can effect the other producing inter-causal relationships. Physical fatigue simply results from much energy being expended to overcome physical obstacles and disturbances. Many psychologists feel that mental fatigue only reflects the somatic or physical conditions that produce it,[33] however, it may also result from a "feeling of fatigue" caused by psychological or pedagogical sources.

Ill conceived school curricula can cause pedagogical fatigue. Too heavy a reliance on textbook-centered programs, lecture only methods or catechetical approaches or other wearing educational conventions produce pedagogical fatigue. This leads to psychological fatigue, but psychological fatigue can also result from the lack of readiness in the student, programs that do not serve the interests and needs of the individual and programs that lack motivation or are monotonous and boring in presentation.

Students seldom suffer from physical fatigue in their school life in the way a laborer suffers physical fatigue. However, facilities that are poor in terms of the various physical environments do produce physical fatigue. These usually are related to poor visual, acoustical, thermal or aesthetic facility characteristics. The remedies for the various fatigue problems are rather easy to prescribe once the problems are identified. Good physical environmental design would solve most of the physical fatigue problems.

Psychological fatigue could be reduced by providing spaces designed to be more stimulating, comfortable and convenient. Attention could be given to producing unobtrusive aesthetic surroundings, to producing spaces that would allow for flexible teaching activities and for the employment of the great variety of educational innovations available today.

The anomalous student.-- The problem of individual

differences has already been discussed. However, this discussion concerned those differences within the so-called average student population. Now, schools are becoming increasingly aware of the extremes of abnormality, the slow learner and the gifted, the individual who matures rapidly and the one who does not. There are those who learn slowly because of the lack of ability, interest or experience. Students may learn slowly because of sensory or speech defects or any number of physical impediments. Social or emotional maladjustments can obstruct a child's mental development. Castaldi estimates that there are over 6,000,000 public school students who require special assistance.

The American school is geared to the average student but there is an increasing trend to identify these non-average students and to make special arrangements for them. For the gifted students enrichment courses are being offered; diagnostic and remedial facilities are being developed for the slow learner. Educators also are giving more attention to problems connected with the psychological and emotional aspects of child development.

This writer believes that the many programs that are being developed for the disadvantaged should be recognized in school planning. While these programs are not yet beginning to meet the need, many of them have been exemplary. Because of their environmental background the disadvantaged

often show many of the abnormal symtoms already mentioned. These disadvantaged Americans compromise one of the nations greatest problems. Obviously, education is one of the most important means to be used in the solution of the problem.

School facilities for the anomalous student.-- Provisions can be made in school buildings for the physically handicapped. Easy to use exits, thresholds, elevators and walks are some elements to be considered. Special arrangements can be made for those with poor sight and hearing. Special rooms and facilities might be designed for the slow learner and the gifted. These spaces could maintain special remedial equipment for the slow learner or project type facilities for the gifted.

Summary

Several observations can be made concerning Castaldi's psychological framework for school facilities. It is notable that while many solutions are suggested, it appears there are few that come out of specific research projects. The psychological principles themselves are sound but there is often an unsure reaching or speculating that the suggested activities or facilities will satisfy the requirements of the particular psychological principle under discussion. However, Castaldi has thrown down the gauntlet; he has indicated where hard-nosed research might begin. He has challenged facility

researchers and provided them with a plan to apply psychological principles to physical spaces.

The reader must be impressed with how often the facility solutions in the different psychological areas keep turning up similar answers. What appears to foster one psychological goal usually aids several others. It might be an interesting study to gather all these common recommendations in an attempt to produce some, more or less, ideal educational space designs. Not many of the solutions seem to be mutually opposing and a great many appear to be mutually satisfying or at least compatable. Most of the suggestions would cost little more than expert planning, while a few may be too costly for local budgets. In the latter case, other revenues must be found. At the risk of over simplifying, it might be observed that three facility concepts continually reoccur: (1) a well-equipped media center is necessary, (2) spaces should be designed to be as flexible as possible and (3) facilities must be designed with the comfort and well-being of the occupants in mind.

Some Other Related Data

The Eninger study.-- Earlier in this paper it was noted that critics of facility literature found that almost none of the literature resulted from scientific investigation. However, the M.U. Eninger study (1968)[34] is an important exception

to that observation. According to the foreward of the study: "The primary study objective was to provide a survey sample description of the process and products of trade and industrial secondary school vocational education. Of necessity, such a description covers a multitude of variables related to curriculums and courses, general and shop facilities, guidance and placement services, teachers and claimed instructional methods, administrative policies and practices and yet other areas of description. Data was obtained and analyzed on a total of 4,700 independent variables." The study is the first comprehensive United States survey of the process and product variables related to vocational education. The total study was reported in two volumes of several hundred pages each and about four years of work was devoted to the task. As might be suspected the breadth of the project contributed to a lack of depth in many of the specific areas as the author candidly admits. However, each chapter is an individual, self-contained study of a particular aspect of vocational education. Each chapter could serve as a model for further investigation in its area of interest.

The writer of this paper is more concerned with environmental effects on occupants of the school while Eninger is more concerned with assessing availability and adequacy of equipment, facilities and conditions. However, there is much common interest between the two studies. Eninger is concerned

essentially with making his evaluations and recommendations in terms of what appears to this writer to be limited educational objectives. The study data of each chapter is evaluated in relation to nine criteria indicated below:

1. Time to first full-time job
2. Relatedness, first job
3. Satisfaction, first job
4. Initial earnings
5. Relatedness, present job
6. Satisfaction, present job
7. Present earnings
8. Percentage earnings increase
9. Employment security

The objectives appear to lack a concern for broader, long-established education goals such as good citizenship, family living, leisure time usage and others. Also the psychological and physical well-being of the student appears to be unimportant in this study. The emphasis is solely on the occupational experience of graduates.

Chapters six and seven of Eninger's work deal with physical facilities of vocational schools. Chapter six treats vocational shops and related data while chapter seven is concerned with the general vocational school facilities. Chapter six covers the availability and adequacy of shop equipment and how it compares to its counterparts in industry. It is also concerned with safety and efficiency. Chapter seven considers the age of the school plant, its state of repair, adequacy of outdoor and indoor facilities, instructional equipment and miscellaneous equipment. The areas of

concern in each chapter were correlated with the nine occupational criteria mentioned above. Obviously, Eninger found little correlation between his measuring criteria and good facilities in either of the chapters. In summary, he made the following statement:

> "The scattered significant correlation coefficients fail to make a case for shop variables, such as availability and adequacy of major equipment and auxiliary facilities, having any impressive influence on what happens to graduates after leaving school. Stated differently, whether a shop is modern and has all the latest equipment and facilities or whether it is grossly inadequate in terms of equipment and facilities seems to have no effect upon whether the graduate enters the occupation studied, the time it takes him to find his first job, the earnings he makes, or the satisfaction he reports with his work. Apparently, a student can learn his skills in what is essentially an obsolescent and inadequate shop (according to his instructor) and do as well in the field for which trained as one who has experienced, so to say the best of everything. Plainly stated, differences in hardware do not explain or account for the differences in post-school occupational success. This generalization may leave those who are inclined to give hardware top priority somewhat uncomfortable."35

However he did add: "A cautionary note must be sounded. The writer has seen some shops that were so grossly crowded, so lacking in essential facilities, so handicapped by decrepit equipment that no one needs to await research findings

to support a decision to improve these shops."

The writer is indebted to this study for background information, for offering a pattern for study design and as a source of important characteristic items used in the writer's instruments and which are used in many thoughtful studies.

The Climate of the Times

No study of facility literature would be complete without considering the varied writings concerning the crises of our times. Unfortunately, this is a literature which usually is not based on emperical studies. It is often frustrated, emotional, angry and radical. Some of our best minds are grappling with these problems. These people are seeking solutions to the explosive problems that cry out for immediate solutions to assure our survival. One could cite many works that try to identify the principal problems within the total crisis complex. This writer has been impressed with the simplicity and lucidity of one study. This was a paper presented to the Inter-American Bishops Meeting at Mexico City in 1971, entitled, <u>The Liberation of Men and Nations</u>. The working paper cited "eight points of stress":

> POVERTY AND ILLITERACY: "Large pockets of poverty still trap 20 to 25 percent of Americans and Canadians."

UNCONTROLLED TECHNOLOGY and threat to environment: "There is an almost crippling fear that technical advance may make the environment inhospitable for man, even for life itself."

URBAN CRISIS: "Some major cities appear to face paralysis, some are considered ungovernable. The anonymity they impose on lonely crowds results in an absence of community."

ALIENATION OF YOUTH: "The growing disenchantment and mounting anger of many youths is described by commentators as a counter-culture in the making, one formed consciously and deliberately in opposition to the one-dimensional perspective of technical man."

THE OLDER GENERATION: "There is much surprise, resentment and fear among the older generations at seeing the American experiment radically called in question."

THE VIETNAM WAR: "Widespread revulsion is leading to a very critical examination of the United States present course and social priorities."

ARMS RACE: "Many North Americans regard the staggering fiscal and psychological burden of the arms race as ultimately suicidal."

VIOLENCE: "Angry demonstrations, bombings, kidnappings and murders have become almost common. The excesses of the new left in turn have revived the old right, which favors law and order to a repressive degree."

One might question what does this have to do with the objectives of this paper. The answer is a great deal. This researcher is convinced innovations must be tested scientif-

ically before they are adopted universally. Men must explore, define problem areas and maybe even dream solutions before viable innovations can be tested. All areas of the Social Sciences can contribute here, particularly a relatively recently recognized one, environmental design. Pure research might suggest solutions that can be defended in as much as they work, but one must always ask work in what way? When one investigates social problems he finds he is dealing with a fabric, interwoven with many variables that are very difficult to isolate and evaluate independently. Solutions must succeed not only in terms of economics and learning efficiency but also in terms of human values and aspirations. It is generally agreed that while we have made great progress in technology we have proliferated social crises. It appears imperative that we must heed the suggestions of the social scientists and critics while we initiate and test innovations in the school facilities area.

This writer has found two works to be very useful and timely. The Harvard Educational Review published a special issue in 1969 entitled Architecture and Education.[36] The second is Richard Dober's book Environmental Design.[37] The Harvard issue is a series of articles written by a variety of scholars exploring the interrelationships between education and the architecture in which it is fostered. Dober's Environmental Design is an investigation of man's physical

environment within and beyond architecture. Many other writers and critics have treated these areas but these are more relevant because they are particularly interested in Education and the physical environment where Education happens.

Dober defines the term "environmental design" as "an art larger than architecture, more comprehensive than planning, more sensitive than engineering. An art pragmatic, one that preempts traditional concerns. The practice of this art is intimately connected with man's ability to function, to bring visual order to his surroundings, to enhance and embellish the territory he occupies."[38] The book is admittedly biased towards the urban situation for three reasons. (1) This is where most people live and will live. (2) Solutions to urban problems also effect non-urban areas. (3) The theories developed are not treating a geographic area so much as they are dealing with places occupied and used by urban activities. Environmental Design is a new discipline and while there are already Environmental Design departments in many colleges and universities, the science is still defining and refining itself. Since it concerns itself with all the factors that impinge on man's physical environment it is a very useful resource for facility planners. Dober is very much aware of man's present plight on the periphery of catastrophy but he is optimistic and believes man can save himself from himself

by designing his environment using his present knowledge and technology along lines suggested by this new science. Outside the central city school facilities continue to grow in size and scope. Often this occurs as though larger facilities were always better. In any case, in terms of facilities, these schools are responding to educational advances. They can do this because they are operated by integral communities which usually have the economic resources and sites to do so. However, in the central city such options are not so readily available. The local neighborhood has little to say in decision-making: land is very expensive and often not available; and most cities already suffer from economic ills. Dober feels that highly innovative designs are necessary, some of which at first consideration may seem radical. The following ideas are among his suggestions. Much could be gained by sharing facilities with other activities such as the educational park where educational, recreational and cultural facilities could be shared by the whole community as illustrated by figure 2. These and similar projects could provide open green spaces within the city, free of commercial and private vehicular traffic. High-rise schools might be built with the areas of the facilities that deal with large numbers concentrated on the lower floors and the less dense activities on upper floors. Schools could share sites with other enterprises such as office buildings, apartment complexes and some

The City as a School: schematic diagram from a city planning proposal by Shadrach Woods for an extension (pop. 40,000) of the city of Caen in 1961. The activities which serve and support dwellings are organized into a linear center which becomes the comprehensible structure of the city. Schools, shops and social service buildings dominate the structure. The schools in this program are small and range from the école maternelle (nursery) to the college d'enseignement general (high school). The linear center, or stem, is serviced from each side by roads leading into it but is reserved for pedestrians, forming a safe, traffic-free zone. In such a system one can imagine a constantly adaptable educational experience with different constellations of places for teaching and learning being formed and modified by the participants.

Figure 2. The City as a School
From the "Harvard Educational Review: Architecture and Education"

industrial areas. The roof tops of large scale constructions such as industrial parks and shopping centers could provide areas for schools. It is now feasible to construct schools on land formerly considered waste such as ravines, rocky sites and wet lands while preserving these sites ecologically and providing uniquely aesthetic settings. There is also the possibility of the Mini-school as a temporary solution or to bring the school into the neighborhood. There is the block connector school and the air rights buildings over expressways and similar innovations. Dober concludes his arguments and suggestion with the following paragraph:

> "As an every day activity, education occupies one out of four Americans full-time. The environmental design that accompanies education is as important as it is pervasive. We can see that new environmental designs need not spring forth haphazardly but can rise from common necessity, common sense, and concern for joining social purpose with public aesthetics, yielding reasons for wide environmental improvement. In the provision of urban open space we will again see how an everyday requirement for urban life can produce diverse, delightful and functionally appropriate designs."39

Earlier in this paper it was observed that the facility literature does not result from empirical investigations. Another serious deficiency of the literature is that it fails to deal adequately with the effects of the climate of the times on school architecture. Among others, Cubberly has

has observed that the time that elapsed between the proposal of an educational improvement and its adoption is about 50 years. Today's crises are so pressing that we cannot afford to waste time before taking action if the educational enterprise is to survive. The Harvard report is the first in depth attempt to consider these unique, contemporary social problems, while studying the reciprocal implications of architectural and educational concerns.

In the preface to the Harvard study the editors stated their goals in these words:

> "Our intent is to explore the relationship of architectural values to significant human experience and in particular to basic educational goals - to question if and how the physical environment informs and shapes and liberates the human spirit."40

The report identifies and explores the problems but it does not see its mission as providing specific answers. The authors are anxious, at times emotional and radical. Innovation is often more important than traditional logic. The literature is, at times, rebellious in format as in the writings of Maurice Smith illustrated in figures 3 and 4. The reader might be made uncomfortable by the rebellious nature of many of the essays. The hallmarks of the new left are evident in references to the alienation of the students, the technological society, the Establishment, the educational

? WHAT IS 'ARCHITECTURE' / SHOULD 'ARCHITECTURE' BE / ARE ARCHITECTS DESIGNERS FOR.

IF (NEGATIVE)
"THOSE WHO" are concerned mostly with the 'mind'
they CONTROL 'disorderly' people, they will
SUBDUE 'prefer' the 'advantages' of
assume, militaristic singular organization —
hierarchic exclusive
deadening circulation
dominating 'services'
limited building SYSTEMS
to feed cellular
produce repetitive packing orders.

but
IF (POSITIVE)
the intention is to help GENERATE
variable responsive environments for towards
REAL GROWTH and CHANGE, —
through participation — (those same)
architects designers makers will (could) 'discover' the
exciting rational coherence of INCLUSIVE PLURALISTIC ORDER —
(maximal range of definitions polarities
clarifying choices
and offering fresh possibilities
through RECIPROCAL CONTINUITY.)
in which
NO PLACE USE is wholly exclusively self-defined,
but is mutually dependent for its existence form on many others.

IF LIFE
can possibly be become
(then) BUILDINGS MUST BE
happy
sane
'rich'
productive
humane
joyful
'responsive'
involved
'worthwhile'
.....

and IF this
PHYSICAL ENVIRONMENT
IS a certain definite PART OF LIFE
not merely neutral
a 'background' for it
then
"THOSE WHO" make
program
design
pay for
use
& or participate in any every way
in the transformation of place

are obligated to DISCOVER
INVENT
USE
PROJECT
PROCESSES
METHODS
FORM DEFINITIONS
.....

that are the DIRECT MANIFESTATIONS
INTERPRETATIONS
of what they
we
think
believe
understand
about everything else good IN LIFE.

what is LIVABLE
must be BUILT and USED
and (must be) BUILT for by
the REAL users,
(users' choice),
— there is NO good purpose in
making terrible
unhappy
impersonally places.
'educational' buildings this means
in 'schools' (no building types please)
non-schools'
.....
that we must build mostly directly
for the children
students
teachers
administrators
parents
'community'
and less for the systems
salesmen and the
completed images.

Figure 3. A Maurice Smith Format
From the "Harvard Educational Review:
Architecture and Education"

If a/your building/school is for 2000/500/200 people
in 5 years it will largely consume/stage/'measure' 10 000/2500/1000 PERSON-YEARS!
in say 20 years (buildings ARE still important) → 40 000/10 000/4000 PERSON-YEARS!
? what are our/your standards.

? FOR HOW LONG IS A BUILDING
HOW DO YOU/DOES ..... MEASURE
THE TIME/LIFE OF A BUILDING
WHAT, FOR HOW MANY ?

It is violently insulting/disorientating/suffocating to stuff/'put' (all those) 'CHILDREN'/PEOPLE into near-identical/minimal 'definitions' session/season/year after year/season/session.
(a classroom is/is not/never a classroom)

If each person has the opportunity to/CAN generate his own 'building life' in continuing/continually changing association with others — many/one/few — then that building ('life') must be a synthesis of many/varied individual & group actions/choices/decisions/relationships and any singular/clear/instantaneous/'a priori'/'fascistic'/simplistic TOTAL form/image must be inappropriate.

so BUILDING TYPES/prototypes (if for PEOPLE to use, not machines)
DON'T HELP; but rather tend to isolate/separate 'collective' experiences which then have to be re-'connected' to others.
This NEVER works — connections/'bridges' are usually use-place separations.

IF buildings ARE positively synthesised —
from a pluralistic range of definitions/processes —
the powerful CONTINUITY of each individual's direction/experience/LIFE can accommodate/recognise/welcome
ENORMOUS DIFFERENCES —
there will/need be NO BUILT AVERAGE/NORM, no automatic/idle/negative repetitions/boredom.

Figure 4. A Maurice Smith Format
From the "Harvard Educational Review: Architecture and Education"

bureaucracy, the student rebellions, liberated buildings and zones and the ruling class. Nevertheless, these are not the people who attack America as Amerika, rather they rebel with reasonable arguments and their primary goal is the creation of a more viable educational architecture.

According to the writers, planners still design buildings to meet standards that are too limited in scope. In wealthier communities more attractive buildings are built, research is done on teaching equipment and certain basic animal needs of the users are met in improved ways. In contrast, the social requirements of the learning environment remain largely unattended. Education for the good life gets lost in the morass of power politics, bond issues, economics and the system. Aldo van Eyck sees much of the problem as stemming from what he calls "vast multiplicity" resulting from our "bewildering technological ability" and "our inability to come to terms with greater numbers and behave with sanity towards environment," he goes on to state the following:

> "No previous society made quite so little of knowledge and technology available, or fell so far short of what imaginative concerted action could bring about. What are authorities, speculators, architects and planners doing everywhere? The result is mile upon mile of organized nowhere. With everything too far and too near; too large and too small; too few and too many; too similar and too different. With everything far, near,

> large, small, few, many, similar, and different in the wrong-inhuman-way. Wrong in the wrong way, for things can be wrong in the right-nice-way; the way they can be right in the wrong-nasty-way." [41]

Others of the writers try to explain how architecture should function for education. Hertzberger points out; "The aim of the architecture is then to reach the situation where everyone's identity is optimal."[42] Ackerman declares that "architecture is the physical form of social institutions."[43] The obvious conclusion to be drawn is that our institutions must change attitudes and priorities before we can expect improvement in the educational environment.

What are the issues and actors that are involved in this vast and varied problem? The study does not precisely and concisely identify them in any order. Each writer discusses the issues according to his own frame of reference. This researcher suggests that the following broad headings might contain most of them:

(1) The Administrators
(2) The Teachers
(3) The Students and the Social Interrelationships Bearing on Their Environment
(4) The Diagnosis and Prognosis of the State of Educational Architecture

In the discussion of the above headings this writer will quote the authors often so that the reader can experience the precise language and color of the various criticisms.

The Administrators

The administrators are identified (usually not kindly) as the maintainers of the status quo society all the way from the highest officer in the land to the local elementary principal. There are a few exceptions, but the usual educational administrator is seen as unimaginatively reacting to the social problems while slavishly preserving the goals of the establishment. He is autocratic and fosters "exclusiveness" and "inclusiveness" according to accepted patterns. Shadrack Woods says:

> "Education itself has too long been a preserve of bureaucracy. The consequent atrophying of the educational part of Education is not at all surprising when form, size, cost, location and content have all been left largely to the unimaginative, often incompetent minority which administers for us."44

The administrator is seen variously as a "laissez-faire" official, a benevolent dictator or in the extreme, as a facist. His "modus operandi," his interactions and accomplishments will become more apparent in the succeeding paragraphs. Steinberg's cartoon, figure 5, depicts one of these persons destroying a youngster's dream.

The Teacher

The teacher gets less abuse than the administrator but suffers the ignominity of being some sort of a non-person.

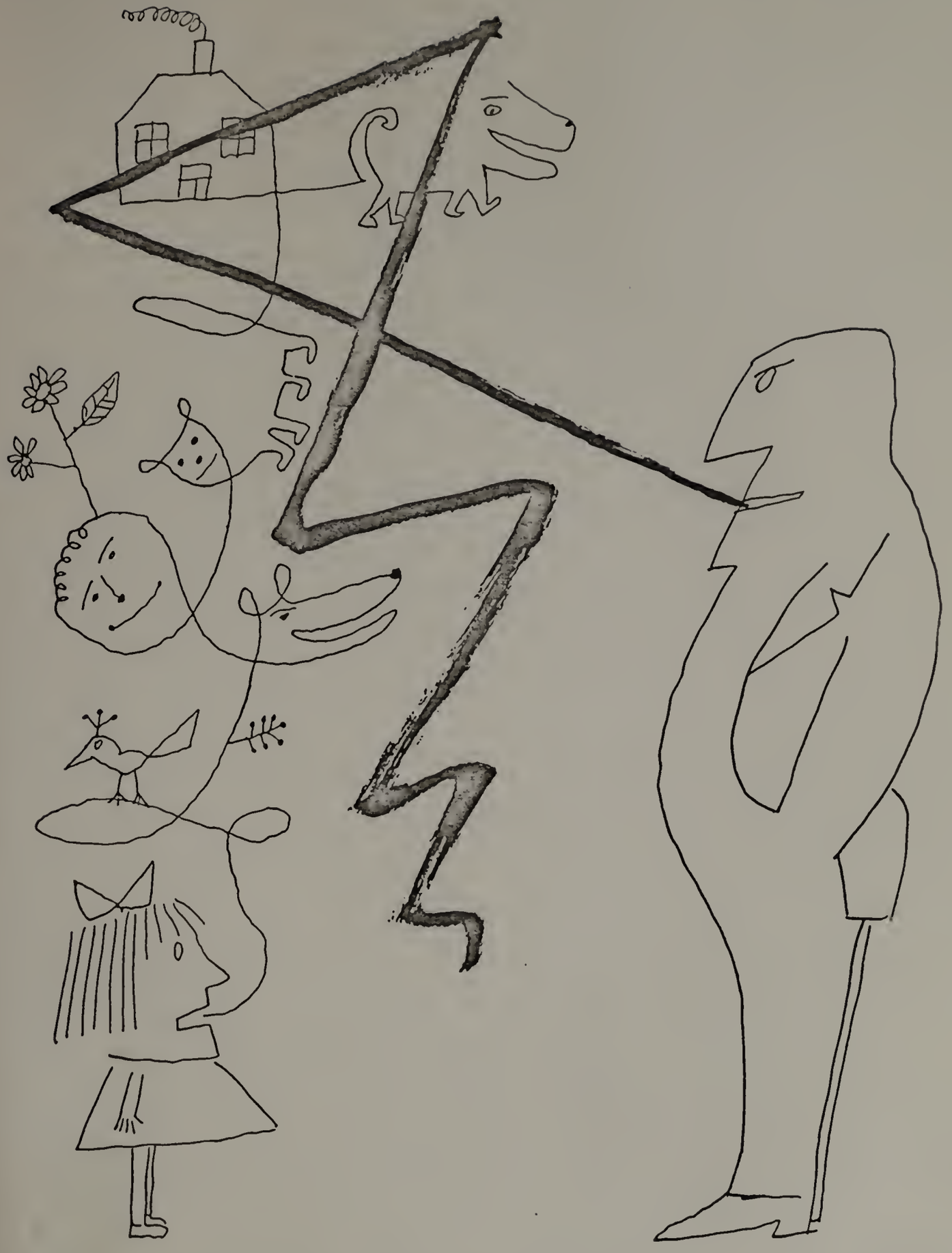

Figure 5. Steinberg Cartoon
From the "Harvard Educational Review:
Architecture and Education"

In the quoted interviews with students, the teacher usually appears jaded by the curriculum which also bores the children; she is fatigued by large numbers and faulty facilities. She is usually not a member of the local community, either physically or spiritually, and in many urban situations is intimidated by it. Certification and degree requirements protect some poor teachers while excluding more relevant teaching candidates. Carew in his interview concerning his work in the black community in Washington tells about Eric who is an excellent successful musician with whom the children can relate but he cannot teach because he is not certified. The report does relate some exciting programs by innovative teachers but the average teacher is seen as a "ho hum" stereotype less malicious than the administrator but still a tool under his control. The teacher who should be the leading actor is eclipsed and emasculated by circumstances and the other role players.

The Student and the Social Interrelationships Bearing on His Environment

The student is the primary consideration because he is the recipient of education. Is education for the benefit of the student only? It is to serve society by domesticating the student? Or does it serve both society and the student in mutually beneficial ways? These appear to be the critical

questions. Society has to be assured that the student will behave in a responsible manner within that society. The student also must be assured that his needs and aspirations will be served. To this point there is general agreement. It is in the interpretation of the goals of each group that poses the conflict. Students who have been brought up to believe they are members of a democratic society find it difficult to resolve the disparity between the ideals professed by society and the actual expression of those ideals.

The power structure of our society has become known as the Establishment. The Establishment is accused of being inflexible and concerned primarily with its own perpetuation. The society has become perplexingly technological. This technology could be of benefit to all but more often than not its benefits are available to the highest bidders. The power of the market place is all-pervasive and the rich grow richer and the poor, poorer.

The Harvard report believes that the Establishment uses education to control men's minds and thereby assuring the status quo. De Carlo, the most radical of the report's authors, declares that Napoleon defined education as "the means of directing opinion." De Carlo feels this situation still exists but the problem is compounded since the Emperor's time.

> "The expansion of culture, increasing objectively the critical potentialities of the social body, has necessitated an increasingly articulated opinion-control which, in order to be efficient, has had to restrict the sphere in which culture is formed, and therefore, organize a rigid and unified structure of teaching. The development of industry and technology has pushed this development to extremes, generating the necessity of mass education in order to face up to the demands of production and consumption at the same time that it has generated the necessity of conditioning the educated masses by means of a controlled educational system, to prevent their becoming aware of their exclusion from the processes of the decision-making and the manipulation of power." 45

The student is now becoming aware of his collective student power, the power of the people, Black power, and the power of a large number of other groups consisting of various people who believed themselves aggrieved by society.

The student rebellion is underway in an attempt to wrench from the Establishment what students perceive to be rightfully theirs. Shadrack Woods reacts to the student rebellion:

> "The student rebellion (it is not yet a revolution) is based on solid tangible griefs, as well as feeding on a general sense of disillusionment with an affluent, strongly-differentiated typically colonialist society. Schools and universities in the Western World have been more of a babysitting operation in which the ruling class parks its children while they wait to succeed their parents at the helm of government

> or simply at coupon-clipping rather than a real participation in any viable society. Whether it is possible to change this without changing the entire socio-economic structure is not at all sure. If not, then we can only hope that the rebellion will ripen into revolution. This hope is almost surely vain in the West, where a strong-arm, facist takeover appears far more likely. The climate preceding the Spanish Civil War is closer to us than that which ushered in October 1917, and this is why we hope that it may be possible to come to more valid organizations without violence: not to save us from the left but rather from the right, which is waiting in the wing, as it were, of the White House." 46

Woods is not completely pessimistic and believes that violent upheaval may be averted by a valid reorganization of the educational system to bring it in line with the goals, needs and aspirations of the students. Education, says Woods, should assume responsibility for assisting in the continuing evolution of Western Society in positive ways.

What then are the factors involved? What are the things that students want or need? Unfortunately so many of the terms that define these issues have now become hackneyed, boring and banal and others have revolutionary connotations such as communications, relevance, identity, dignity, racism, the new left, facists and the extreme right to identify a few. Probably the most trite of all is relevance and yet what it represents has tremendous importance. The frustration

caused essentially by a lack of relevance is expressed in the answer Robert Coles received from a little girl when he asked how she would make her school better:

> "I'll tell you one thing, I'd tear this building down. There's nothing to do but that. Then, if I could build a new school, I'd make it pleasant-like. I'd get rid of all the desks, every one of them. I'd have us sit around a table, and maybe we could have cookies. I'd have the teacher be better. She could laugh a lot, and there wouldn't be a clock up there, making noise every minute that goes by. We could open and close the windows and they wouldn't be stuck like now. We could have a big rug here in the room, so if you fell down you wouldn't get hurt, like I did. And they could have some places, some big sofas maybe, where if you didn't feel too good, you could lie down, or you could just sit in them sometimes, and you'd be more comfortable. I'm not sure why they have us go to school. Do you know? Is there anyone who does? I know it's to learn things, how to read and do arithmetic and like that, but most of the time it's just a waste and you'd think they might want to change it around, and have us spend the day better. You'd think they might try to change a lot of things themselves. The principal himself, he complains to us that the big hall, it's too big and you can't hear good, and the corridors, they're just too long and you practically should have a car to travel from one part of the building to the next. My older brother, he's in the sixth

> grade, and it's like he's across
> the country from me. I never see
> him except when school is out.
> Then everyone wakes up."47

So much is lost because of a lack of communication. If a positive dialogue could be established opposing arguments could be resolved. The impenetrable resistance of negative attitudes to positive vehicles for change is illustrated by Steinberg's cartoon, figure 6. The generation gap is good example where parents and children actually love one another and yet cannot resolve their disagreements over often relatively trivial matters. The Vietnam War continues in spite of the fact that the adversaries have had enough of it. Fighting and killing appears easier than objectively discussing differences. The climate of hostility and suspicion is now so intense that any attempt at communication is emotionally put aside. Communications could be improved if decision-making were shared. All interested parties including the students would talk together to reach resolutions on points of contention. One would find it hard to feel alienated when he is a consulted part of the operation.

Robert Goodman in his essay, "The Liberated Zone"[48] discusses this very aspect. As an advocacy planner he becomes disenchanted because he found he did nor represent the students. He accepted the challenge to design the

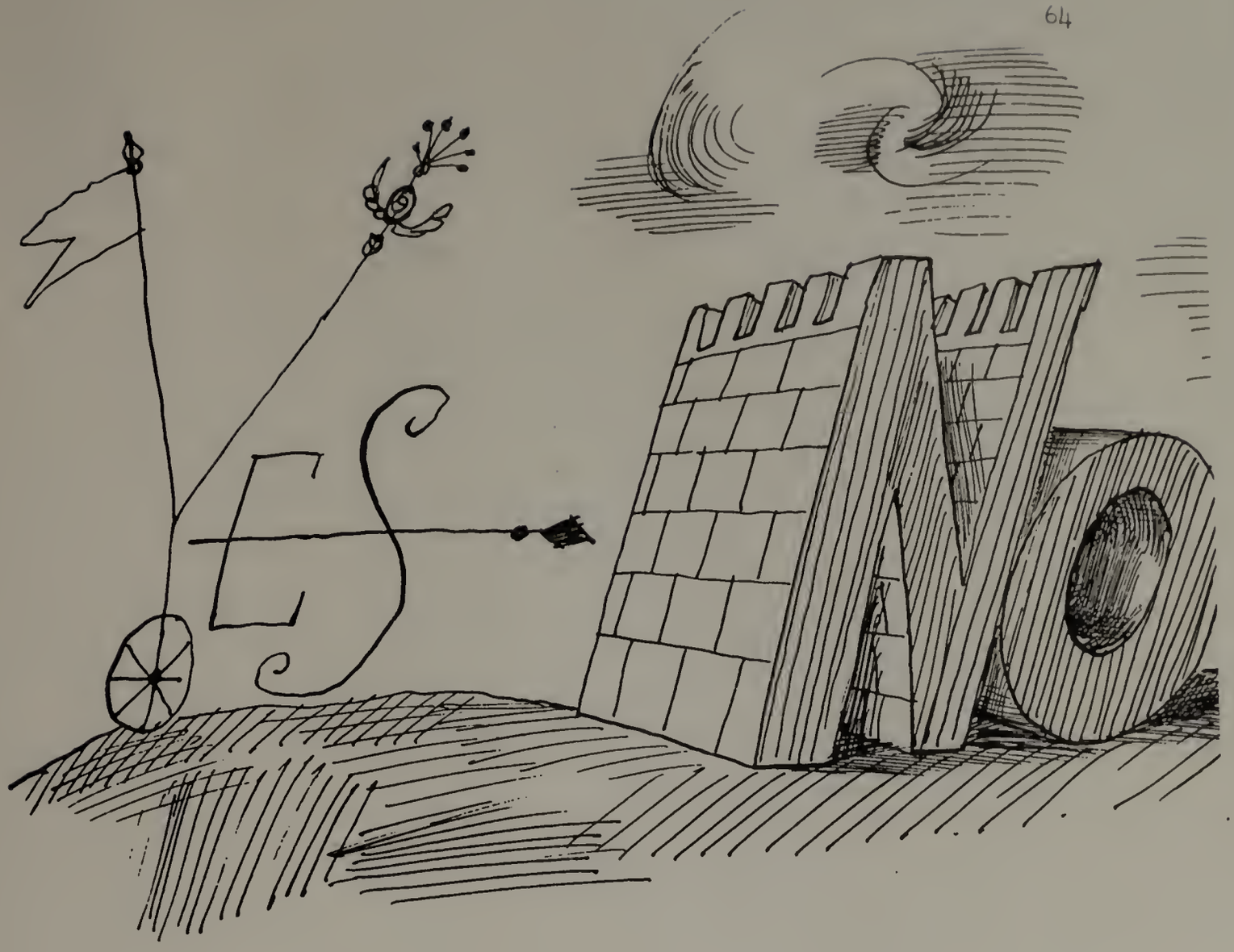

Figure 6. Steinberg Cartoon
From the "Harvard Educational Review:
Architecture and Education"

"Liberated Zone." This is to be a Youth Center not planned by authorities, but rather one where the students assist in the designing and building of it. This kind of activity puts trust in the students and reciprocally the students trust the administration more. The students are not excluded.

Trust is one of the factors that can generate dignity which all humans seek. Dignity depends on having a sense of worth. Minority groups suffer most from its absence. Carew explains that you cannot have dignity when you must continually adjust for being black and because of this fact dignity becomes all the more important. This is where technology can be so degrading. One feels little dignity when he has to characterize himself as a mechanical number in a computed world. His sense of identity is also gone. Carew indicates that the "black cat" wears purple pants or owns a Cadillac to assert his sense of identity which society denies him.

Racism and minority group problems present many issues too broad and deep to be discussed in a paragraph or two. Still one cannot ignore the implications of race problems. Carew discusses how racism begins and how it effects a minority group:

> "Any time that you have a group of people that are subjected to a set of standards, whether they be cultural, aesthetic, artistic or architectural or whatever, and that group of people does not share the same origin as those standards, you have racism. So I contend that

> most architecture that has its practice in the black community or any minority community happens to be racist because it does not respect the origins of those particular people. I contend that Afro-Americans have a life style which relates specifically to who they are as a people on the basis of that we could probably define a set of cultural, aesthetic, artistic standards which relate specifically to them as a people. That they have an origin in Africa, have a life in Afro-America, have assimilated a given amount of Western culture, but are not Westernized. And that sort of defines what is the modern Afro-American."[49]

While the Establishment tries to "educate" or assimilate the minority groups according to its standards, the minority group asserts its identity more and more violently or becomes completely frustrated. Then comes the riots, fire bombings and police brutality. Being cattle prodded, hosed and jailed can destroy cats as Carew observes. Society feels threatened by the various minority groups. Rebellions and demonstrations and so the vicious circle continues. Obviously, society must objectively identify the troublesome issues and must seek solutions intelligently and honestly that will provide for all groups and allow for the development of each individual.

The Diagnosis and Prognosis of the State of Educational Architecture

Certainly school facilities are environmental determinants in the quality of life for the citizenry. Man made environments, the buildings and artifacts within them, say many

things about the makers and the users. As van Eyck says, "environment reveals whatever occurs there." The character of all who were involved in the planning is displayed by the finished product. Was it made of hard concrete to prevent vandalism or was it made of wood to suggest warmth? The expected behavior is made evident. Attitudes of makers and users can be determined from the way it was designed and from the way it is used.

So many schools are oppressive places as indicated in previous quotations. They are usually too large and over-power the children. They are impersonal and institutional with no human warmth. In general little attempt is made to provide a stimulating education environment. The social and psychological needs of learners and minority groups are often ignored. Prangnell sees them as designed with janitorial consideration as paramount. In short most schools do not reflect what we know is necessary for the educational process. They do reflect other things which are many times negative.

This state of affairs would indicate some failure on the part of the planners. Ackerman[50] indicates that "experts are expert in the wrong thing." Almost all the writers in the Harvard report believe the planners have failed. De Carlo feels specialists cannot design school buildings for two reasons. First, the specialist's professional horizon does not go beyond the circle of requests of the institution.

Secondly, his training has prepared him to design "autonomous and self-sufficient organizational systems," according to the dictates of the Establishment. Carew declares that the specialist who cannot understand why the black youth wears purple bell bottoms cannot possibly design a building for this student's education. Prangnell argues that school plant planners usually start the task half way along the road, never begin with the clarification of the problem. They have pretensions to scientific objectivity and blind us with it. Such approaches cannot be used when one is dealing with human occupation. Human relevance is the key point that unites all, children, parent, teachers, city fathers and the professional specialists. "We have to dedicate ourselves to the simple idea that we all count."

If the planners have failed there must be something wrong in the method of selecting these specialists. The writers emphatically advocate that the users should choose the architect. This is another manifestation of the necessity to have all the people involved in the activity to take part in the decision-making. Goodman observes: "Real decision-making by the users of the physical or social environment is the true test of democracy."[51]

Equally important is the choice of the right architect for the job. Ackerman says there are three possible choices. The Pragmatic planner - "give them what they want school,"

the Egoist - "give them what I want school," or the catalytic type who attempts to give form to the functions of society. The pragmatic type is the one about whom De Carlo complains. The one who reacts with acquiesence to the dictates of the power structure. The Egoist is the one who sees himself as another Frank Lloyd Wright, but he is more interested in his own image than he is in aiding education. It is the catalyst planner who tries to provide for the needs of the users in consultation with them. It is too important to the health of society to choose an architect unwisely.

What must the architect do? What must architecture provide? First of all the facility must "work." A building that is aesthetically fine but in which the student is inhibited by the inflexible order of the facilities does not work for the student. There are many ways a facility may fail to work when it is not designed specifically for the users. De Carlo argues for "disorder" as well as order. He finds "order" can limit experience because it isolates only the variables that are considered significant by authorities. Disorder in this regard is not a series of malfunctions but is a characteristic which might make possible the interplay of all the variables in an event. A structure that is too tightly organized can result in an oppressive school.

Prangnell indicates our main concern is with the "friendly object." This might be a street lamp, a shop or

even a city. They are those objects that manifest human relevance. They invite our participation. They have immediate and withheld meaning. They stimulate our creative power which is the basis of our growth. If we recognize the need to grow as basic, all aspects of organization and administration will take their appropriate place. The friendly object must properly perform the function for which it was designed, yet it should leave something in its usefulness for the preference of the user. Its design must not be over explicit. Hertzberger, in discussing his Montessori school, states that in the center of his flexible classroom is a permanently set island block. This gives a suggestion of stability and yet it can be many things - a stage, a ship or a mountain at the dictate of the student's imagination.

The writers recognize the necessity for flexibility and adaptability but caution that this design feature can also be carried too far. There may be times when it is expecting too much to be able to change a room for every activity. Flexibility and adaptability are also attributes of attitudes. Also a change of locale might be stimulating. Even the small school could provide varied spaces that would allow the students and teachers to move easily to spaces more suitable to a particular activity. Flexibility is more than moveable walls.

There is great need for private spaces. These might

range from the individual carrel to small group spaces. These escape areas would act as buffers to the oppressiveness of present institutional large spaces such as gymnasiums and cafeterias. Even cafeterias could be broken down into more intimate sub-spaces.

It is no coincidence that several of the articles in the Harvard study describe incidents in which young children thought being given a cookie once in a while would have an important humanizing effect. Most environmental designers have sensed that eating together has a tremendous portent for productive relationships. In his article describing the planning of a youth center, Goodman described the importance of eating together, sharing a basic human activity in a social way that allows for an unstructured communal experience.

> "Eating seemed the one common activity that ostensibly brings people together to fulfill individual desires, but often allows people the "opening" for communal activities. Some restaurants and most coffee houses are places where this happens. The kitchen during a party at home is often the most used space for discussions. Somehow it's easier for people to get together over passing each other food than simply introducing themselves. Perhaps coming into the kitchen for food means you don't have to make a commitment to talk to someone too long since your primary purpose was obviously to satisfy your hunger. This being done you can always leave in the middle of a conversation since you weren't there to talk in the first place."52

Other alternatives to the oppressive school are suggested. These call for the abandoning of large city schoolhouses through the setting up of various types of non-schools.

Many of the writers believe the most important part of education now happens in the streets anyway. Some alternatives might be the store-front schools and neighborhood centers in renovated old houses or warehouses because these facilities would decentralize education and bring it back to the neighborhood where it might provide more self-determination for the local community. Several other premises appear important to the various writers. The amount of agreement on them is surprising and does give substance to the identification of the problems. Schools should avoid being oppressive as most of them now are. It is most important that all interested parties, especially the users, share in decision-making. Schools can no longer be the creation of autocratic administrations. Education should take place in a variety of locations in the community and the school should be part of the total community - not a microcosm within it. Education should be available for as long as one wishes it. The self-determination of the individual is of primary importance. Flexibility and adaptability in the schools are necessities but it is important to recognize that this flexibility and adaptability must reside in the mind before it can be manifested in the physical structure.

The writer of this paper realizes that the authors of the Harvard study do not claim to offer us tested variables although many of the concepts come from areas where research has been performed. Often the writings appear to be sentimental moralizings. However, the issues are so urgent that perhaps some thoughtful moralizing is much more appropriate and positive than any continuation of our present demoralising course. See van Eyck's presentation in figure 7.

As was noted earlier in this section, the Harvard report explores the issues but does not attempt to provide specific solutions. The implication is that one must be aware of and knowledgeable about these problems before he can make hypotheses and test them. Thus, this researcher has isolated some of the weaving for testing, while attempting to be aware of the total fabric. In the case of this paper the central premise is that students and faculty are important data sources. It is believed that the Harvard study, Dober's work and that of Castaldi have demonstrated this.

This writer finds it regrettable that only one empirical study, the Eninger study, was of sufficient value to merit reporting here. This researcher does not wish to close this discussion of the literature without at least a mention of the more traditional sources of facility literature. They have not been reported here in depth because all who are involved in facility planning are already aware of them. These

Remember that tanker holding the largest quantity of oil in a single hull and the way it broke in two.

Never mind the millions enjoying those two coasts on a fine summer's day.
Never mind the birds.

And that coal hill towering over a little school at its foot.

Never mind those children.

And those thousands of square miles of other people's jungle chemically defoliated; their rice fields ruined and their soil poisoned.

Never mind what or who lives in and between those trees.
Never mind those who live off that soil.

And, lest I forget, Ben Tre. The city ". . . we had to destroy in order to save it."

Never mind the streets, shops, schools, houses and all the small intimate things.
Oh yes, and never mind the dead.

Remember also the large and little portions of the same kind of thing occurring all over the globe hour by hour.

Never mind:

FROM LIMITED TOTAL LOSS TO LIMITLESS TOTAL LOSS

Figure 7. A Writing by Aldo van Eyck
From the "Harvard Educational Review: Architecture and Education"

sources are noted in the bibliography of this paper.

These publications include the following sources:

The professional journals, educational and architectural, several of which publish periodic school building issues.

The varied publications produced by organizations who study school buildings. The Educational Facilities Laboratory and the National Council on Schoolhouse Construction are particularly notable examples.

Several publications resulting from grant-based studies on Vocational-Technical Schools done by University and other groups. These are usually concerned with such issues as square footage, space requirements and the types and amount of machines.

Finally there are a number of text books available on School plant planning. Usually these books treat the areas of this paper superficially but are often good in the brick and mortar spectrum of school plant planning and operation.

CHAPTER III

PROCEDURES

An Overview

As stated previously, the problem of this study was to produce some tested data regarding the perceptions of teachers and students which might be an aid to facility planners. The samples were drawn from the faculties and students in five Massachusetts regional vocational-technical schools and two older traditional vocational schools in that state. The subjects in the older schools served as a control group. The guidance counsellor at each school was asked to provide the most representational sample possible within his appropriate student groupings. These groups consisted of juniors, seniors and institute students. These samples were large in each school; in all cases they were greater than fifty percent of the total population. The faculty samples consisted of a large majority of the teachers in each of these schools.

Since no instrument was available to seek the information wanted, questionnaires were developed. One was designed for the faculties and a second one for students. Before administering the instruments to the samples, they were examined for validity and reliability. The instruments were deemed valid after examination. Reliability was determined by a

test-retest correlation application to a group in another school and resulted in a correlation coefficient of .88. The questionnaires were then administered to the various samples. Seven comparisons were made corresponding to the problem hypotheses. The chi square technique was used for the test of significance. A detailed explanation of the procedures follows below.

While this study is primarily designed to seek some methods of evaluating the regional vocational-technical school plants in Massachusetts, it is believed that methods and procedures used here might be applicable to similar populations elsewhere in the United States. The broad educational goals, the method of writing educational specifications and the various means of funding do not differ materially across the country and these are the principal factors which determine the nature of the school plant at the present time.

It is further believed that the responsible people in most of these school systems have available to them the expertise and facilities to duplicate the procedures used here. It is hoped that these authorities will find these methods and tools to be a new and productive yardstick to measure some aspects of school plants already completed. In addition these procedures might serve as a data gathering instrument for continued improvements in existing facilities as well as

in new construction.

The review of the literature indicated that faculties, students and administrators are the prime users of the school plants. The literature also points out that faculties and students are important data sources that are often overlooked or minimized. It was noted in the literature already reviewed that while the administrators are among the prime users, their views are not usually disregarded as are those of teachers and students; on the contrary they are often the only group of this trio which is consulted. Until now, facility planning has been customarily the prerogative of consultants, architects and administrators who are, in varying degrees, removed from actual involvment in the functioning spaces of the facilities. Students and faculty, on the other hand work daily in these spaces. For these reasons this study has attempted to find a method to seek and evaluate some data from these neglected sources.

It was decided to design a questionnaire that would record the perceptions of students and faculties concerning the positiveness or negativeness of their school physical environments. It was hoped that these responses would provide data to test the hypotheses proposed in this study. If the hypotheses were accepted then there would be support for a favorable evaluation of the Massachusetts Regional Vocational-Technical School building program. If the hypotheses were

rejected than at least some questions about the unimportance of the physical environment would be raised. In addition, it was hoped to gain some knowledge concerning the feasibility of using faculties and students as data sources for facility planning.

Population and Sample

The schools selected for this study were chosen as representative of the total population of Massachusetts vocational schools. The selection of schools to be used in the study were made with the aid of members of the Massachusetts Bureau of Vocational Education, The Massachusetts Research Coordinating Unit and with several superintendent-directors from the regional vocational-technical schools. The schools in the study consisted of five of the seven regional vocational-technical schools and two older non regional vocational schools built before World War I. The older vocational schools were included as control schools and are referred to as the traditional schools in this report. In addition to these schools a new urban vocational-technical school was added for some comparisons.

The samples selected within these schools consisted of students and faculty members. Three questionnaires were developed for this study which are discussed in detail in the instrument section of this chapter. The first questionnaire

contained items seeking general factual information from the superintendent-director of each school. The responses to this questionnaire were expected to provide the researcher with the background information and to serve as a validity check on the other two questionnaires. The second and third questionnaires sought the perceptions, reactions and attitudes of faculties and students toward their physical environment. These latter questionnaires are the ones most important to this study and are the ones which will be subjected to statistical analysis.

The first questionnaire was answered by all superintendent-directors of the schools involved in the study. The superintendent in each school agreed to have his personnel administer the second and third questionnaires to random samples of teachers and students in his school. The faculty sample consisted of a majority of the faculty members in each of the schools. Both vocational and academic faculties were represented. The student sample consisted of groups selected in each of the schools to be a large representative cross section of the students in each school. Because of their longer acquaintance with the school, the student sample was limited to juniors, seniors and post-graduate students. An attempt was made to get a proportional number of female students and faculty into the study as this group is often neglected in evaluations of vocational educational programs.

The numbers and distribution of respondents is as follows:

	Faculty	Student	Administrators
Regional Schools (5)	110	327	5
Old Schools (2)	44	129	2
Urban School (1)	24	92	1
	178	548	8

Grand Total of all respondents 734

The total school enrollments in the various institutions in this study were comparatively small in the order of 300-600 students in each school with one school having about 1,000 students. However, the enrollments were usually at the lower numbers. Therefore, the numbers reported represent a respectable sample of about 60 percent of the population. One of the regional schools elected not to have its students represented in the study. While this is regrettable, the writer does not see any great effect on the sample. In addition to the sampling above, the writer interviewed the superintendent of each school involved in the study at his school. The author toured each of the schools at least once to get a first-hand knowledge of them. It was possible to speak to teachers, students, counselors, audio-visual specialists and non-professional staff. Most of the classrooms, laboratories and shops were seen. These visits provided the opportunity to verify some of the observations made by the respondents as well as allowing the investigator to get the "feel" of the institutions.

It should be emphasized that this researcher did not have control over the sample selections. In order to disrupt the educational process as little as possible and at the same time get as large a sample as possible this researcher agreed with the superintendents to allow them, with the aid of their guidance staffs to select the samples. They agreed to make the samples as random and representational as possible within the limitations of other school commitments. This writer has no reason to believe that the sample selections were prejudiced in any manner.

Description of the Instrument

The search through the literature and through the usual test sources did not produce an instrument that would secure the kinds of data the author believed necessary to collect. There were facility measures of various types but these were usually concerned with mechanical features such as square footage minimums and machinery availability. Very few of these came from what could be considered a theoretical base. For these reasons this researcher decided to design his own instrument. Since the literature, particularly in recent years, is rich with attempts to come to grips with facility problems in pragmatic ways, this investigator found that literature to be a fruitful source from which to borrow ideas for items and subscales in his instrument.

Architects and specialists for all types of buildings have identified a number of sub-environments within the total physical environment. The sub-environments which are most commonly discussed in public building planning and evaluation are also the ones employed in this study. These are listed below along with a brief description of their characteristics:

> The Visual Environment might be described as the light-sight environment. It is concerned with the quality of natural and artificial light as well as other features which might effect vision.
>
> The Thermal Environment is related to temperature, ventilation and humidity factors.
>
> The Acoustical Environment is concerned with the transmittal and control of sound.
>
> The Spatial Environment has to do with how space is used, the relationship of one space to another and the availability of space.
>
> The Aesthetic Environment is concerned with the attractiveness of the facility in terms of color, texture, design and the general environmental pleasantness or lack of it.

These sub-environments provided the first five subscales for the student and faculty questionnaires. While these scales cover most of the purely architectural consideration, six other subscales are considered appropriate by many authorities on school facilities and are as follows:

Safety Provisions. This subscale is particularly appropriate to vocational schools where the possibilities of accidents and health hazards are greater because of the nature of the activity.

Storage Facilities. This one is especially appropriate because of the need for adequate storage and security for tools and equipment in addition to the usual school storage requirements.

Utilities. This subscale concerns adequacy of electrical, water, air and other utility services.

General. The General subscale provided for questions concerning heterogeneous items outside of the more specific areas.

Audio-Visual. The Audio-Visual subscale sought faculty reactions to provisions in this area.

Vertical Instructional Surfaces. This subscale asked for faculty perceptions regarding the use of blackboards, bulletin boards, display areas and the like. It concerns the utilization of vertical surfaces to serve as teaching facilities.

The items within the subscales were those that appeared most important in the review of the literature. This collection of items makes no pretense of being exhaustive but they are considered to be representational enough to draw significant responses.

The faculty questionnaire contains 91 items. Of these 67 were found to lend themselves to statistical analysis. The student questionnaire contained 63 items that are identical to the corresponding ones in the faculty questionnaire. Of these, 45 were found suitable for statistical

analysis. Put another way the faculty responds to all the questions the students answer plus 18 additional items.

When the questionnaires were tabulated it was found that there were nearly 45,000 individual responses. Because of this volume it was decided to use data processing machines. A series of four IBM data processing cards were designed to record this data in a useful form. These cards are identified as 01, 02, 03 and 04. The card numbers are found under columns 79 and 80 on each card. Each respondent was assigned a card with a three digit identification number under columns 1, 2 and 3 on the card. Card 01 which represents student and faculty subscale totals was not used in this study. Card 02 lists general information about the respondent and his individual item responses. On card 02 the item responses recorded are those common to both faculty and students. On card 03 and 04 all faculty responses are recorded by item. On all cards used subscales are indicated. There are 11 subscales for faculty and 9 for students. The subscales of the students are in common with those of the faculty but here again the students usually have fewer items and never more items under each subscale.

On card 02, 03 and 04 the first 13 columns contain general information about the respondent while the item responses are indicated after column 13. Values assigned

to the responses were:

Yes	=	2
No Response	=	1
No	=	0

The "no response" reply was assigned a value of 1 because it is regarded as a mixed response; neither "yes" nor "no." The layout of the data on the data processing cards is indicated in Table 4.1.

Each school and each respondent was assured that anonymity would be observed to lessen any tension in regard to answering the questions and to preclude any chance of embarrassment. The only explanation given to respondents was that their answers would be useful in future facility planning. No one was apprised of the fact that he was in an experiment. The only personal information requested of teachers concerned the subject taught, numbers of years of teaching and whether the respondent taught elsewhere. Students were asked if they were juniors, seniors or post-graduates. Both types of respondents were asked to identify their schools and sex. The word facilities was defined as including buildings and grounds.

Validity Information

Scates and Yeomans have suggested criteria to check the validity of a questionnaire.[53] In the following para-

graphs this writer has restated these criteria questions and has attempted to answer them in respect to this study's questionnaires.

1. Are the questions on the subject? The questions were adapted from various items in the literature that had received emphasis from the experts.

2. Are the questions perfectly clear and unambiguous? The questions were refined by repeatedly testing them on subjects outside of the study until there appeared to be no misunderstanding. Emphasis was placed on dealing with a single idea in each item.

3. Do the individual questions get at something stable which is typical of the particular situation? All items were single concepts placed in proper subscales which in turn seek responses in the important areas of the problem.

4. Do the questions pull or have extractive power? Will they be answered by a large enough proportion of respondents to have validity? A glance at the data displays in the next chapter will demonstrate that in most cases there were very few "no responses." Seldom more than two to three percent of the subjects failed to respond to the various items, Even in these cases it is believed that the "no response" indicates an honest mixed response rather than a lack of pulling power or misunderstanding of the item.

5. Do the responses show a reasonable range of variation? Responses did indicate that some respondents were in general quite favorable while others were quite unfavorable as would be expected from a normal population.

6. Is the information in agreement with what is known and in agreement with expectancy? Since the items come from the literature and expert opinion, it is in agreement with what is known and expected.

7. Are the items sufficiently inclusive? One can only hope that an individual items is sufficiently inclusive while at the same time avoiding responses

that are reflections of general non specific attitudes. That attempt has been made here.

8. Is there a possibility of obtaining an external criterion to evaluate the questionnaire? As stated earlier no similar published questionnaire appeared to be available. Therefore the possibility of a parallel form testing was not possible. However, as stated above the items were pretested on students and they were reviewed in depth by an architect and an industrial designer. Other experts read and commented on the items and subscales. Their comments and suggestions were noted and added greatly in refining the items.

The Reliability of the Instrument

As a reliability measure the instrument was administered to a group of 36 subjects in another school. The questionnaire was again administered to the same group of subjects two weeks later. The two test results were subjected to the tetrachoric correlation technique[54] and resulted in a .88 correlation.

Experimental Treatment

The research design employed in this study is the Control-Group Posttest only-Design. The experimental or X variable was the physical environment of a new school which was assumed to be a more optimal environment than could be provided by an older school. The dependent or Y variable was student and faculty attitudes toward the physical environment of their schools. Therefore, the samples

from the newer schools became the experimental group as they were already in the newer environment. The samples in the older schools became the control group. All samples were large in proportion to the school population from which they came.

Seven null hypotheses were tested statistically which are related to the seven problem hypotheses. The seven null hypotheses are as follows:

1. There will be no significant differences in the favorability of student responses in the new and traditional schools.

2. There will be no significant differences in the favorability of faculty responses in the new and traditional schools.

3. There will be no significant differences in the favorability of responses between the faculties and students in all schools.

4. There will be no significant differences in the favorability of responses among the various regional vocational-technical schools.

5. There will be no significant differences in the favorability of responses between male and female students in all schools.

6. There will be no significant differences in the favorability of responses among juniors, seniors and post-graduate students in all schools.

7. There will be no significant differences in the favorability of responses between academic and vocational faculty members in all schools.

To test the null hypotheses the chi square technique was employed. The observed frequencies were tabulated for

each comparison indicated in the null hypotheses. Using k x 1 contingency tables the corresponding expected frequencies were calculated. In all comparisons significance was sought for all subscales appropriate to that comparison. This operation required sixty-seven k x 1 contingency tables, all of which appear in the appendix of this paper. For a simple explanation of the chi square test of significance, the reader is referred to Van Dalen's Understanding Educational Research.[55]

Chapter Four contains seven tables corresponding to the seven hypotheses tested. These tables group together data from all the subscales within each comparison. The data reported consists of the percentages of favorable responses based on the raw data, as well as the degree of significance determined from the raw data. These tables allow the reader to get an overview of the research results at a glance. The reader is referred to the appendix for the more detailed statistical analysis.

Validity of the Experiment

Measures were taken to maintain the validity of the experiment and these are reviewed here. The design of the experiment controls internal validity factors. The possibility of a pretest experience in this study was impossible because both the experimental group and control group were

already in their groups when the experiment began. However, the "ex post facto" situation does not appear to have any great effect on this study. It would be very difficult to arrange it to be otherwise. It is reasoned that members of either group might have been in the other by the natural laws of chance. There were no observable group differences. Since there was no pretest, the effects of history, maturation process, pretesting procedures, measuring instruments, statistical regression and mortality were not factors. In as much as all samples were large and assumed to be equal no pretest was considered necessary. The internal validity of this experiment appears reasonably secure.

The external validity is more complex. As suggested earlier, if the form of this experiment were carefully followed it is believed that the procedures employed here might be generalized to most states in the United States. Students and faculties who are involved in vocational education are by nature fairly uniform in character. There may be some differences between academic and vocational faculties and this paper does seek some information on this issue. While minor differences might be observable among populations in various sections of the country, intelligent researchers would compensate for these variations. The reactive or interaction effect of a pretest is not present in this experiment.

To avoid the effect that experimental procedures might have, this study turned the actual testing over to local personnel who usually do other testing in the school. The directions given on the cover sheet of the questionnaire and those given by the testers gave no hint to the respondents that they were in an experiment. The whole procedure, as far as the respondents were concerned, maintained a low profile.

It should be noted that is possible that the very fact that respondents are part of a new school might make them feel "special." This is not seen as incompatible with the objectives of this study because the literature repeatedly agreed that a sense of personal worth was a desirable characteristic. Any situation that promotes that quality is to be valued. Finally, one of the main probes of this paper is to determine some factual information concerning this new school effect.

A more serious question was raised by people in the older schools. They reasoned that "esprit de corps," excellent teachers and good programs could compensate for the lack of good facilities. One could hardly refute this argument. This researcher did find these older schools did possess good programs and teachers as was claimed. However, the newer schools had pluses in these areas making them all about equal on this score. It will be remembered that the

Eninger study pointed out that its findings indicated facility improvements has a low priority compared with other variables. This study and the Eninger study differ on the objectives of education. The Eninger study appears to be orientated toward the cost-benefit theory while this study seeks its educational objectives from a more humanitarian base as suggested by the general tone of the literature reviewed. It is admitted that personnel and program variables must be equalized and optimized before the effect of excellent facilities can have its greatest educational consequences. It is further believed that no other biases or extraneous variables existed in this study.

CHAPTER IV

RESULTS

In order to test the seven hypotheses of this study the population was classified in seven different ways according to the comparisons required by each hypothesis. These comparisons are as follows:

1. Students in the newer regional vocational-technical schools are compared with the students in the older traditional vocational schools.

2. Faculties in the newer regional vocational-technical schools are compared with the faculties in older, traditional vocational schools.

3. The faculties in all schools are compared with the students in all schools.

4. The students in each of the four regional schools are compared.

5. All male students are compared with all female students.

6. All juniors, seniors and institute students are compared.

7. The vocational faculties of all schools are compared with academic faculties of all schools.

In order to present the results of the various comparisons in a concise simple form, seven tables are presented below. In each table the percentages of favorable responses to the appropriate subscales by the various groupings are reported. These percentages are derived from the mean scores of the corresponding raw data. In the last column

of each table is the significance level based on the chi square test for that comparison. In the appendix will be found complete contingency tables and chi square computation tables for all 67 subscale comparisons that were made. The tables in this chapter will enable the reader to ascertain at a glance the degree of favorability that the raw data indicates and the confidence level of the tested data. For a more detailed display of the statistical processing of the data the reader is referred to the complete tables in the appendix. In all comparisons non significance was determined on the basis of $p < .05$.

In Table 4.1 it will be noted that the students in the newer regional schools responded considerably more favorably than did the students from the older schools on all scales according to the raw data. These results were found to be statistically significant $p > .05$ in all but the "thermal" and "utilities" subscales. The experimental hypotheses must be rejected for these two subscales and should be accepted for the remaining seven. It is concluded that in most cases students in the regional schools tend to perceive their school physical environment more favorably than students in the older vocational schools.

TABLE 4.1

Hypothesis I: Regional vs Traditional Students

Percentages Responding Favorably

Scale	Regional (Percentage)	Traditional (Percentage)	Significance
Spatial	69.41	51.93	.001
Visual	81.95	70.34	.05
Thermal	60.24	51.68	not sig *
Acoustic	63.30	60.46	.01
Aesthetic	68.73	20.68	.001
Safety	72.87	61.24	.05
Storage	54.02	31.00	.001
Utilities	73.16	63.37	not sig *
General	55.96	30.03	.001

* Non significance was determined on the basis of $p < .05$

The results of the data from the tests of the second hypothesis are shown in Table 4.2. It will be noted that on each scale, regional faculties consistantly reported much more favorably than the faculties in the older schools according to the raw data. All the subscale responses were found to be significant above the .05 level except the "vertical instructional surfaces" subscale which was at the .05 level. Therefore, the experimental hypothesis is accepted for the complete scale. Further, it is concluded that the faculties in the newer schools perceive their school physical environment more favorably than the faculties in the older schools.

TABLE 4.2

Hypothesis II: Regional vs Traditional Faculties

Percentages Responding Favorably

Scale	Regional (Percentage)	Traditional (Percentage)	Significance
Spatial	75.10	46.50	.001
Visual	77.39	53.92	.01
Thermal	61.21	33.54	.01
Acoustic	63.60	31.81	.01
Aesthetic	89.70	35.22	.001
Safety	86.70	60.22	.001
Storage	64.80	28.02	.001
Utilities	77.00	55.68	.01
General	75.20	32.38	.001
Audio-Visual	79.50	17.04	.001
Vertical Inst. Surfaces	72.72	52.27	.05

To test the third hypothesis, faculty members of all the schools were compared with the students in all schools. The results are indicated in Table 4.3. The faculties were more favorable in varying degrees, than the students in six of the nine subscales according to the raw data. Results were found to be significant in all but the "visual" and "acoustical" subscales. The results are so mixed and often so close that the null hypothesis cannot be accepted for the total scale. The data does indicate faculties, more often than not, appear to be more favorable in their perceptions of their school physical environment than students appear to be.

TABLE 4.3

Hypothesis III: All Faculty vs All Students

Percentages Responding Favorably

Scale	Faculty (Percentage)	Students (Percentage)	Significance
Spatial	66.51	65.10	.05
Visual	74.43	76.96	not sig *
Thermal	55.99	55.71	.05
Acoustic	62.90	64.14	not sig *
Aesthetic	70.92	57.70	.01
Safety	77.03	68.71	.01
Storage	52.41	48.54	.05
Utilities	69.10	69.20	.05
General	62.35	49.36	.001

* Non significance was determined on the basis of $p < .05$

To test the fourth hypothesis the students from each of the four regional schools were compared. Table 4.4 indicates little differences occurring across each subscale. All student bodies respond from favorably to very favorably except for some indifferent scores on the "storage" and "general" subscales, indicating some students displeasure with the schools on these issues. The consistency of scores plus the no significance chi square results on all scales appear to call for the rejection of the experimental hypothesis.

TABLE 4.4

Hypothesis IV: Four Regional Schools Compared

Percentages Responding Favorably

Scale	School I	School II	School III	School IV	Sig
Spatial	65.87	61.57	68.73	79.22	not sig
Visual	85.50	84.21	74.51	85.71	not sig
Thermal	59.01	50.00	58.57	70.12	not sig
Acoustic	65.13	60.52	55.33	72.72	not sig
Aesthetic	58.02	74.34	71.35	77.59	not sig
Safety	62.38	77.13	77.36	79.38	not sig
Storage	45.87	53.50	51.13	69.70	not sig
Utilities	70.87	73.02	71.60	78.57	not sig
General	51.60	53.28	52.18	68.50	not sig

Non significance was determined on the basis of $p < .05$
The raw data is expressed in percentages

The fifth hypothesis was tested by comparing the score of all male students with those of all the female students. The results are shown in Table 4.5. The raw data percentage responses are very close to one another except on the "thermal" subscale. Perhaps the more vigorous school activity of the male students makes them less sensitive to thermal conditions. This subscale difference indicates a real difference at the .05 level. The "acoustic," "storage" and "utilities" subscales also show reliable differences according to the chi square calculations. Because the "thermal" subscale can probably be explained and the other significant differences are so small it appears defensible to accept the experimental hypothesis for the whole scale. Little differences between perceptions of male and female students were observed.

TABLE 4.5

Hypothesis V: Male Students vs Female Students

Percentages Responding Favorably

Scale	Males (Percentage)	Females (Percentage)	Significance
Spatial	65.09	65.24	not sig *
Visual	77.31	74.18	not sig *
Thermal	57.70	39.90	.05
Acoustic	63.55	68.85	.01
Aesthetic	57.59	58.60	not sig *
Safety	68.62	69.45	not sig *
Storage	48.66	47.54	.05
Utilities	68.78	72.54	.01
General	48.66	54.91	not sig *

* Non significance was determined on the basis of $p < .05$

To test the sixth hypothesis all students were classified according to their class: juniors, senior and institute students and compared according to classification. In general the raw data indicated differences in percentages of favorable responses to be less than ten percentage points. Of five of the comparisons these differences were found to be not significant. On the "aesthetic," "safety" and "utilities" subscales, significant differences were found. In general the seniors appeared to be less positive, particularly on those comparisons attaining levels of significance. Since the significance levels are mixed and since the raw data figures are somewhat spread, it is deemed advisable not to accept or reject the experimental hypothesis. It is concluded that while there are some real differences the results were observed to be so varied that the data would best be deemed inconclusive. The data are displayed in Table 4.6.

TABLE 4.6

Hypothesis VI: Juniors, Seniors and Institute Students

Percentages Responding Favorably

Scale	Juniors (Percent)	Seniors (Percent)	Institute (Percent)	Sig
Spatial	70.10	62.73	60.59	not sig *
Visual	79.71	75.86	73.50	not sig *
Thermal	58.67	55.90	46.26	not sig *
Acoustical	64.28	63.68	65.67	not sig *
Aesthetic	64.79	50.17	69.02	.01
Safety	71.78	65.50	73.41	.05
Storage	53.73	43.85	53.23	.001
Utilities	72.57	66.75	69.77	.001
General	54.84	43.77	57.08	not sig *

* Non significance was determined on the basis of $p < .05$

To test the seventh hypothesis, all faculties were classified as academic or vocational faculties and compared on that basis. The raw data indicates that each faculty group scored highest on five of the eleven subscales. On the "acoustic" subscale they were about equal. None of the comparisons achieved significance on the chi square calculations. Since no real differences are found, the experimental hypothesis is rejected. The results are summarized in Table 4.7.

TABLE 4.7

Hypothesis VII: Academic Faculty vs Vocational Faculty

Percentages Responding Favorably

Scale	Academic (Percentage)	Vocational (Percentage)	Significance
Spatial	67.31	65.70	not sig
Visual	68.85	76.31	not sig
Thermal	52.58	55.26	not sig
Acoustic	54.74	54.21	not sig
Aesthetic	76.29	68.42	not sig
Safety	79.68	77.63	not sig
Storage	51.43	63.15	not sig
Utilities	73.27	63.81	not sig
General	62.71	63.81	not sig
Audio-Visual	59.05	69.73	not sig
Vertical Inst. Surfaces	68.96	60.52	not sig

Non significance was determined on the basis of $p < .05$

CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

The problem of this study was to obtain data upon the perceptions of the physical environment of schools held by teachers and students in existing vocational facilities in the hope that this data would aid planners in the designing of efficient and pleasant vocational-technical school plants. While it is recognized that these perceptions do not actually tell what is right or wrong, they do indicate how successful these facilities are regarded by their prime users. It is an assumption of the writer that teachers and students will perform their roles better in facilities that are perceived as satisfactory to them.

Seven hypotheses were developed to be used to test the data collected. The first two hypotheses were of primary importance to this study and are restated below:

1. Students from the newer regional schools will view their schools more favorably than students from the older non regional schools.

2. Faculty from the newer regional schools will view their school more favorably than faculty from the older non regional schools.

The remaining five hypotheses were concerned with making intra-group comparisons in order to get a more refined eval-

uation of the data. These dealt with comparing the responses of students with faculties; students from different regional schools; male students with female students; juniors with seniors and graduate students; and finally, vocational with academic faculties. The tested data in the previous chapter appears to support the following conclusions.

Both students and faculty in the regional schools perceive their environment more favorably than their counterparts in the older schools on nearly all counts. The regional school students were considerably more favorable on all nine subscales according to the raw data. However, on two of these subscales the results failed to attain significance. These subscales were the thermal and the utilities subscales. Possibly because of the physical nature of much of the student activity, thermal conditions are not an important factor. In the case of the utilities subscale, it is possible that students are less sensitive to problems in this area than the faculty might be because the students are not critically concerned with utilities inadequacies. The teachers from the regional schools on the other hand were very much more postive on all accounts than their colleagues in the older schools. All subscales but one attained significance levels greater than .01 and the exception reached the .05 level.

As might be expected the differences on the aesthetic

subscale were very dramatic for both teachers and students, with the students showing the greatest divergence in these scores. The storage and spatial subscales also showed dramatic differences. The teachers only answered the audio-visual subscale but these were by far the most divergent scores again in favor of the regional schools. When one considers the overall scores as well as the individual subscale scores, the evidence appears overwhelming that the students and teachers in the regional schools view their school environments more favorably than their counterparts in the older non regional schools.

In the next comparison, the responses of the teachers in all schools were compared with those of the students in all schools. In six of the nine subscales, faculties were found to be more positive than students. In two of the three subscales in which the students were found to be more positive according to the raw data the results were not significant statistically. The evidence does appear to indicate that teachers' responses are usually somewhat more positive than those of students.

When the students of each of the regional schools were compared, no significant differences were found. According to the raw data, students responded most favorably to the spatial, visual, aesthetic and utilities subscales. They

reacted least favorably to the storage subscale indicating some displeasure there. School IV was consistently higher in its favorability score than the other schools. The scores on the various subscales across all the schools in general do not spread greatly and are relatively consistent, supporting the conclusion that there is little difference between the responses of the students in the various regional schools.

When the perceptions of male and female students were compared, little differences were observed. Differences were consistently small except for the thermal subscale. Possibly, the more vigorous activity of the male student made him less sensitive to thermal conditions. Otherwise, it can be assumed that male and female students appear to react about the same to their school environment.

On comparing the responses of juniors, seniors and institute students, significant differences were found in only four of the nine subscales. Seniors appeared to be somewhat less positive than their fellows in the other grades. The results observed were so varied and with no apparent pattern that the data would best be deemed inconclusive.

Little raw differences were observed when academic teachers and vocational teachers were compared and none of these differences was found significant. It appears there are no real differences in the perceptions between academic and

vocational faculties in regard to their school's physical environment.

The results of this study indicate that when the faculty and student groups are broken down into various sub-groups there is little or no significant differences observable among them. This finding suggests that the faculty and student responses are relatively stable and consistent, which in turn appears to indicate that these group responses are a reliable data source. When the responses of faculties and students of the regional schools are compared with their counterpart in the non regional schools the results strongly favored the regional schools. In general these results appear to indicate that when the school's physical environment is better, faculty and students will perceive these facilities to be more educationally satisfactory to them. Specifically, the results indicate that the Massachusetts regional vocational-technical schools are perceived to be more successful facilities than the older non regional schools by students and faculties.

Recommendation

While the tested statistical results were derived from the data collected from the questionnaires, there was a vast amount of relevant data accumulated from other sources. These sources included the experts noted in the preface, the related

literature reviewed and this writer's on-site observations of the schools in this study. Appropriately, these sources have enriched and tempered the scope of the recommendations this investigator makes here.

Caution must be observed lest one makes recommendations unwarranted by the data. In this study, the investigator realizes that he does not have all the data, that he is likely to be over influenced by his own findings and finally that his problem is a very complex one. With these considerations in mind, this writer will offer some suggestions, observations and reactions deduced from the sources and resources available to him. These are not to be accepted as inflexible recommendations but rather as a series of considerations which facility planners might find useful for further explorations of this type.

The author's data, tested and untested, concern a number of influences on education. Among these influences are the physical environment, the social and psychological settings, the theories of learning, the environmental - ecological settings as well as curricular and philosophical needs. It would be neat and convenient if recommendations and observations could be made in an orderly way under these separate headings but the observer soon realizes that each of these considerations are so entwined with the others that isolation of the

factors dilutes their impact by taking them out of context. Nevertheless, it does appear useful to identify these areas as, at least, a series of check points for the facility planners. It is also suggested that a very useful project might be to devise a check list of important issues to be considered in evaluating existing school facilities and in planning new ones. This check list might be similar to those now available from facility consultants and researchers but would go far beyond the bricks and mortar requirements of the purely physical environment and would place more emphasis on the social, psychological and spiritual values of the environment. The suggestions below represent some of the areas for consideration and some of the data this investigator derived from them. These notations are necessarily short burst summaries as the comprehensive discussions and documentations are included elsewhere in this paper.

One of the over arching considerations of this study is the concept that the physical environment is much more than shelter for the educational process. More and more experts are observing that the value of a building lies more in its merit as a social setting than as a provider of purely physical needs. The physical provisions for the comfort and safety of the occupants are also very important but these requirements are fairly well understood and provided for in

contemporary construction. Of course, the physical needs will not be met optimally until the social needs are also met. The philosophical considerations of the community and the physical design requirement for the curriculum were considered beyond the scope of this paper. However, these considerations must also be understood in the designing of any facility. It is suggested that these philosophical goals and curriculum design requirements could provide subjects for further investigations in the school facility area.

It is difficult to separate the psychological factors of education from the sociological ones as there is often an overlapping. The psychologist sees the meeting of social needs as basic to psychological well being. Educational psychologists recognize several concepts as making up a theory of learning. Among these principles are the following:

Social Needs
Readiness for Learning
Motivation
Attention and Learning
Retention and Learning
Activity and Learning
Multi-stimuli Effects
Fatigue and Learning
Incidental Learning
Transfer of Learning
Differences and Similarities
The Anomalous Student
Grouping

These psychological concepts have been well researched and theories have been developed from them. It is important to translate these theories into implications for facility

design. The review of the literature section of this paper, devoted considerable space to this problem. Also, the author's questionnaires contain items that attempt to determine how well these theory requirements are being met. It is recommended that facility planners consciously and systematically incorporate appropriate physical space provisions for these concepts of educational psychology into their school design.

Social needs were among the psychological concepts noted above. As the nation becomes more sensitive to solving the problems of all segments of the population, identifying and satisfying social needs becomes of paramount importance and the science of sociology becomes a vehicle for suggesting some of the necessary adjustments. The school is one of the major fronts of the social struggles. The image of the school and what it does and does not do has a tremendous impact on society. The present climate of the times is explosive even in education. We find strong, sometimes violent, reactions to such problems as the uncontrolled technology, the establishment with its alleged authoritarianism and little consideration for the individual, the alienation of youth and the generation gap, the urban issues, the problem of poverty amid affluence, the racial struggles, the disadvantaged and the destruction of the environment. These issues have spawned a new left and a reactionary extreme right which in turn are often given to violence and anarchy. These problems deal with

broader concepts than physical facilities, but these facilities are the social settings and therefore can do much to provide the physical environment where the larger social environment resides. In the review of the literature in this paper, much discussion was relevant to these issues and how good facility design might provide this optimal physical environment. It is recommended that facility planners review these social issues and pay particular attention to the new area of study, environmental design, while planning new facilities and evaluating existing ones.

In the final analysis, the facility planner can only express and realize his aims through physical property. He cannot cure all the social problems but he can provide the physical settings for solutions proposed by other experts, particularly in education. The writer would not wish to burden the reader with a total review of this paper at this point but he does deem it appropriate to make a few remarks about the tool of the planner, the physical property, which he, the planner, can manipulate. Flexibility and relevance are probably the most needed ideals to which educational facility planners should aspire. As some critics have noted, flexibility probably resides more in the mind than in moveable walls and the like. Flexibility starts with innovative and uncluttered thinking and may result in a systems approach to building or getting many and varied uses from the spaces pro-

vided. The old library must become a media center and provisions must be made for proven educational innovations and an attempt must be made not to guess what future developments will be, but rather to provide structures that will not inhibit those developments whatever they might be.

The idea of relevance is broader in scope. It means that planners must seek genuine reasons for incorporating every design feature to provide for the environmental needs of the users. The school should be a "friendly object" which provides for the psychological, environmental and sociological needs of the individual and those of his community as well as for those of society at large.

The school should be a place where each individual's identity is optimal, where he can have a feeling of worth and belonging. It should provide for the education of the whole person. It should serve the entire community with continuing education and should be responsive to the desire of the community to be involved in the decision-making. It should be part of the community and not a microcosm within it. With these provisions and the other suggested elsewhere in this paper, the school's physical environment could become a strong force in developing a better world for all.

In summary, it can be said that this study has provided a basic instrument, its questionnaire, that is capable of collecting useful data. The tested data has indicated that

where better facilities have been provided, faculty and students respond more favorably to their physical environment. It also appears to indicate that when students and faculties are broken down into various sub-groups, little differences appear in their perceptions of their physical environments. More important than the tested data results are the raw data gleaned from the literature and expert opinion reported in this study. The writer realizes that much of this data is untested and reactionary. Nevertheless, the problems indicated are so urgent that planners cannot wait for empirical evaluations before seeking relief. However, while immediate first aid is being applied, researchers could and should continue to isolate the variables and search out reliable data for decision-making in facility planning.

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APPENDIX A

STUDENT QUESTIONNAIRE

STUDENT QUESTIONNAIRE

This questionnaire is designed to provide information to help concerned people improve present and future Vocational-Technical School buildings. Since you are currently enrolled here, your answers are very important in providing this information and will be beneficial to all who will attend these facilities in the future.

The word facilities as used in this form includes the buildings and grounds.

Please fill in the following

Name of School.....

Male.....Female.....

Junior.....Senior.....Technical Institute.....

SPATIAL ENVIRONMENT

THE SPATIAL ENVIRONMENT CONCERNS THE USE OF SPACE

1. Do you have adequate space for recreation and/or athletics?..... yes no

2. Are you basically satisfied with the use of space within the building?..... yes no

3. Are receiving areas in or conveniently near the shops?..... yes no

4. Are the various areas in which you work located conveniently to one another?..... yes no (i.e. labs to lecture, demonstration areas, etc.)

5. Are there sufficient spaces for student activities?..... yes no (newspaper, clubs, etc...)

VISUAL ENVIRONMENT

THE VISUAL ENVIRONMENT CONCERNS THE LIGHT - SIGHT RELATIONSHIP

18. Do lighting fixtures produce glare?..... yes no

19. Is there special lighting for equipment in problem areas where necessary?..... yes no

20. If you have rooms with little or no window space it is oppressive to you?..... yes no

21. Can the natural lighting be easily controlled? yes no

22. Lighting is good in (all, some, no) work areas?..... circle one

23. Lighting is good in general?..... yes no

THERMAL ENVIRONMENT

THE THERMAL ENVIRONMENT CONCERNS ITSELF WITH TEMPERATURE AND HUMIDITY FACTORS

28. Is the general room temperature pleasant for your activity?

a. in no areas..... yes no
b. in most areas..... yes no
c. in all areas..... yes no

29. Do cold walls, floors or ceilings, seem to make the room feel cold?..... yes no

30. Does the ventilation system produce drafts?.. yes no

31. Is the ventilation satisfactory?..... yes no

ACOUSTICAL ENVIRONMENT

THE ACOUSTICAL ENVIRONMENT CONCERNS THE TRANSMITTAL AND CONTROL OF SOUND

36. Are there areas where sound cannot be heard adequately?..... yes no

Where if any?

37. Is noise a disturbing problem in this school? Circle one

a. always
b. sometimes
c. never

Identify specific noises if any:

38. Does the ventilation equipment operate quietly? yes no (i.e. air conditioning)

AESTHETIC ENVORONMENT

THE AESTHETIC ENVIRONMENT IS CONCERNED WITH THE VISUAL APPEARANCE OF THE FACILITY

42. The architectural style is:

a. ornate..... yes no
b. severe..... yes no
c. too modern..... yes no
d. quiet..... yes no
e. pleasant..... yes no
f. traditional..... yes no
g. contemporaty..... yes no
h. causes no reaction..... yes no

43. Does the style seem consistent with the activities of the school?..... yes no

44. Are the areas in which you work designed to function well for their purposes?..... yes no

45. Does the school have a pleasant setting?..... yes no

46. Does the color and texture used on the walls, ceilings, floor and equipment provide a pleasant atmosphere?..... yes no

47. Do you believe that too much emphasis was placed on the artistic design of the school?..... yes no

48. Would you resent an institutional appearance in your school?..... yes no

49. Do you feel the building might be more appropriate if it looked like an industrial facility?..... yes no

50. Was the appearance of your school building a factor in your decision to attend the school?..... yes no

51. Is the beauty of the building and grounds important to you?..... yes no

52. Do you feel the building is less beautiful than it might be?..... yes no

53. Does the exterior style of the architecture of your school generate pride in you?..... yes no

SAFETY PROVISIONS

54. Are fire extinguishers easily accessible?.... yes no

55. Does building empty quickly during fire drill? yes no

56. Are there adequate fire escapes?..... yes no
(exits, ladders or stairs)

57. Fire control provisions are: good bad indifferent

58. Does the general design of the facility provide for easy maintenance and clean up?... yes no

59. Are there adequate facilities for removing gases, odors, over-spray heat from work and dust from sanders, saws, etc?..... yes no

60. Floors are properly finished to prevent accidents from slipping and falling?..... yes no

61. Machines and other equipment are placed with safety in mind?..... yes no

62. Drinking fountains are placed so as not to be hazardous in passageways or traffic areas?..... yes no

63. Are there ample and safe parking areas?..... yes no

64. Busses can enter the grounds and unload safely?..... yes no

65. Are areas adequately lighted for safety?..... yes no

66. Electrical equipment is properly marked or identified where necessary?..... yes no

67. Electrical equipment is properly safeguarded? yes no

68. The First Aid Room(s) are convenient in location?..... yes no

69. Drinking fountains are adequate?..... yes no

70. Lavatories are adequate?..... yes no

MISCELLANEOUS SYSTEMS

STORAGE FACILITIES

71. Is there adequate storage for:

    a. reference material..... yes no
    b. portable tools and equipment..... yes no
    c. personal clothing and books..... yes no
    d. instrument storage..... yes no
    e. raw material storage..... yes no
    f. exhibition material..... yes no

72. Do storage areas provide for proper security against thefts and abuse?..... yes no

73. Is storage generally satisfactory throughout the school?..... yes no

74. Does junk seem to collect in certain areas?.. yes no

UTILITIES

75. Are there enough electrical outlets?..... yes no

76. Do you have a variety of voltage and phases for specific areas and tasks?..... yes no

77. Are there sufficient electrical outlets for other educational media?

    a. tape recorders..... yes no
    b. sound amplifier..... yes no
    c. special lighting..... yes no
    d. others..... yes no

78. Do you have enough sinks and water outlets where needed?..... yes no

79. Do you have enough air outlets where necessary? yes no

GENERAL

80. Is there a good intercom system throughout the school?..... yes no

81. Is projection equipment used often?..... yes no

82. How would you rate the following:
(circle one rating for each category)

a.	gymnasium.....	good	bad	indifferent
b.	gymnasium facilities...	good	bad	indifferent
c.	cafeteria.....	good	bad	indifferent
d.	auditorium.....	good	bad	indifferent
e.	library.....	good	bad	indifferent

83. How many times (approximately) did you use the library last semester?..... times

84. Does the general design of the school help in your education and training?..... yes no

85. I find this school building to be: check appropriate responses

gay	friendly
humanly warm	inviting
humanly cold	informal
efficient	not threatening
business-like	unfinished
over-powering	colorful
beautiful	changeable
pleasant	orderly
well-kept	shabby
natural	uninspiring
stimulating	institutional

86. I consider this total school facility (circle one)

good bad indifferent

APPENDIX B

FACULTY QUESTIONNAIRE

FACULTY QUESTIONNAIRE

This questionnaire is seeking information to be of assistance in the improvement of the physical plant of Vocational-Technical Schools. Your answers are important to this study and will benefit all occupants of these facilities in the future.

The word facilities as used in this form includes the buildings and grounds.

Please fill in the following:

Name of your School .....

Location.....

Your sex: Male.....Female.....

Subject you teach.....

Grade level you teach: Junior.....Senior.....Tech Institute....

Number of years you have been teaching:.....

Have you taught in another School: Yes.....No.....

SPATIAL ENVIRONMENT

THE SPATIAL ENVIRONMENT CONCERNS THE USE OF SPACE

1. Do you have adequate space for recreation and/or athletics?..... yes no

2. Are you basically satisfied with the use of space within the building?..... yes no

3. Are receiving areas in or conveniently near the shops?..... yes no

4. Are the various areas in which you work located conveniently to one another?..... yes no
(i.e. labs to lecture, demonstration areas, etc.)

5. Are there sufficient spaces for student activities?..... yes no
(newspaper, clubs, etc.)

6. Faculty rooms are.....good bad indifferent

   a. Was the faculty room planned to be a faculty room..... yes no

   b. Have you lost your original faculty room to other uses..... yes no

7. Could most instructional areas be easily adapted for new uses in the future?..... yes no

8. Are the instructional areas enough for the activity of that area?..... yes no

9. Are working spaces sufficient for the size of the classes?..... yes no

10. Are shop surfaces basically flexible?..... yes no
(i.e. can floor and bench surfaces be used for a variety of purposes)

11. Is most of the enclosed space available for educational purposes?..... yes no
(ex. Is space wasted on corridors, etc.)

12. Are the areas where projection equipment is used, suitable for that purpose?..... yes no
(i.e. dark enough)

13. Much of your training comes under three headings: reaction, interaction and action. That is one reacts to lectures; one interacts in small groups and in seminar discussions and one acts when he personally works with a problem.
Are the requirements of these three types of activities adequately served by the design of the instructional areas?..... yes no

Comment if any:

15. Are display areas adequate?..... yes no

16. Would the building permit team teaching?..... yes no

17. Does the total facility seem to fit the educational requirements well?..... yes no

VISUAL ENVIRONMENT

THE VISUAL ENVIRONMENT CONCERNS THE LIGHT - SIGHT RELATIONSHIP

18. Do lighting fixtures produce glare?..... yes no

19. Is there special lighting for equipment in problem areas where necessary?..... yes no

20. If you have rooms with little or no window space is it oppressive to you?..... yes no

21. Can the natural lighting be easily controlled? yes no

22. Lighting is good in (all, some, no) work areas?..... circle one

23. Lighting is good in general?..... yes no

24. Do wall and ceiling colors aid in the distribution of light?..... yes no

25. Do lighting provisions remain good when moveable walls are changed?..... yes no

26. Are electrical switching arrangements satisfactory for a variety of lighting patterns needed for various tasks?..... yes no

27. Can the natural lighting be controlled without upsetting ventilation?..... yes no

THERMAL ENVIRONMENT

THE THERMAL ENVIRONMENT CONCERNS ITSELF WITH TEMPERATURE AND HUMIDITY FACTORS

28. Is the general room temperature pleasant for your activity?

a. in no areas..... yes no
b. in most areas..... yes no
c. in all areas..... yes no

29. Do cold walls, floors or ceilings seem to make the room feel cold?..... yes no

30. Does the ventilation system produce drafts?.. yes no

31. Is the ventilation satisfactory?..... yes no

32. Does the ventilator system produce adequate amounts of fresh air?..... yes no

33. Can heating and ventilating systems be controlled?

a. by teachers..... yes no
b. by janitor..... yes no

34. Does the ventilator operate only when needed? yes no

35. Is the humidity at a proper level for your comfort?..... yes no

ACOUSTICAL ENVIRONMENT

THE ACOUSTICAL ENVIRONMENT CONCERNS THE TRANSMITTAL AND CONTROL OF SOUND

36. Are there areas where sound cannot be heard adequately?..... yes no

Where if any?

37. Is noise a disturbing problem in this school? (circle one)

a. always
b. sometimes
c. never

Identify specific noises if any:

38. Does the ventilation equipment operate quietly?..... yes no (i.e. air conditioning)

39. The acoustical design elements (i.e. sound absorbing or deflecting materials and structures) are not over obvious?..... yes no

40. Interior surfaces are acoustically satisfactory?..... yes no (i.e. they control sound adequately)

41. Does the acoustical design work well enough to permit full use of adjacent open areas?..... yes no

AESTHETIC ENVIRONMENT

THE AESTHETIC ENVIRONMENT IS CONCERNED WITH THE VISUAL APPEARANCE OF THE FACILITY

42. The architectural style is:

a.	ornate.....	yes	no
b.	severe.....	yes	no
c.	too modern.....	yes	no
d.	quiet.....	yes	no
e.	pleasant.....	yes	no
f.	traditional.....	yes	no
g.	contemporary.....	yes	no
h.	causes no reaction.....	yes	no

43. Does the style seem consistent with the activities of the school?..... yes no

44. Are the areas in which you work designed to function well for their purposes?..... yes no

45. Does the school have a pleasant setting?..... yes no

46. Does the color and texture used on the walls, ceilings, floor and equipment provide a pleasant atmosphere?..... yes no

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49. Do you feel the building might be more appropriate if it looked like an industrial facility?..... yes no

50. Was the appearance of your school building a factor in your decision to attend the school?..... yes no

51. Is the beauty of the building and grounds important to you?..... yes no

52. Do you feel the building is less beautiful than it might be?..... yes no

53. Does the exterior style of the architecture of your school generate pride in you?..... yes no

SAFETY PROVISIONS

54. Are fire extinguishers easily accessible?.... yes no

55. Does building empty quickly during fire drill? yes no

56. Are there adequate fire escapes?..... yes no
(exits, ladders or stairs)

57. Fire control provisions are: good bad indifferent

58. Does the general design of the facility provide for easy maintenance and clean up?... yes no

59. Are there adequate facilities for removing gases, odors, over-spray heat from work and dust from sanders, saws, etc?..... yes no

60. Floors are properly finished to prevent accidents from slipping and falling?..... yes no

61. Machines and other equipment are placed with safety in mind?..... yes no

62. Drinking fountains are placed so as not to be hazardous in passageways or traffic areas?..... yes no

63. Are there ample and safe parking areas?..... yes no

64. Busses can enter the grounds and unload safely?..... yes no

65. Are areas adequately lighted for safety?..... yes no

66. Electrical equipment is properly marked or identified where necessary?..... yes no

67. Electrical equipment is properly safeguarded? yes no

68. The First Aid Room(s) are convenient in location?..... yes no

69. Drinking fountains are adequate?..... yes no

70. Lavatories are adequate?..... yes no

MISCELLANEOUS SYSTEMS

STORAGE FACILITIES

71. Is there adequate storage for:

    a. reference material..... yes no
    b. portable tools and equipment..... yes no
    c. personal clothing and books..... yes no
    d. instrument storage..... yes no
    e. raw material storage..... yes no
    f. exhibition material..... yes no

72. Do storage areas provide for proper security against thefts and abuse?..... yes no

73. Is storage generally satisfactory throughout the school?..... yes no

74. Does junk seem to collect in certain areas?.. yes no

UTILITIES

75. Are there enough electrical outlets?..... yes no

76. Do you have a variety of voltage and phases for specific areas and tasks?..... yes no

77. Are there sufficient electrical outlets for other educational media?

    a. tape recorders..... yes no
    b. sound amplifier..... yes no
    c. special lighting..... yes no
    d. others..... yes no

78. Do you have enough sinks and water outlets where needed?..... yes no

79. Do you have enough air outlets where necessary? yes no

GENERAL

80. Is there a good intercom system throughout the school?..... yes no

81. Is projection equipment used often?..... yes no

82. How would you rate the following:
(circle one rating for each category)

a.	gymnasium.....	good	bad	indifferent
b.	gymnasium facilities...	good	bad	indifferent
c.	cafeteria.....	good	bad	indifferent
d.	auditorium.....	good	bad	indifferent
e.	library.....	good	bad	indifferent

83. How many times (approximately) did you use the library last semester?..... times

84. Does the general design of the school help in your education and training?..... yes no

85. I find this school building to be: check appropriate responses

gay	friendly
humanly warm	inviting
humanly cold	informal
efficient	not threatening
business-like	unfinished
over-powering	colorful
beautiful	changeable
pleasant	orderly
well-kept	shabby
natural	uninspiring
stimulating	institutional

86. I consider this total school facility
(circle one)

good bad indifferent

AUDIO VISUAL

87. Are the instructional TV outlets in most areas and rooms where they might possibly be used now or in the future?..... yes no

88. In general, there are provisions for a variety of audio visual media?..... yes no

VERTICAL INSTRUCTIONAL SURFACES

89. In your working areas do you have sufficient provisions of:

a.	chalkboards - wall-mounted.....	yes	no
b.	chalkboards - portable.....	yes	no
c.	tack boards and bulletin boards.....	yes	no
d.	display or exhibition space.....	yes	no
e.	peg board.....	yes	no
f.	projection screens.....	yes	no

90. Are tack boards used as much as possible?.... yes no

91. Are walls used for educational purposes as much as they might be?..... yes no
(i.e. for displays, posters, bookcases, etc.)

APPENDIX C

SUPERINTENDENT-DIRECTOR'S INQUIRY FORM

THE COMMONWEALTH OF MASSACHUSETTS

DEPARTMENT OF EDUCATION

RESEARCH COORDINATING UNIT

Superintendent-Director's Inquiry Form

for

The Massachusetts Regional Vocational-Technical School Construction Study

ADMINISTRATIVE

1. Did you build the school?..... yes no

2. Were you essentially in charge of the planning from its inception?..... yes no

3. Were you appointed before the educational specifications were developed?..... yes no

4. Were the educational specifications developed under your directions?..... yes no

5. Were you appointed in time to be involved with the selection of an architect?..... yes no

6. Who was the construction engineer?.....

7. Was there a clerk of the works engaged on the building project?..... yes no

   a. Who appointed him?.....

   b. What was his name and/or company?.....

   .....

8. Do you believe it is very necessary for the superintendent-director to be appointed before planning begins?..... yes no

9. What was the cost of the building(s) per square foot (not including the site)?.....

10. What was tht total cost of the facility?..... (not including machinery and equipment)

11. What was the cost of the site?.....

12. What was the cost of the site development?.....

13. What was the cost of the building with machines and equipment?.....

14. What was the cost of the building(s) per square foot?.....

15. What was the cost per pupil at full enrollment?.....

16. What was the cost of the heating plant?.....

    a. What type is it?.....

    b. What type of boiler is used?.....

17. What was the heating costs for the '68 - '69 season?.....

18. What is your total enrollment at capacity?.....

19. What was the cost of electrical power for the '68 - '69 year?.....

    a. Cost for lighting?.....

    b. Cost of electricity other than lighting?.....

20. How many custodians are employed?.....

DESIGN

21. Does the structural design of the building permit large, open spans?.....yes no (50 feet or more)

22. Are most of the partitions between educational areas non-bearing?..... yes no

23. Space divisions within the exterior shell of the building result from..... partitions? (check appropriate types below)

    a. demountable
    b. moveable
    c. freestanding
    d. removeable

24. Do you accept the concept of windowless classrooms?..... yes no

    a. Do you have any such areas?..... yes no

    b. Are you satisfied with the results in them?..... yes no

25. Do you have a separate auditorium not included in the cafeteria?..... yes no

26. Do you think a separate auditorium is necessary?..... yes no

27. Does the facility provide for community use? (check appropriate areas planned for community use)

    a. in classrooms

    b. in auditorium

    c. cafetorium

    d. other.....name them

28. Was the site location an important factor aesthetically?..... yes no

29. Is there a special exhibition area for the use of the whole school?..... yes no (in the entrance or foyer for example)

30. If not would you like to have an exhibition area?..... yes no

31. Should not the building relate in style and environment to the sort of facility in which the student will eventually work?.. yes no

32. Is it important that your school does <u>not</u> look like an industrial facility?..... yes no

33. Is there a built-in vacuum system for cleaning?..... yes no

34. Lighting Types

    a. Which type of lighting do you prefer? incandescent

       flourescent

    b. Would you prefer a balanced arrangement of both types?..... yes no

    Comments if any:

35. Are acoustical materials or design techniques used to control sound?..... yes no

36. Was sound absorbing concrete and/or sound absorbing concrete blocks used in the construction?..... yes no

37. Are ceilings treated for sound control?..... yes no
(i.e. acoustical tile, sound baffles, etc.)

38. Is carpeting used to reduce noise where possible?..... yes no
(library, offices, etc.)

39. What flooring surfaces are used throughout the building. Please indicate the approximate percentage of each used in the table below:

	In Total Building	Shop Area	Other Instructional Areas
concrete	.....%	.....%	.....%
terrazzo	.....%	.....%	.....%
asphalt tile	.....%	.....%	.....%
rubber tile	.....%	.....%	.....%
cork tile	.....%	.....%	.....%
vinyl tile	.....%	.....%	.....%
ceramic tile	.....%	.....%	.....%
carpet	.....%	.....%	.....%
wood	.....%	.....%	.....%
stone	.....%	.....%	.....%
other (specify)	.....%	.....%	.....%

40. Do you have a faculty lounge?..... yes no

41. Was it planned to be a faculty lounge?..... yes no

42. Do you find it adequate?..... yes no

Any comments?

AUDIO-VISUAL

43. Does the audio-visual room have a physical connection with the library?..... yes no

44. Does the audio-visual department serve in conjunction with the library?..... yes no

45. Do you have provisions for closed circuit television?..... yes no

Is it already in use?..... yes no

a. fully (check one)
b. partially

46. Has cable vision been considered?..... yes no

47. Does your school have a specific area for faculty use in the production of visual aids or other educational materials?..... yes no

a. Does it have: (check the appropriate)

typewriters
copy machine
mimeograph machine(s)
dark room
slide copier(s)
provisions for making slides
overhead projectors
tape recorders
phonographs

b. This room is: (check the appropriate)

near the audio-visual room
not near the audio-visual room
in the audio-visual room
connected to the audio-visual room

48. What should this publication contain in order to:

a. help you in future planning

Comment:

b. help a new Superintendent-Director in his planning for a new facility:

Comment:

SUPERINTENDENT MISCELLANEOUS

49. Were the following local agencies involved in the planning? (check the appropriate)

a. City planner..... yes no
b. Libraries (local)..... yes no
c. Park Commissioner..... yes no
d. Police..... yes no

50. Student Projections:

a. were arrived at in the usual way?..... yes no
b. a special method has to be designed because of the unique requirements?... yes no

51. Do you feel a beautiful, non-institutional looking school is necessary to produce a good environment that will enhance the students' self respect?..... yes no

52. What is the percentage of male students in your student body?

a. institute.....%

b. high school.....%

53. Do you have team teaching now?..... yes no

Any comment:

a. do you plan for it in the future?..... yes no
b. are there specific facilities provided for it?..... yes no

Any comment:

54. Do you see the ungraded system as a possibility in your school?..... yes no

If so, are you using it?..... yes no

Any comment:

55. Do you use the auditorium as a teaching station?..... yes no
For what classes or activities?
(Name them)

56. What is the size of the average class?.....

a. at the High School level?.....
b. at the Technical Institute level?.....

57. The school is preparing students for employment (check the appropriate)

a. within the district..... yes no
b. within the State..... yes no
c. nationally..... yes no

58. Do you feel the school is actually meeting:

a. local needs..... yes no
b. State needs..... yes no
c. National needs..... yes no

59. Who decides what is taught other than State and Federal agencies?
(check the appropriate)

a. Superintendent-Director
b. School Committee
c. Advisory Board
d. other.....name them

60. Does the presence of female students have a negative effect on the program for the male students?..... yes no

61. What percentage of the student body is in the Technical-Institute?.....%

62. Are committees at work studying the future educational requirements needed to prepare your students for the employment needs of tomorrow?..... yes no

63. Are faculty members consulted concerning future facility planning?..... yes no

64. Is the student body consulted concerning future facility planning?..... yes no

65. Are others concerned in the planning?..... yes no
(Please name them)

66. Are the areas in which your staff and students work, conveniently located to the other related areas?..... yes no

67. Does the two week shop-classroom cycle force you into a difficult timing situation?..... yes no

68. Is the Audio-Visual office satisfactory in regard to:

a. size of collection of equipment..... yes no
b. location in school..... yes no
c. convenient for your use..... yes no

any comment:

69. Are you satisfied with the traffic flow within the building?..... yes no

70. Is the library important to your students in accomplishing faculty assignments?..... yes no

71. Does the related classroom have to be adjacent or near the shops?..... yes no

72. Do you receive complaints concerning the location of the school from:

a. parents..... yes no
b. teachers..... yes no
c. students..... yes no
d. other staff members..... yes no

EXPANDIBILITY

73. The site is adequate for expansion in:

a. size..... yes no
b. utilization..... yes no

74. Provisions were made for expansion in the following utilities:

	by location	by stub out	by sizing
plumbing.....	.....	.....	.....
electrical systems.....	.....	.....	.....
heating.....	.....	.....	.....

75. Corridors continue to outside walls?..... yes no

76. Essential window walls are not present in areas where expansion might take place?.. yes no

77. Entrances and exists would not be eliminated by expansion?..... yes no

78. Piercing a wall for expansion will not seriously effect the structural system?..... yes no

APPENDIX D

TABLES OF CHI SQUARE VALUES

STUDENT RESPONSES

REGIONAL vs TRADITIONAL SCHOOLS

Table A.1 Spatial Subscale: Student Responses: Regional vs Traditional Schools

Comparison	Yes	No Response	No	Σ
Regional	227 (210.83)	3 (2.15)	97 (114.02)	327
Traditional	67 (83.17)	0 (.85)	62 (44.98)	129
Σ	294	3	159	456

(Numbers in parentheses are expected frequencies)

Table A.1A Chi Square Values for Table A.1

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
227	210.83	$\frac{261.46}{210.83}$	1.240	3	2.15	$\frac{.72}{2.15}$	.336	97	114.02	$\frac{289.68}{114.02}$	2.540
67	83.17	$\frac{261.46}{83.17}$	3.143	0	.85	$\frac{.72}{.85}$	.850	62	44.98	$\frac{289.68}{44.98}$	6.440
Σ			4.383				1.186				8.980

$\Sigma X^2 =$ 14.549 significant at .001

Table A.2 Visual Subscale: Student Responses: Regional vs Traditional Schools

Comparison	Yes	No Response	No	Σ
Regional	268 (257.26)	4.50 (3.94)	54.50 (65.80)	327
Traditional	90.75 (101.49)	1 (1.56)	37.25 (25.95)	129
Σ	358.75	5.50	91.75	456

(Numbers in parentheses are expected frequencies)

Table A.2A Chi Square Values for Table A.2

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
268	257.26	$\frac{115.34}{257.26}$	.448	4.50	3.94	$\frac{.31}{3.94}$	.079	54.50	65.80	$\frac{127.69}{65.80}$	1.940
90.75	101.49	$\frac{115.34}{101.49}$	1.136	1	1.56	$\frac{.31}{1.56}$	.201	37.25	25.95	$\frac{127.69}{25.95}$	4.920
Σ			1.584				.280				6.860

$\Sigma X^2 =$ 8.724 significant at .05

Table A.3 Thermal Subscale: Student Responses: Regional vs Traditional Schools

Comparison	Yes	No Response	No	Σ
Regional	197.66 (189.55)	2.67 (4.07)	126.67 (133.38)	327
Traditional	66.67 (74.78)	3 (1.60)	59.33 (52.62)	129
Σ	264.33	5.67	186	456

(Numbers in parentheses are expected frequencies)

Table A.3A Chi Square Values for Table A.3

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
197.66	189.55	$\frac{65.77}{189.55}$	.346	2.67	4.07	$\frac{1.96}{4.07}$	.481	126.67	133.38	$\frac{45.02}{133.38}$	.337
66.67	74.78	$\frac{65.77}{74.78}$	.879	3	1.60	$\frac{1.96}{1.60}$	1.225	59.33	52.62	$\frac{45.02}{52.62}$	.855
Σ			1.225				1.706				1.192

$\Sigma X^2 = 4.123$ not significant

Table A.4 Acoustic Subscale: Student Responses: Regional vs Traditional Schools

Comparison	Yes	No Response	No	Σ
Regional	207 (204.38)	2.50 (7.17)	117.50 (115.45)	327
Traditional	78 (80.62)	7.50 (2.83)	43.50 (45.55)	129
Σ	285	10	161	456

(Numbers in parentheses are expected frequencies)

Table A.4A Chi Square Values for Table A.4

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
207	204.38	$\frac{6.86}{204.38}$	.033	2.50	7.17	$\frac{21.80}{7.17}$	3.041	117.50	115.45	$\frac{4.20}{115.45}$	.036
78	80.62	$\frac{6.86}{80.62}$	.085	7.50	2.83	$\frac{21.80}{2.83}$	7.706	43.50	45.55	$\frac{4.20}{45.55}$	.092
Σ			.118				10.747				.128

$\Sigma X^2 = 10.993$ significant at .01

Table A.5 Aesthetic Subscale: Student Responses: Regional vs Traditional Schools

Comparison	Yes	No Response	No	Σ
Regional	224.75 (187.70)	2.25 (3.05)	100 (136.25)	327
Traditional	37 (74.05)	2 (1.20)	90 (53.75)	129
Σ	261.75	4.25	190	456

(Numbers in parentheses are expected frequencies)

Table A.5A Chi Square Values for Table A.5

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
224.75	187.70	$\frac{1372.70}{187.70}$	7.313	2.25	3.05	$\frac{.64}{3.05}$	.209	100	136.25	$\frac{1314.06}{136.25}$	9.644
37	74.05	$\frac{1372.70}{74.05}$	18.537	2	1.20	$\frac{.64}{1.20}$	.533	90	53.75	$\frac{1314.06}{53.75}$	24.447
Σ			25.850				.742				34.091

$\Sigma X^2 = 60.683$ significant at .001

Table A.6 Safety Subscale: Student Responses: Regional vs Traditional Schools

Comparison	Yes	No Response	No	Σ
Regional	238.13 (227.42)	3.56 (3.72)	85.31 (95.86)	327
Traditional	79 (89.71)	1.63 (1.47)	48.37 (37.82)	129
Σ	317.13	5.19	133.68	456

(Numbers in parentheses are expected frequencies)

Table A.6A Chi Square Values for Table A.6

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
238.13	227.42	$\frac{114.70}{227.42}$	.504	3.56	3.72	$\frac{.02}{3.72}$	.006	85.31	95.86	$\frac{111.30}{95.86}$	1.161
79	89.71	$\frac{114.70}{89.71}$	1.278	1.63	1.47	$\frac{.02}{1.47}$	.017	48.37	37.82	$\frac{111.30}{37.82}$	2.942
Σ			1.782				.023				4.103

$\Sigma X^2 =$ 5.908 significant at .05

Table A.7 Storage Subscale: Student Responses: Regional vs Traditional Schools

Comparison	Yes	No Response	No	Σ
Regional	176.67 (155.37)	3.67 (3.35)	146.66 (168.28)	327
Traditional	40 (61.30)	1 (1.32)	88 (66.38)	129
Σ	216.67	4.67	234.66	456

(Numbers in parentheses are expected frequencies)

Table A.7A Chi Square Values for Table A.7

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
176.67	155.37	$\frac{453.69}{155.37}$	2.920	3.67	3.35	$\frac{.10}{3.35}$	.030	146.66	168.28	$\frac{467.42}{168.28}$	2.777
40	61.30	$\frac{453.69}{61.30}$	7.401	1	1.32	$\frac{.10}{1.32}$	.077	88	66.38	$\frac{467.42}{66.38}$	7.041
Σ			10.321				.107				9.818

$\Sigma X^2 = 20.246$ significant at .001

Table A.8 Utilities Subscale: Student Responses: Regional vs Traditional Schools

Comparison	Yes	No Response	No	Σ
Regional	239.25 (230.19)	6.75 (6.45)	81 (90.36)	327
Traditional	81.75 (90.81)	2.25 (2.55)	45 (35.64)	129
Σ	321	9	126	456

(Numbers in parentheses are expected frequencies)

Table A.8A Chi Square Values for Table A.8

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
239.25	230.19	$\frac{82.08}{230.19}$	.356	6.75	6.45	$\frac{.09}{6.45}$	.013	81	90.36	$\frac{87.60}{90.36}$	.969
81.75	90.81	$\frac{82.08}{90.81}$	.903	2.25	2.55	$\frac{.09}{2.55}$	.035	45	35.64	$\frac{87.60}{35.64}$	2.458
Σ			1.259				.048				3.427

$\Sigma X^2 =$ 4.734 not significant

Table A.9 General Subscale: Student Responses: Regional vs Traditional Schools

Comparison	Yes	No Response	No	Σ
Regional	183 (159.02)	31.75 (32.09)	112.25 (135.89)	327
Traditional	38.75 (62.73)	13 (12.66)	77.25 (53.61)	129
Σ	221.75	44.75	189.50	456

(Numbers in parentheses are expected frequencies)

Table A.9A Chi Square Values for Table A.9

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
183	159.02	$\frac{575.04}{159.02}$	3.616	31.75	32.09	$\frac{.11}{32.09}$	.003	112.25	135.89	$\frac{558.84}{135.89}$	4.112
38.75	62.73	$\frac{575.04}{62.73}$	9.166	13	12.66	$\frac{.11}{12.66}$	.009	77.25	53.61	$\frac{558.84}{53.61}$	10.424
Σ			12.782				.012				14.536

$\Sigma X^2 =$ 27.330 significant at .001

FACULTY RESPONSES

REGIONAL vs TRADITIONAL SCHOOLS

Table A.10 Spatial Subscale: Faculty Responses: Regional vs Traditional Schools

Comparison	Yes	No Response	No	Σ
Regional	82.61 (73.62)	4.85 (4.18)	22.54 (32.20)	110
Traditional	20.46 (29.45)	1 (1.67)	22.54 (12.88)	44
Σ	103.07	5.85	45.08	154

(Numbers in parentheses are expected frequencies)

Table A.10A Chi Square Values for Table A.10

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
82.61	73.62	$\frac{80.82}{73.62}$	1.097	4.85	4.18	$\frac{.44}{4.18}$	.107	22.54	32.20	$\frac{93.31}{32.20}$	2.898
20.46	29.45	$\frac{80.82}{29.45}$	2.744	1	1.67	$\frac{.44}{1.67}$	.268	22.54	12.88	$\frac{93.31}{12.88}$	7.245
Σ			3.841				.375				10.143

$\Sigma X^2 = 14.359$ significant at .001

Table A.11 Visual Subscale: Faculty Responses: Regional vs Traditional Schools

Comparison	Yes	No Response	No	Σ
Regional	85.13 (77.77)	9.37 (10.09)	15.50 (22.14)	110
Traditional	23.75 (31.11)	4.75 (4.03)	15.50 (8.86)	44
Σ	108.88	14.12	31	154

(Numbers in parentheses are expected frequencies)

Table A.11A Chi Square Values for Table A.11

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
85.13	77.77	$\frac{54.16}{77.77}$	.696	9.37	10.09	$\frac{.51}{10.09}$	.051	15.50	22.14	$\frac{44.08}{22.14}$	1.991
23.75	31.11	$\frac{54.16}{31.11}$	1.741	4.75	4.03	$\frac{.51}{4.03}$	.128	15.50	8.86	$\frac{44.08}{8.86}$	4.976
Σ			2.437				.179				6.967

$\Sigma X^2 =$ 9.583 significant at .01

Table A.12 Thermal Subscale: Faculty Responses: Regional vs Traditional Schools

Comparison	Yes	No Response	No	Σ
Regional	67.33 (58.58)	5.50 (7.50)	37.17 (43.92)	110
Traditional	14.67 (23.42)	5 (3)	24.33 (17.58)	44
Σ	82	10.50	61.50	154

(Numbers in parentheses are expected frequencies)

Table A.12A Chi Square Values for Table A.12

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
67.33	58.58	$\frac{76.56}{58.58}$	1.306	5.50	7.50	$\frac{4}{7.50}$	.533	37.17	43.92	$\frac{45.56}{43.92}$	1.037
14.67	23.42	$\frac{76.56}{23.42}$	3.269	5	3	$\frac{4}{3}$	1.333	24.33	17.58	$\frac{45.56}{17.58}$	2.591
Σ			4.575				1.866				3.628

$\Sigma X^2 =$ 10.069 significant at .01

Table A.13 Acoustical Subscale: Faculty Responses: Regional vs Traditional Schools

Comparison	Yes	No Response	No	Σ
Regional	70 (60)	7.40 (9.29)	32.60 (40.71)	110
Traditional	14 (24)	5.60 (3.71)	24.40 (16.29)	44
Σ	84	13	57	154

(Numbers in parentheses are expected frequencies)

Table A.13A Chi Square Values for Table A.13

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
70	60	$\frac{100}{60}$	1.666	7.40	9.29	$\frac{3.57}{9.29}$	.384	32.60	40.71	$\frac{65.77}{40.71}$	1.615
14	24	$\frac{100}{24}$	4.166	5.60	3.71	$\frac{3.57}{3.71}$	.962	24.40	16.29	$\frac{65.77}{16.29}$	4.037
Σ			5.832				1.346				5.652

$\Sigma X^2 = 12.830$ significant at .01

Table A.14 Aesthetic Subscale: Faculty Responses: Regional vs Traditional Schools

Comparison	Yes	No Response	No	Σ
Regional	98.75 (81.61)	1 (2.32)	10.25 (26.07)	110
Traditional	15.50 (32.64)	2.25 (.93)	26.25 (10.43)	44
Σ	114.25	3.25	36.50	154

(Numbers in parentheses are expected frequencies)

Table A.14A Chi Square Values for Table A.14

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
98.75	81.61	$\frac{293.77}{81.61}$	3.599	1	2.32	$\frac{1.74}{2.32}$	.751	10.25	26.07	$\frac{250.27}{26.07}$	9.600
15.50	32.64	$\frac{293.77}{32.64}$	9.000	2.25	.93	$\frac{1.74}{.93}$	1.873	26.25	10.43	$\frac{250.27}{10.43}$	23.995
Σ			12.599				2.624				33.595

$\Sigma X^2 = 48.818$ significant at .001

Table A.15 Safety Subscale: Faculty Responses: Regional vs Traditional Schools

Comparison	Yes	No Response	No	Σ
Regional	95.43 (87.09)	3.63 (4.02)	10.94 (18.89)	110
Traditional	26.50 (34.84)	2 (1.61)	15.50 (7.55)	44
Σ	121.93	5.63	26.44	154

(Numbers in parentheses are expected frequencies)

Table A.15A Chi Square Values for Table A.15

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
95.43	87.09	$\frac{69.55}{87.09}$	.798	3.63	4.02	$\frac{.15}{4.02}$	.037	10.94	18.89	$\frac{63.20}{18.89}$	3.345
26.50	34.84	$\frac{69.55}{34.84}$	1.996	2	1.61	$\frac{.15}{1.61}$	.094	15.50	7.55	$\frac{63.20}{7.55}$	8.371
Σ			2.794				.131				11.716

$\Sigma X^2 =$ 14.641 significant at .001

Table A.16 Storage Subscale: Faculty Responses: Regional vs Traditional Schools

Comparison	Yes	No Response	No	Σ
Regional	71.33 (59.76)	6.67 (6.67)	32 (43.57)	110
Traditional	12.33 (23.90)	2.67 (2.67)	29 (17.43)	44
Σ	83.66	9.34	61	154

(Numbers in parentheses are expected frequencies)

Table A.16A Chi Square Values for Table A.16

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
71.33	59.76	$\frac{133.86}{59.76}$	2.240	6.67	6.67	$\frac{0}{6.67}$	0	32	43.57	$\frac{133.86}{43.57}$	3.072
12.33	23.90	$\frac{133.86}{23.90}$	5.601	2.67	2.67	$\frac{0}{2.67}$	0	29	17.43	$\frac{133.86}{17.43}$	7.680
Σ			7.841				0				10.752

$\Sigma X^2 = 18.593$ significant at .001

Table A.17 Utilities Subscale: Faculty Responses: Regional vs Traditional Schools

Comparison	Yes	No Response	No	Σ
Regional	84.75 (78.04)	9 (8.04)	16.25 (23.92)	110
Traditional	24.50 (31.21)	2.25 (3.21)	17.25 (9.58)	44
Σ	109.25	11.25	33.50	154

(Numbers in parentheses are expected frequencies)

Table A.17A Chi Square Values for Table A.17

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
84.75	78.04	$\frac{45.02}{78.04}$	.576	9	8.04	$\frac{.92}{8.04}$	.114	16.25	23.92	$\frac{58.82}{23.92}$	2.459
24.50	31.21	$\frac{45.02}{31.21}$	1.442	2.25	3.21	$\frac{.92}{3.21}$	.287	17.25	9.58	$\frac{58.82}{9.58}$	6.140
Σ			2.018				.401				8.599

$\Sigma X^2 =$ 11.018 significant at .01

Table A.18 General Subscale: Faculty Responses: Regional vs Traditional Schools

Comparison	Yes	No Response	No	Σ
Regional	82.75 (69.29)	2.25 (2.50)	25 (38.21)	110
Traditional	14.25 (27.71)	1.25 (1)	28.50 (15.29)	44
Σ	97	3.50	53.50	154

(Numbers in parentheses are expected frequencies)

Table A.18A Chi Square Values for Table A.18

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
82.75	69.29	$\frac{181.17}{69.29}$	2.614	2.25	2.50	$\frac{.06}{2.50}$	.025	25	38.21	$\frac{174.50}{38.21}$	4.566
14.25	27.71	$\frac{181.17}{27.71}$	6.538	1.25	1	$\frac{.06}{1}$	.062	28.50	15.29	$\frac{174.50}{15.29}$	11.412
Σ			9.152				.087				15.978

$\Sigma X^2 = 25.217$ significant at .001

Table A.19 Audio-Visual Subscale: Faculty Responses: Regional vs Traditional Schools

Comparison	Yes	No Response	No	Σ
Regional	87.50 (67.86)	9 (10.36)	13.50 (31.78)	110
Traditional	7.50 (27.14)	5.50 (4.14)	31 (12.72)	44
Σ	95	14.50	44.50	154

(Numbers in parentheses are expected frequencies)

Table A.19A Chi Square Values for Table A.19

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
87.50	67.86	$\frac{385.72}{67.86}$	5.684	9	10.36	$\frac{1.84}{10.36}$	.178	13.50	31.78	$\frac{334.15}{31.78}$	10.514
7.50	27.14	$\frac{385.72}{27.14}$	14.212	5.50	4.14	$\frac{1.84}{4.14}$	.446	31	12.72	$\frac{334.15}{12.72}$	26.270
Σ			19.896				.624				36.784

$\Sigma X^2 = 57.304$ significant at .001

Table A.20 Visual Instructional Surfaces Subscale: Faculty Responses: Regional vs Traditional Schools

Comparison	Yes	No Response	No	Σ
Regional	80 (73.57)	5 (4.64)	25 (31.79)	110
Traditional	23 (29.43)	1.50 (1.86)	19.50 (12.71)	44
Σ	103	6.50	44.50	154

(Numbers in parentheses are expected frequencies)

Table A.20A Chi Square Values for Table A.20

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
80	73.57	$\frac{41.34}{73.57}$	.561	5	4.64	$\frac{.12}{4.64}$	.027	25	31.79	$\frac{46.10}{31.79}$	1.450
23	29.43	$\frac{41.34}{29.43}$	1.404	1.50	1.86	$\frac{.12}{1.86}$	.069	19.50	12.71	$\frac{46.10}{12.71}$	3.627
Σ			1.965				.096				5.077

$\Sigma X^2 = 7.138$ significant at .05

ALL FACULTIES vs ALL STUDENTS

Table A.21 Spatial Subscale: All Faculties vs All Students

Comparison	Yes	No Response	No	Σ
Faculty	118.40 (116.51)	6.40 (2.65)	53.20 (58.84)	178
Students	356.80 (358.69)	4.40 (8.15)	186.80 (181.16)	548
Σ	475.20	10.80	240	726

(Numbers in parentheses are expected frequencies)

Table A.21A Chi Square Values for Table A.21

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
118.40	116.51	$\frac{3.57}{116.51}$	.030	6.40	2.65	$\frac{14.06}{2.65}$	5.306	53.20	58.84	$\frac{31.80}{58.84}$	.540
356.80	358.69	$\frac{3.57}{358.69}$	.009	4.40	8.15	$\frac{14.06}{8.15}$	1.725	186.80	181.16	$\frac{31.80}{181.60}$	.175
Σ			.039				7.031				.715

$\Sigma X^2 =$ 7.785 significant at .05

Table A.22 Visual Subscale: All Faculties vs All Students

Comparison	Yes	No Response	No	Σ
Faculty	132.50 (135.89)	6.25 (3.31)	39.25 (38.80)	178
Students	421.75 (418.36)	7.25 (10.19)	119 (119.45)	548
Σ	554.25	13.50	158.25	726

(Numbers in parentheses are expected frequencies)

Table A.22A Chi Square Values for Table A.22

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
132.50	135.89	$\frac{11.49}{135.89}$	.084	6.25	3.31	$\frac{8.64}{3.31}$	2.611	39.25	38.80	$\frac{.20}{38.80}$	.005
421.75	418.36	$\frac{11.49}{418.36}$	.027	7.25	10.19	$\frac{8.64}{10.19}$	.848	119	119.45	$\frac{.20}{119.45}$	.001
Σ			.111				3.459				.006

$\Sigma X^2 = 3.576$ not significant

Table A.23 Thermal Subscale: All Faculties vs All Students

Comparison	Yes	No Response	No	Σ
Faculty	99.67 (99.30)	8 (3.60)	70.33 (75.10)	178
Students	305.33 (305.70)	6.67 (11.07)	236 (231.23)	548
Σ	405	14.67	306.33	726

(Numbers in parentheses are expected frequencies)

Table A.23A Chi Square Values for Table A.23

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
99.67	99.30	$\frac{.13}{99.30}$	.001	8	3.60	$\frac{19.36}{3.60}$	5.377	70.33	75.10	$\frac{22.75}{75.10}$	.302
305.33	305.70	$\frac{.13}{305.70}$	.000	6.67	11.07	$\frac{19.36}{11.07}$	1.748	236	231.23	$\frac{22.75}{231.23}$	.098
Σ			.001				7.125				.400

$\Sigma X^2 = 7.526$ significant at .05

Table A.24 Acoustic Subscale: All Faculties vs All Students

Comparison	Yes	No Response	No	Σ
Faculty	112 (113.64)	7.50 (5.03)	58.50 (59.33)	178
Students	351.50 (349.86)	13 (15.47)	183.50 (182.67)	548
Σ	463.50	20.50	242	726

(Numbers in parentheses are expected frequencies)

Table A.24A Chi Square Values for Table A.24

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
112	113.64	$\frac{.68}{113.64}$	.023	7.50	5.03	$\frac{6.10}{5.03}$	1.212	58.50	59.33	$\frac{.68}{59.33}$	.011
351.50	349.86	$\frac{2.68}{349.86}$	.007	13	15.47	$\frac{6.10}{15.47}$	.394	183.50	182.67	$\frac{.68}{182.67}$	.003
Σ			.030				1.606				.014

$\Sigma X^2 = 1.650$ not significant

Table A.25 Aesthetic Subscale: All Faculties vs All Students

Comparison	Yes	No Response	No	Σ
Faculty	126.25 (108.49)	4.25 (2.39)	47.50 (67.12)	178
Students	316.25 (334.01)	5.50 (7.36)	226.25 (206.63)	548
Σ	442.50	9.75	273.75	726

(Numbers in parentheses are expected frequencies)

Table A.25A Chi Square Values for Table A.25

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
126.25	108.49	$\frac{315.41}{108.49}$	2.907	4.25	2.39	$\frac{3.45}{2.39}$	1.447	47.50	67.12	$\frac{384.94}{67.12}$	5.735
316.25	334.01	$\frac{315.41}{334.01}$	.944	5.50	7.36	$\frac{3.45}{7.36}$	.470	226.25	206.63	$\frac{384.94}{206.63}$	1.862
Σ			3.851				1.917				7.597

$\Sigma X^2 = 13.365$ significant at .01

Table A.26 Safety Subscale: All Faculties vs All Students

Comparison	Yes	No Response	No	Σ
Faculty	137.12 (125.94)	6.63 (3.48)	34.25 (48.58)	178
Students	376.56 (387.74)	7.56 (10.71)	163.88 (149.55)	548
Σ	513.68	14.19	198.13	726

(Numbers in parentheses are expected frequencies)

Table A.26A Chi Square Values for Table A.26

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
137.12	125.94	$\frac{124.99}{125.94}$	.992	6.63	3.48	$\frac{9.92}{3.48}$	2.851	34.25	48.58	$\frac{205.34}{48.58}$	4.227
376.56	387.74	$\frac{124.99}{387.74}$	.322	7.56	10.71	$\frac{9.92}{10.71}$	.926	163.88	149.55	$\frac{205.34}{149.55}$	1.373
Σ			1.314				3.777				5.600

$\Sigma X^2 =$ 10.691 significant at .01

Table A.27 Storage Subscale: All Faculties vs All Students

Comparison	Yes	No Response	No	Σ
Faculty	89.33 (87.12)	9.67 (4.82)	79 (86.06)	178
Students	266 (268.21)	10 (14.85)	272 (264.94)	548
Σ	355.33	19.67	351	726

(Numbers in parentheses are expected frequencies)

Table A.27A Chi Square Values for Table A.27

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
89.33	87.12	$\frac{4.88}{87.12}$	.056	9.67	4.82	$\frac{23.52}{4.82}$	4.880	79	86.06	$\frac{49.84}{86.06}$	.579
266	268.21	$\frac{4.88}{268.21}$	.018	10	14.85	$\frac{23.52}{14.85}$	1.584	272	264.94	$\frac{49.84}{264.94}$	.188
Σ			.074				6.464				.767

$\Sigma X^2 =$ 7.305 significant at .05

Table A.28 Utilities Subscale: All Faculties vs All Students

Comparison	Yes	No Response	No	Σ
Faculty	123 (123.14)	12.50 (6.44)	42.50 (48.42)	178
Students	379.25 (379.11)	13.75 (19.81)	155 (149.08)	548
Σ	502.25	26.25	197.50	726

(Numbers in parentheses are expected frequencies)

Table A.28A Chi Square Values for Table A.28

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
123	123.14	$\frac{.01}{123.14}$	.000	12.50	6.44	$\frac{36.72}{6.44}$	5.702	42.50	48.42	$\frac{35.04}{48.42}$	.723
379.25	379.11	$\frac{.01}{379.11}$	.000	13.75	19.81	$\frac{36.72}{19.81}$	1.853	155	149.08	$\frac{35.04}{149.08}$	.235
Σ			.000				7.555				.958

$\Sigma X^2 = 8.513$ significant at .05

Table A.29 General Subscale: All Faculties vs All Students

Comparison	Yes	No Response	No	Σ
Faculty	111 (93.54)	3.50 (13.66)	63.50 (70.80)	178
Students	270.50 (287.96)	52.25 (42.09)	225.25 (217.95)	548
Σ	381.50	55.75	288.75	726

(Numbers in parentheses are expected frequencies)

Table A.29A Chi Square Values for Table A.29

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
111	93.54	$\frac{304.85}{93.54}$	3.259	3.50	13.66	$\frac{103.22}{13.66}$	7.556	63.50	70.80	$\frac{53.29}{70.80}$	.752
270.50	287.96	$\frac{304.85}{287.96}$	1.058	52.25	42.09	$\frac{103.22}{42.09}$	2.452	225.25	217.95	$\frac{53.29}{217.95}$	.244
Σ			4.317				10.008				.996

$\Sigma X^2 =$ 15.321 significant at .001

STUDENT RESPONSES

THE FOUR REGIONAL SCHOOLS

Table A.30 Spatial Subscale: Student Responses: The Four Regional Schools

Comparison	Yes	No Response	No	Σ
School 3	71.80 (75.67)	.40 (1)	36.80 (32.33)	109
School 4	23.40 (26.38)	0 (.35)	14.60 (11.27)	38
School 5	70.80 (71.50)	1.60 (.94)	30.60 (30.56)	103
School 6	61 (53.45)	1 (.71)	15 (22.84)	77
Σ	227	3	97	327

(Numbers in parentheses are expected frequencies)

Table A.30A Chi Square Values for Table A.30

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
71.80	75.67	$\frac{14.97}{75.67}$	.197	.40	1	$\frac{.36}{1}$	.360	36.80	32.33	$\frac{19.98}{32.33}$	.618
23.40	26.38	$\frac{8.61}{26.38}$	.326	0	.35	$\frac{.12}{.35}$	.350	14.60	11.27	$\frac{11.08}{11.27}$	.983
70.80	71.50	$\frac{.49}{71.50}$	.006	1.60	.94	$\frac{.43}{.94}$	.463	30.60	30.56	$\frac{.00}{30.56}$	.000
61	53.45	$\frac{57}{53.45}$	1.066	1	.71	$\frac{.08}{.71}$	.118	15	22.84	$\frac{61.46}{22.84}$	2.691
Σ			1.595				1.291				4.292

$\Sigma X^2 =$ 7.178 not significant

Table A.31 Visual Subscale: Student Responses: The Four Regional Schools

Comparison	Yes	No Response	No	Σ
School 3	93.25 (89.33)	1.75 (1.50)	14 (18.17)	109
School 4	32 (31.14)	.50 (.52)	5.50 (6.34)	38
School 5	76.75 (84.42)	1.25 (1.42)	25 (17.16)	103
School 6	66 (63.11)	1 (1.06)	10 (12.83)	77
Σ	268	4.50	54.50	327

(Numbers in parentheses are expected frequencies)

Table A.31A Chi Square Values for Table A.31

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
93.25	89.33	$\frac{15.36}{89.33}$	.172	1.75	1.50	$\frac{.06}{1.50}$	.041	14	18.17	$\frac{17.38}{18.17}$	.957
32	31.14	$\frac{.73}{31.14}$	.023	.50	.52	$\frac{.00}{.52}$	.000	5.50	6.34	$\frac{.70}{6.34}$	.111
76.75	84.42	$\frac{58.82}{84.42}$	.696	1.25	1.42	$\frac{.02}{1.42}$	.020	25	17.16	$\frac{61.46}{17.16}$	3.581
66	63.11	$\frac{8.35}{63.11}$	.132	1	1.06	$\frac{.00}{1.06}$	.003	10	12.83	$\frac{8.00}{12.83}$	.624
Σ			1.023				.064				5.273

$\Sigma X^2 = 6.360$ not significant

Table A.32 Thermal Subscale: Student Responses: The Four Regional Schools

Comparison	Yes	No Response	No	Σ
School 3	64.33 (65.89)	1 (.89)	43.67 (42.22)	109
School 4	19 (22.97)	0 (.31)	19 (14.72)	38
School 5	60.33 (62.26)	1.67 (.84)	41 (39.90)	103
School 6	54 (46.54)	0 (.63)	23 (29.83)	77
Σ	197.66	2.67	126.67	327

(Numbers in parentheses are expected frequencies)

Table A.32A Chi Square Values for Table A.32

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
64.33	65.89	$\frac{2.43}{65.89}$	.036	1	.89	$\frac{.01}{.89}$	.013	43.67	42.22	$\frac{2.10}{42.22}$	.049
19	22.97	$\frac{15.76}{22.97}$	.686	0	.31	$\frac{.09}{.31}$	.310	19	14.72	$\frac{18.31}{14.72}$	1.244
60.33	62.26	$\frac{3.72}{62.26}$	.059	1.67	.84	$\frac{.68}{.84}$	.820	41	39.90	$\frac{1.21}{39.90}$	.030
54	46.54	$\frac{55.65}{46.54}$	1.195	0	.63	$\frac{.39}{.63}$	.630	23	29.83	$\frac{46.64}{29.83}$	1.563
Σ			1.976				1.773				2.886

$\Sigma X^2 \leq$ 6.635 not significant

Table A.33 Acoustic Subscale: Student Responses: The Four Regional Schools

Comparison	Yes	No Response	No	Σ
School 3	71 (69)	.50 (.83)	37.50 (39.17)	109
School 4	23 (24.06)	0 (.29)	15 (13.65)	38
School 5	57 (65.20)	1 (.79)	45 (37.01)	103
School 6	56 (48.74)	1 (.59)	20 (27.67)	77
Σ	207	2.50	117.50	327

(Numbers in parentheses are expected frequencies)

Table A.33A Chi Square Values for Table A.33

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
71	69	$\frac{4}{69}$	.057	.50	.83	$\frac{.10}{.83}$	.131	37.50	39.17	$\frac{2.78}{39.17}$	.071
23	24.06	$\frac{1.12}{24.06}$	.046	0	.29	$\frac{.08}{.29}$	.290	15	13.65	$\frac{1.82}{13.65}$	.133
57	65.20	$\frac{67.24}{65.20}$	1.031	1	.79	$\frac{.04}{.79}$	.055	45	37.01	$\frac{63.84}{37.01}$	1.724
56	48.74	$\frac{52.70}{48.74}$	1.081	1	.59	$\frac{.16}{.59}$	.284	20	27.67	$\frac{58.82}{27.67}$	2.126
Σ			2.215				.760				4.054

$\Sigma X^2 =$ 7.029 not significant

Table A.34 Aesthetic Subscale: Student Responses: The Four Regional Schools

Comparison	Yes	No Response	No	Σ
School 3	63.25 (74.92)	1.50 (.75)	44.25 (33.33)	109
School 4	28.25 (26.12)	0 (.26)	9.75 (11.62)	38
School 5	73.50 (70.79)	.75 (.71)	28.75 (31.50)	103
School 6	59.75 (52.92)	0 (.53)	17.25 (23.55)	77
Σ	224.75	2.25	100	327

(Numbers in parentheses are expected frequencies)

Table A.34A Chi Square Values for Table A.34

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
63.25	74.92	$\frac{136.18}{74.92}$	1.817	1.50	.75	$\frac{.56}{.75}$	.750	44.25	33.33	$\frac{119.24}{33.33}$	3.577
28.25	26.12	$\frac{4.53}{26.12}$	.173	0	.26	$\frac{.06}{.26}$	.260	9.75	11.62	$\frac{3.49}{11.62}$	.300
73.50	70.79	$\frac{7.34}{70.79}$	.103	.75	.71	$\frac{.00}{.71}$	.002	28.75	31.50	$\frac{7.56}{31.50}$	.240
59.75	52.92	$\frac{46.51}{52.92}$	.878	0	.53	$\frac{.28}{.53}$	.530	17.25	23.55	$\frac{39.69}{23.55}$	1.685
Σ			2.971				1.542				5.802

$\Sigma X^2 = 10.315$ not significant

Table A.35 Safety Subscale: Student Responses: The Four Regional Schools

Comparison	Yes	No Response	No	Σ
School 3	68 (79.38)	1.68 (1.19)	39.32 (28.43)	109
School 4	29.31 (27.67)	.19 (.41)	8.50 (9.92)	38
School 5	79.69 (75.01)	1 (1.12)	22.31 (26.87)	103
School 6	61.13 (56.07)	.69 (.84)	15.18 (20.09)	77
Σ	238.13	3.56	85.31	327

(Numbers in parentheses are expected frequencies)

Table A.35A Chi Square Values for Table A.35

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
68	79.38	$\frac{129.50}{79.38}$	1.631	1.68	1.19	$\frac{.24}{1.19}$	.201	39.32	28.43	$\frac{118.37}{28.43}$	4.163
29.31	27.67	$\frac{2.68}{27.67}$	.097	.19	.41	$\frac{.04}{.41}$	.118	8.50	9.92	$\frac{2.01}{9.92}$	.203
79.69	75.01	$\frac{21.90}{75.01}$	.291	1	1.12	$\frac{.01}{1.12}$	.012	22.31	26.87	$\frac{20.79}{26.87}$	.773
61.13	56.07	$\frac{25.60}{56.07}$	.456	.69	.84	$\frac{.02}{.84}$	.026	15.18	20.09	$\frac{24.10}{20.09}$	1.200
Σ			2.475				.357				6.339

$\Sigma X^2 =$ 9.171 not significant

Table A.36 Storage Subscale: Student Responses: The Four Regional Schools

Comparison	Yes	No Response	No	Σ
School 3	50 (58.89)	1.34 (1.22)	57.66 (48.89)	109
School 4	20.33 (20.53)	0 (.43)	17.67 (17.04)	38
School 5	52.67 (55.65)	1 (1.16)	49.33 (46.19)	103
School 6	53.67 (41.60)	1.33 (.86)	22 (34.54)	77
Σ	176.67	3.67	146.66	327

(Numbers in parentheses are expected frequencies)

Table A.36A Chi Square Values for Table A.36

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
50	58.89	$\frac{79.03}{58.89}$	1.342	1.34	1.22	$\frac{.01}{1.22}$	.011	57.66	48.89	$\frac{76.91}{48.89}$	1.573
20.33	20.53	$\frac{.04}{20.53}$	.001	0	.43	$\frac{.18}{.43}$	.430	17.67	17.04	$\frac{.39}{17.04}$	.023
52.67	55.65	$\frac{8.88}{55.65}$	.159	1	1.16	$\frac{.02}{1.16}$	.022	49.33	46.19	$\frac{9.85}{46.19}$	.213
53.67	41.60	$\frac{145.68}{41.60}$	3.502	1.33	.86	$\frac{.22}{.86}$	.256	22	34.54	$\frac{157.25}{34.54}$	4.552
Σ			5.004				.719				6.361

$\Sigma X^2 =$ 12.084 not significant

Table A.37 Utilities Subscale: Student Responses: The Four Regional Schools

Comparison	Yes	No Response	No	Σ
School 3	77.25 (79.75)	1.25 (2.25)	30.50 (27)	109
School 4	27.75 (27.80)	0 (.78)	10.25 (9.42)	38
School 5	73.75 (75.36)	2.75 (2.13)	26.50 (25.51)	103
School 6	60.50 (56.34)	2.75 (1.59)	13.75 (19.07)	77
Σ	239.25	6.75	81	327

(Numbers in parentheses are expected frequencies)

Table A.37A Chi Square Values for Table A.37

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
77.25	79.75	$\frac{6.25}{79.75}$	.078	1.25	2.25	$\frac{1}{2.25}$	.444	30.50	27	$\frac{12.25}{27}$	.453
27.75	27.80	$\frac{.00}{27.80}$	.000	0	.78	$\frac{.60}{.78}$	.780	10.25	9.42	$\frac{.68}{9.42}$	.073
73.75	75.36	$\frac{2.59}{75.36}$	.034	2.75	2.13	$\frac{.38}{2.13}$	.180	26.50	25.51	$\frac{.98}{25.51}$	.038
60.50	56.34	$\frac{17.30}{56.34}$	.307	2.75	1.59	$\frac{1.34}{1.59}$	.846	13.75	19.07	$\frac{28.30}{19.07}$	1.484
Σ			.419				2.250				2.048

$\Sigma X^2 = 4.717$ not significant

Table A.38 General Subscale: Student Responses: The Four Regional Schools

Comparison	Yes	No Response	No	Σ
School 3	56.25 (61)	9.25 (10.58)	43.50 (37.42)	109
School 4	20.25 (21.27)	3.75 (3.69)	14 (13.04)	38
School 5	53.75 (57.64	12.50 (10)	36.75 (35.36)	103
School 6	52.75 (43.09)	6.25 (7.48)	18 (26.43)	77
Σ	183	31.75	112.25	327

(Numbers in parentheses are expected frequencies)

Table A.38A Chi Square Values for Table A.38

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
56.25	61	$\frac{22.56}{61}$	.369	9.25	10.58	$\frac{1.76}{10.58}$	.167	43.50	37.42	$\frac{36.96}{37.42}$	.987
20.25	21.27	$\frac{1.04}{21.27}$	.048	3.75	3.69	$\frac{.00}{3.69}$	.000	14	13.04	$\frac{.92}{13.04}$	.070
53.75	57.64	$\frac{15.13}{57.64}$	.262	12.50	10	$\frac{6.25}{10}$	.625	36.75	35.36	$\frac{1.93}{35.36}$	.054
52.75	43.09	$\frac{93.31}{43.09}$	2.165	6.25	7.48	$\frac{1.51}{7.48}$	.202	18	26.43	$\frac{71.06}{26.43}$	2.688
Σ			2.844				.994				3.799

$\Sigma X^2 =$ 7.637 not significant

STUDENT RESPONSES

MALE vs FEMALE

Table A.39 Spatial Subscale: Student Responses: Male vs Female

Comparison	Yes	No Response	No	Σ
Male	317 (317.08)	3.20 (3.91)	166.80 (166.01)	487
Female	39.80 (39.72)	1.20 (.49)	20 (20.79)	61
Σ	356.80	4.40	186.80	548

(Numbers in parentheses are expected frequencies)

Table A.39A Chi Square Values for Table A.39

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
317	317.08	$\frac{.00}{317.08}$	.000	3.20	3.91	$\frac{.50}{3.91}$	.128	166.80	166.01	$\frac{.62}{166.01}$	.003
39.80	39.72	$\frac{.00}{39.72}$	.000	1.20	.49	$\frac{.50}{.49}$	1.028	20	20.79	$\frac{.62}{20.79}$	.030
Σ			.000				1.156				.033

$\Sigma X^2 = 1.189$ not significant

Table A.40 Visual Subscale: Student Responses: Male vs Female

Comparison	Yes	No Response	No	Σ
Male	376.50 (374.81)	5.25 (6.44)	105.25 (105.75)	487
Female	45.25 (46.94)	2 (.81)	13.75 (13.25)	61
Σ	421.75	7.25	119	548

(Numbers in parentheses are expected frequencies)

Table A.40A Chi Square Values for Table A.40

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
376.50	374.81	$\frac{2.85}{374.81}$	.007	5.25	6.44	$\frac{1.41}{6.44}$	.219	105.25	105.75	$\frac{.25}{105.75}$	.002
45.25	46.94	$\frac{2.85}{46.94}$	.060	2	.81	$\frac{1.41}{.81}$	1.748	13.75	13.25	$\frac{.25}{13.25}$	.018
Σ			.067				1.967				.020

$\Sigma X^2 =$ 2.054 not significant

Table A.41 Thermal Subscale: Student Responses: Male vs Female

Comparison	Yes	No Response	No	Σ
Male	281 (271.35)	5.33 (5.92)	200.67 (209.73)	487
Female	24.34 (33.99)	1.33 (.74)	35.33 (26.27)	61
Σ	305.34	6.66	236	548

(Numbers in parentheses are expected frequencies)

Table A.41A Chi Square Values for Table A.41

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
281	271.35	$\frac{93.12}{271.35}$	.343	5.33	5.92	$\frac{.34}{5.92}$	.058	200.67	209.73	$\frac{82.08}{209.73}$	.391
24.34	33.99	$\frac{93.12}{33.99}$	2.739	1.33	.74	$\frac{.34}{.74}$	.470	35.33	26.27	$\frac{82.08}{26.27}$	3.124
Σ			3.082				.528				3.515

$\Sigma X^2 =$ 7.125 significant at .05

Table A.42 Acoustical Subscale: Student Responses: Male vs Female

Comparison	Yes	No Response	No	Σ
Male	309.50 (312.37)	8.50 (11.56)	169 (163.07)	487
Female	42 (39.13)	4.50 (1.44)	14.50 (20.43)	61
Σ	351.50	13	183.50	548

(Numbers in parentheses are expected frequencies)

Table A.42A Chi Square Values for Table A.42

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
309.50	312.37	$\frac{8.23}{312.37}$	.026	8.50	11.56	$\frac{9.36}{11.56}$	.810	169	163.07	$\frac{35.16}{163.07}$	.215
42	39.13	$\frac{8.23}{39.13}$	.210	4.50	1.44	$\frac{9.36}{1.44}$	6.502	14.50	20.43	$\frac{35.16}{20.43}$	1.721
Σ			.236				7.312				1.936

$\Sigma X^2 = 9.484$ significant at .01

Table A.43 Aesthetic Subscale: Student Responses: Male vs Female

Comparison	Yes	No Response	No	Σ
Male	280.50 (281.05)	4.50 (4.89)	202 (201.06)	487
Female	35.75 (35.20)	1 (.61)	24.25 (25.19)	61
Σ	316.25	5.50	226.25	548

(Numbers in parentheses are expected frequencies)

Table A.43A Chi Square Values for Table A.43

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
280.50	281.05	$\frac{.30}{281.05}$	.001	4.50	4.89	$\frac{.15}{4.89}$	.031	202	201.06	$\frac{.88}{201.06}$	.004
35.75	35.20	$\frac{.30}{35.20}$	.008	1	.61	$\frac{.15}{.61}$	.245	24.25	25.19	$\frac{.88}{25.19}$	.035
Σ			.009				.276				.039

$\Sigma X^2 =$ .324 not significant

Table A.44 Safety Subscale: Student Responses: Male vs Female

Comparison	Yes	No Response	No	Σ
Male	334.18 (334.63)	5.44 (6.73)	147.38 (145.64)	487
Female	42.37 (41.92)	2.13 (.84)	16.50 (18.24)	61
Σ	376.55	7.57	163.88	548

(Numbers in parentheses are expected frequencies)

Table A.44A Chi Square Values for Table A.44

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
334.18	334.63	$\frac{.20}{334.63}$	.000	5.44	6.73	$\frac{1.66}{6.73}$	.247	147.38	145.64	$\frac{3.02}{145.64}$	.020
42.37	41.92	$\frac{.20}{41.92}$	.004	2.13	.84	$\frac{1.66}{.84}$	1.981	16.50	18.24	$\frac{3.02}{18.24}$	.165
Σ			.004				2.228				.185

$\Sigma X^2 = 2.417$ not significant

Table A.45 Storage Subscale: Student Responses: Male vs Female

Comparison	Yes	No Response	No	Σ
Male	237 (236.39)	5.33 (8.89)	244.67 (241.72)	487
Female	29 (29.61)	4.67 (1.11)	27.33 (30.28)	61
Σ	266	10	272	548

(Numbers in parentheses are expected frequencies)

Table A.45A Chi Square Values for Table A.45

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
237	236.39	$\frac{.37}{236.39}$	.001	5.33	8.89	$\frac{12.67}{8.89}$	1.425	244.67	241.72	$\frac{8.70}{241.72}$	.036
29	29.61	$\frac{.37}{29.61}$	.012	4.67	1.11	$\frac{12.67}{1.11}$	11.417	27.33	30.28	$\frac{8.70}{30.28}$	.287
Σ			.013				12.842				.323

$\Sigma X^2 =$ 13.178 significant at .05

Table A.46 Utilities Subscale: Student Responses: Male vs Female

Comparison	Yes	No Response	No	Σ
Male	335 (337.03)	8.75 (12.22)	143.25 (137.75)	487
Female	44.25 (42.22)	5 (1.53)	11.75 (17.25)	61
Σ	379.25	13.75	155	548

(Numbers in parentheses are expected frequencies)

Table A.46A Chi Square Values for Table A.46

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
335	337.03	$\frac{4.12}{337.03}$	.012	8.75	12.22	$\frac{12.04}{12.22}$	.985	143.25	137.75	$\frac{30.25}{137.75}$	.219
44.25	42.22	$\frac{4.12}{42.22}$	.097	5	1.53	$\frac{12.04}{1.53}$	7.869	11.75	17.25	$\frac{30.25}{17.25}$	1.753
Σ			.109				8.854				1.972

$\Sigma X^2 = 10.935$ significant at .01

Table A.47 General Subscale: Student Responses: Male vs Female

Comparison	Yes	No Response	No	Σ
Male	237 (240.39)	48.50 (46.43)	201.50 (200.18)	487
Female	33.50 (30.11)	3.75 (5.82)	23.75 (25.07)	61
Σ	270.50	52.25	225.25	548

(Numbers in parentheses are expected frequencies)

Table A.47A Chi Square Values for Table A.47

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
237	240.39	$\frac{11.49}{240.39}$	.047	48.50	46.43	$\frac{4.28}{46.43}$	.092	201.50	200.18	$\frac{1.74}{200.18}$	.008
33.50	30.11	$\frac{11.49}{30.11}$	.381	3.75	5.82	$\frac{4.28}{5.82}$	.736	23.75	25.07	$\frac{1.74}{25.07}$	.069
Σ			.428				.828				.077

$\Sigma X^2 = 1.333$ not significant

STUDENT RESPONSES

JUNIORS vs SENIORS vs INSTITUTE

Table A.48 Spatial Subscale: Student Responses: Juniors vs Seniors vs Institute

Comparison	Yes	No Response	No	Σ
Junior	137.40 (127.62)	1.20 (1.57)	57.40 (66.81)	196
Senior	178.80 (185.56)	1.20 (2.29)	105 (97.15)	285
Institute	40.60 (43.62)	2 (.54)	24.40 (22.84)	67
Σ	356.80	4.40	186.80	548

(Numbers in parentheses are expected frequencies)

Table A.48A Chi Square Values for Table A.48

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
137.40	127.62	$\frac{95.64}{127.62}$	.749	1.20	1.57	$\frac{.13}{1.57}$	.087	57.40	66.81	$\frac{88.54}{66.81}$	1.325
178.80	185.56	$\frac{45.69}{185.56}$	.246	1.20	2.29	$\frac{1.18}{2.29}$	.518	105	97.15	$\frac{61.62}{97.15}$	.634
40.60	43.62	$\frac{9.12}{43.62}$	.209	2	.54	$\frac{2.13}{.54}$	3.947	24.40	22.84	$\frac{2.43}{22.84}$	.106
Σ			1.204				4.552				2.065

$\Sigma X^2 =$ 7.821 not significant

Table A.49 Visual Subscale: Student Responses: Juniors vs Seniors vs Institute

Comparison	Yes	No Response	No	Σ
Junior	156.25 (150.85)	1.75 (2.59)	38 (42.56)	196
Senior	216.25 (219.34)	3.25 (3.77)	65.50 (61.89)	285
Institute	49.25 (51.56)	2.25 (.89)	15.50 (14.55)	67
Σ	421.75	7.25	119	548

(Numbers in parentheses are expected frequencies)

Table A.49A Chi Square Values for Table A.49

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
156.25	150.85	$\frac{29.16}{150.85}$	.193	1.75	2.59	$\frac{.70}{2.59}$	.272	38	42.56	$\frac{20.79}{42.56}$	.488
216.25	219.34	$\frac{9.54}{219.34}$	.043	3.25	3.77	$\frac{.27}{3.77}$	.071	65.50	61.89	$\frac{13.03}{61.89}$	.210
49.25	51.56	$\frac{5.33}{51.56}$	.103	2.25	.89	$\frac{1.84}{.89}$	2.078	15.50	14.55	$\frac{.90}{14.55}$	.062
Σ			.339				2.421				.760

$\Sigma X^2 =$ 3.520 not significant

Table A.50 Thermal Subscale: Student Responses: Juniors vs Seniors vs Institute

Comparison	Yes	No Response	No	Σ
Junior	115 (109.21)	3.33 (2.38)	77.67 (84.41)	196
Senior	159.33 (158.79)	2.67 (3.47)	123 (122.74)	285
Institute	31 (37.33)	.67 (.82)	35.33 (28.85)	67
Σ	305.33	6.67	236	548

(Numbers in parentheses are expected frequencies)

Table A.50A Chi Square Values for Table A.50

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
115	109.21	$\frac{33.52}{109.21}$	.306	3.33	2.38	$\frac{.90}{2.38}$	.379	77.67	84.41	$\frac{45.42}{84.41}$	.538
159.33	158.79	$\frac{.29}{158.79}$	.001	2.67	3.47	$\frac{.64}{3.47}$	.184	123	122.74	$\frac{.06}{122.74}$	.000
31	37.33	$\frac{40.06}{37.33}$	1.073	.67	.82	$\frac{.02}{.82}$	.027	35.33	28.85	$\frac{41.99}{28.85}$	1.455
Σ			1.380				.590				1.993

$\Sigma X^2 =$ 3.963 not significant

Table A.51 Acoustical Subscale: Student Responses: Juniors vs Seniors vs Institute

Comparison	Yes	No Response	No	Σ
Junior	126 (125.72)	4.50 (4.65)	65.50 (65.63)	196
Senior	181.50 (182.81)	7.50 (6.76)	96 (95.43)	285
Institute	44 (42.97)	1 (1.59)	22 (22.44)	67
Σ	351.50	13	183.50	548

(Numbers in parentheses are expected frequencies)

Table A.51A Chi Square Values for Table A.51

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
126	125.72	$\frac{.07}{125.72}$	.000	4.50	4.65	$\frac{.02}{4.65}$	.004	65.50	65.63	$\frac{.01}{65.63}$	.000
181.50	182.81	$\frac{1.71}{182.81}$	.009	7.50	6.76	$\frac{.54}{6.76}$	.081	96	95.43	$\frac{.32}{95.43}$	.003
44	42.97	$\frac{1.06}{42.97}$	.024	1	1.59	$\frac{.34}{1.59}$	.218	22	22.44	$\frac{.19}{22.44}$	.008
Σ			.033				.303				.011

$\Sigma X^2 =$ .347 not significant

Table A.52 Aesthetic Subscale: Student Responses: Juniors vs Seniors vs Institute

Comparison	Yes	No Response	No	Σ
Junior	127 (113.11)	.75 (1.97)	68.25 (80.92)	196
Senior	143 (164.47)	3.50 (2.86)	138.50 (117.67)	285
Institute	46.25 (38.67)	1.25 (.67)	19.50 (27.66)	67
Σ	316.25	5.50	226.25	548

(Numbers in parentheses are expected frequencies)

Table A.52A Chi Square Values for Table A.52

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
127	113.11	$\frac{192.93}{113.11}$	1.705	.75	1.97	$\frac{1.48}{1.97}$	.755	68.25	80.92	$\frac{160.52}{80.92}$	1.983
143	164.47	$\frac{460.96}{164.47}$	2.802	3.50	2.86	$\frac{.40}{2.86}$	.143	138.50	117.67	$\frac{433.88}{117.67}$	3.687
46.25	38.67	$\frac{57.45}{38.67}$	1.485	1.25	.67	$\frac{.33}{.67}$	.502	19.50	27.66	$\frac{66.58}{27.66}$	2.407
Σ			5.992				1.400				8.077

$\Sigma X^2 =$ 15.469 significant at .01

Table A.53 Safety Subscale: Student Responses: Juniors vs Seniors vs Institute

Comparison	Yes	No Response	No	Σ
Junior	140.69 (134.69)	1.25 (2.70)	54.06 (58.61)	196
Senior	186.69 (195.84)	2.81 (3.94)	95.50 (85.22)	285
Institute	49.19 (46.04)	3.50 (.92)	14.31 (20.04)	67
Σ	376.57	7.56	163.87	548

(Numbers in parentheses are expected frequencies)

Table A.53A Chi Square Values for Table A.53

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
140.69	134.69	$\frac{36.00}{134.69}$	.267	1.25	2.70	$\frac{2.10}{2.70}$	.778	54.06	58.61	$\frac{20.70}{58.61}$	.353
186.69	195.84	$\frac{83.72}{195.84}$	.427	2.81	3.94	$\frac{1.27}{3.94}$	.324	95.50	85.22	$\frac{105.67}{85.22}$	1.240
49.19	46.04	$\frac{9.92}{46.04}$	.215	3.50	.92	$\frac{6.65}{.92}$	7.235	14.31	20.04	$\frac{32.83}{20.04}$	1.638
Σ			.909				8.337				3.231

$\Sigma X^2 =$ 12.477 significant at .05

Table A.54 Storage Subscale: Student Responses: Juniors vs Seniors vs Institute

Comparison	Yes	No Response	No	Σ
Junior	105.33 (95.13)	1.33 (3.58)	89.34 (97.29)	196
Senior	125 (138.34)	4 (5.20)	156 (141.46)	285
Institute	35.67 (32.53)	4.67 (1.22)	26.66 (33.25)	67
Σ	266	10	272	548

(Numbers in parentheses are expected frequencies)

Table A.54A Chi Square Values for Table A.54

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
105.33	95.13	$\frac{104.04}{95.13}$	1.093	1.33	3.58	$\frac{5.06}{3.58}$	1.414	89.34	97.29	$\frac{63.20}{97.29}$	.649
125	138.34	$\frac{177.95}{138.34}$	1.286	4	5.20	$\frac{1.44}{5.20}$	2.769	156	141.46	$\frac{211.41}{14.146}$	1.494
35.67	32.53	$\frac{9.85}{32.53}$	.302	4.67	1.22	$\frac{11.90}{1.22}$	9.756	26.66	33.25	$\frac{43.42}{33.25}$	1.305
Σ			2.681				13.939				3.448

$\Sigma X^2 = 20.068$ significant at .001

Table A.55 Utilities Subscale: Student Responses: Juniors vs Seniors vs Institute

Comparison	Yes	No Response	No	Σ
Junior	142.25 (135.64)	2.50 (4.92)	51.25 (55.44)	196
Senior	190.25 (197.24)	4.75 (7.15)	90 (80.61)	285
Institute	46.75 (46.37)	6.50 (1.68)	13.75 (18.95)	67
Σ	379.25	13.75	155	548

(Numbers in parentheses are expected frequencies)

Table A.55A Chi Square Values for Table A.55

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
142.25	135.64	$\frac{43.69}{135.64}$	.322	2.50	4.92	$\frac{5.85}{4.92}$	1.190	51.25	55.44	$\frac{17.55}{55.44}$	.316
190.25	197.24	$\frac{48.86}{197.24}$	.247	4.75	7.15	$\frac{5.76}{7.15}$	.805	90	80.61	$\frac{88.17}{80.61}$	1.093
46.75	46.37	$\frac{.14}{46.37}$	.003	6.50	1.68	$\frac{23.23}{1.68}$	13.828	13.75	18.95	$\frac{27.04}{18.95}$	1.426
Σ			.572				15.823				2.835

$\Sigma X^2 =$ 19.230 significant at .001

Table A.56 General Subscale: Student Responses: Juniors vs Seniors vs Institute

Comparison	Yes	No Response	No	Σ
Junior	107.50 (96.75)	15.50 (18.69)	73 (80.56)	196
Senior	124.75 (140.68)	29 (27.17)	131.25 (117.15)	285
Institute	38.25 (33.07)	7.75 (6.39)	21 (27.54)	67
Σ	270.50	52.25	225.25	548

(Numbers in parentheses are expected frequencies)

Table A.56A Chi Square Values for Table A.56

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
107.50	96.75	$\frac{115.56}{96.75}$	1.194	15.50	18.69	$\frac{10.17}{18.69}$	.544	73	80.56	$\frac{57.15}{80.56}$	.709
124.75	140.68	$\frac{253.76}{140.68}$	1.803	29	27.17	$\frac{3.34}{27.17}$	.123	131.25	117.15	$\frac{198.81}{117.15}$	1.697
38.25	33.07	$\frac{26.83}{33.07}$	.811	7.75	6.39	$\frac{1.84}{6.39}$	.289	21	27.54	$\frac{42.77}{27.54}$	1.553
Σ			3.808				.956				3.959

$\Sigma X^2 =$ 8.723 not significant

ACADEMIC FACULTY vs VOCATIONAL FACULTY

Table A.57 Spatial Subscale: Academic Faculty vs Vocational Faculty

Comparison	Yes	No Response	No	Σ
Vocational	78.09 (77.65)	3.53 (4.39)	34.38 (33.96)	116
Academic	25 (25.44)	2.30 (1.44)	10.70 (11.12)	38
Σ	103.09	5.83	45.08	154

(Numbers in parentheses are expected frequencies)

Table A.57A Chi Square Values for Table A.57

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
78.09	77.65	$\frac{.19}{77.65}$	.002	3.53	4.39	$\frac{.73}{4.39}$	.168	34.38	33.96	$\frac{.17}{33.96}$	.005
25	25.44	$\frac{.19}{25.44}$	.007	2.30	1.44	$\frac{.73}{1.44}$	.513	10.70	11.12	$\frac{.17}{11.12}$	.015
Σ			.009				.681				.020

$\Sigma X^2 =$ .710 not significant

Table A.58 Visual Subscale: Academic Faculty vs Vocational Faculty

Comparison	Yes	No Response	No	Σ
Vocational	79.87 (82.01)	11.13 (10.64)	25 (23.35)	116
Academic	29 (26.86)	3 (3.49)	6 (7.65)	38
Σ	108.87	14.13	31	154

(Numbers in parentheses are expected frequencies)

Table A.58A Chi Square Values for Table A.58

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
79.87	82.01	$\frac{4.57}{82.01}$	.055	11.13	10.64	$\frac{.24}{10.64}$	.022	25	23.35	$\frac{2.72}{23.35}$	.116
29	26.86	$\frac{4.57}{26.86}$	.170	3	3.49	$\frac{.24}{3.49}$	.068	6	7.65	$\frac{2.72}{7.65}$	.355
Σ			.225				.090				.471

$\Sigma X^2 =$ .786 not significant

Table A.59 Thermal Subscale: Academic Faculty vs Vocational Faculty

Comparison	Yes	No Response	No	Σ
Vocational	61 (61.77)	8.16 (7.90)	46.84 (46.33)	116
Academic	21 (20.23)	2.33 (2.59)	14.67 (15.18)	38
Σ	82	10.49	61.51	154

(Numbers in parentheses are expected frequencies)

Table A.59A Chi Square Values for Table A.59

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
61	61.77	$\frac{.59}{61.77}$	.009	8.16	7.90	$\frac{.06}{7.90}$	.008	46.84	46.33	$\frac{.26}{46.33}$	.005
21	20.23	$\frac{.59}{20.23}$	.029	2.33	2.59	$\frac{.06}{2.59}$	.026	14.67	15.18	$\frac{.26}{15.18}$	.017
Σ			.038				.034				.022

$\Sigma X^2 = .094$ not significant

Table A.60 Acoustical Subscale: Academic Faculty vs Vocational Faculty

Comparison	Yes	No Response	No	Σ
Vocational	63.50 (63.35)	10.20 (9.79)	42.30 (42.86)	116
Academic	20.60 (20.75)	2.80 (3.21)	14.60 (14.04)	38
Σ	84.10	13	56.90	154

(Numbers in parentheses are expected frequencies)

Table A.60A Chi Square Values for Table A.60

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
63.50	63.35	$\frac{.02}{63.35}$	.000	10.20	9.79	$\frac{.16}{9.79}$	.017	42.30	42.86	$\frac{.31}{42.86}$	.007
20.60	20.75	$\frac{.02}{20.75}$	.001	2.80	3.21	$\frac{.16}{3.21}$	.052	14.60	14.04	$\frac{.31}{14.04}$	.022
Σ			.001				.069				.029

$\Sigma X^2 = .099$ not significant

Table A.61 Aesthetic Subscale: Academic Faculty vs Vocational Faculty

Comparison	Yes	No Response	No	Σ
Vocational	88.50 (86.25)	1.25 (2.44)	26.25 (27.31)	116
Academic	26 (28.25)	2 (.81)	10 (8.94)	38
Σ	114.50	3.25	36.25	154

(Numbers in parentheses are expected frequencies)

Table A.61A Chi Square Values for Table A.61

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
88.50	86.25	$\frac{5.06}{86.25}$	.058	1.25	2.44	$\frac{1.41}{2.44}$	.580	26.25	27.31	$\frac{1.12}{27.31}$	.041
26	28.25	$\frac{5.06}{28.25}$	.179	2	.81	$\frac{1.41}{.81}$	1.748	10	8.94	$\frac{1.12}{8.94}$	.125
Σ			.237				2.328				.166

$\Sigma X^2 = 2.731$ not significant

Table A.62 Safety Subscale: Academic Faculty vs Vocational Faculty

Comparison	Yes	No Response	No	Σ
Vocational	92.44 (91.85)	3 (4.24)	20.56 (19.91)	116
Academic	29.50 (30.09)	2.63 (1.39)	5.87 (6.52)	38
Σ	121.94	5.63	26.43	154

(Numbers in parentheses are expected frequencies)

Table A.62A Chi Square Values for Table A.62

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
92.44	91.85	$\frac{.34}{91.85}$	.003	3	4.24	$\frac{1.53}{4.24}$	.362	20.56	19.91	$\frac{.42}{19.91}$	.021
29.50	30.09	$\frac{.34}{30.09}$	.011	2.63	1.39	$\frac{1.53}{1.39}$	1.106	5.87	6.52	$\frac{.42}{6.52}$	.064
Σ			.014				1.468				.085

$\Sigma X^2 = 1.567$ not significant

Table A.63 Storage Subscale: Academic Faculty vs Vocational Faculty

Comparison	Yes	No Response	No	Σ
Vocational	59.67 (63.02)	5.67 (7.04)	50.66 (45.94)	116
Academic	24 (20.65)	3.67 (2.30)	10.33 (15.05)	38
Σ	83.67	9.34	60.99	154

(Numbers in parentheses are expected frequencies)

Table A.63A Chi Square Values for Table A.63

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
59.67	63.02	$\frac{11.22}{63.02}$	.178	5.67	7.04	$\frac{1.87}{7.04}$	.266	50.66	45.94	$\frac{22.27}{45.94}$	.484
24	20.65	$\frac{11.22}{20.65}$	.543	3.67	2.30	$\frac{1.87}{2.30}$	.816	10.33	15.05	$\frac{22.27}{15.05}$	1.480
Σ			.721				1.082				1.964

$\Sigma X^2 = 3.767$ not significant

Table A.64 Utilities Subscale: Academic Faculty vs Vocational Faculty

Comparison	Yes	No Response	No	Σ
Vocational	85 (82.29)	5.25 (8.47)	25.75 (25.24)	116
Academic	24.25 (26.96)	6 (2.78)	7.75 (8.26)	38
Σ	109.25	11.25	33.50	154

(Numbers in parentheses are expected frequencies)

Table A.64A Chi Square Values for Table A.64

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
85	82.29	$\frac{7.34}{82.29}$	.089	5.25	8.47	$\frac{10.36}{8.47}$	1.224	25.75	25.24	$\frac{.26}{25.24}$	.010
24.25	26.96	$\frac{7.34}{26.96}$	.272	6	2.78	$\frac{10.36}{2.78}$	3.729	7.75	8.26	$\frac{.26}{8.26}$	.031
Σ			.361				4.953				.041

$\Sigma X^2 = 5.355$ not significant

Table A.65 General Subscale: Academic Faculty vs Vocational Faculty

Comparison	Yes	No Response	No	Σ
Vocational	72.75 (73.06)	1.50 (2.64)	41.75 (40.30)	116
Academic	24.25 (23.94)	2 (.86)	11.75 (13.20)	38
Σ	97	3.50	53.50	154

(Numbers in parentheses are expected frequencies)

Table A.65A Chi Square Values for Table A.65

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
72.75	73.06	$\frac{.09}{73.06}$	.001	1.50	2.64	$\frac{1.29}{2.64}$	.492	41.75	40.30	$\frac{2.10}{40.30}$	.052
24.25	23.94	$\frac{.09}{23.94}$	.004	2	.86	$\frac{1.29}{.86}$	1.511	11.75	13.20	$\frac{2.10}{13.20}$	.159
Σ			.005				2.003				.211

$\Sigma X^2 = 2.219$ not significant

Table A.66 Audio-Visual Subscale: Academic Faculty vs Vocational Faculty

Comparison	Yes	No Response	No	Σ
Vocational	68.50 (71.56)	11.50 (10.92)	36 (33.52)	116
Academic	26.50 (23.44)	3 (3.58)	8.50 (10.98)	38
Σ	95	14.50	44.50	154

(Numbers in parentheses are expected frequencies)

Table A.66A Chi Square Values for Table A.66

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
68.50	71.56	$\frac{9.36}{71.56}$	.130	11.50	10.92	$\frac{.33}{10.92}$	.030	36	33.52	$\frac{6.15}{33.52}$	.183
26.50	23.44	$\frac{9.36}{23.44}$	.399	3	3.58	$\frac{.33}{3.58}$	.093	8.50	10.98	$\frac{6.15}{10.98}$	.560
Σ			.529				.123				.743

$\Sigma X^2 = 1.395$ not significant

Table A.67 Vertical Instructional Surfaces Subscale: Academic Faculty vs Vocational Faculty

Comparison	Yes	No Response	No	Σ
Vocational	80 (77.58)	4 (4.90)	32 (33.52)	116
Academic	23 (25.42)	2.50 (1.60)	12.50 (10.98)	38
Σ	103	6.50	44.50	154

(Numbers in parentheses are expected frequencies)

Table A.67A Chi Square Values for Table A.67

Yes				No Response				No			
O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2	O	E	$\frac{(O-E)^2}{E}$	X^2
80	77.58	$\frac{5.85}{77.58}$	.075	4	4.90	$\frac{.81}{4.90}$	.165	32	33.52	$\frac{2.31}{33.52}$	.068
23	25.42	$\frac{5.85}{25.42}$	.230	2.50	1.60	$\frac{.81}{1.60}$	.506	12.50	10.98	$\frac{2.31}{10.98}$	.210
Σ			.305				.671				.278

$\Sigma X^2 = 1.254$ not significant