# THE RELATIONSHIP OF INSTRUCTIONAL METHOD AND OCCUPATIONAL INTERESTS TO THE PERCEPTION OF PROPORTION IN THE ENVIRONMENT

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ABSTRACT

THE RELATIONSHIP OF INSTRUCTIONAL METHOD AND OCCUPATIONAL INTERESTS TO THE PERCEPTION OF PROPORTION IN THE ENVIRONMENT

By

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This study was devised to (1) evaluate the relative effectiveness and efficiency of a programmed slide-tape and a written assignment as instructional strategies to increase perception of proportion in the environment and (2) to determine the relationship of perceptual development resulting from each strategy to the occupational interests of the students using them.

A programmed slide-tape and a written assignment on proportion were developed to accompany a lecture on that design principle. Students enrolled in H.E.D. 143, Design for Living, during the Fall, 1972 term served as subjects for data collection. A perception pre-test requesting the description of the design effect of three slides of environmental settings was administered to all subjects and was scored using King's Content Analysis of Design Perception. Occupational interests were evaluated through administration to all subjects of the

California Occupational Preference Survey (COPS). As a control of the Hawthorne effect, all subjects completed a programmed slide-tape on the design concept of positive and negative space prior to the experiment.

Following a lecture on the design principle of proportion which was attended by all subjects, the students were randomly assigned to either the control or experimental groups. The control group completed the written assignment while the experimental group participated in the programmed slide-tape on proportion. A perception post-test identical to the pre-test in content and method of scoring was then administered to all subjects along with a course evaluation.

Statistical analysis revealed significantly greater perception of proportion for the control group on the factual and analytical scores for slide 2. The experimental group was found to have significantly greater perception of proportion only on the factual score of slide 3. No differences were found on slide 1, on the intuitive scores for any slide, or on the analytical score for slide 3.

No relationship was discovered between the perception scores and any of the fourteen interest dimensions measured for either group. In so far as the measure used is sensitive to differences in learning style, the two instructional strategies do not discriminate against students with different interests.

The programmed slide-tape was found to be more efficient in terms of development and operating cost for a large group setting, and student and faculty time. Student attitude toward each of the instructional strategies was found to be equally positive.

This study, while not conclusive, does indicate that a programmed slide-tape presentation may be a successful instructional strategy to teach basic design concepts in a large group setting. The study does indicate that the method is efficient and certainly bears further examination.

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# CHAPTER I

## STATEMENT OF THE PROBLEM

This study was generated as part of a program of course development for Design for Living, a course offered in the Department of Human Environment and Design at Michigan State University. Once a core course for all Home Economics curricula, Design for Living was revised in 1970, when the College of Human Ecology replaced Home Economics. The course is directed toward "Perceptual development including analytical judgment through the study of design."[1] Explored are "Design components and principles as they relate to the function and ideas in the various phases of man's environment and daily life."[2] Both the natural and man-built environments, including housing, interior design and clothing, are encompassed in the subject matter of the course.

Design for Living is presently required of all Family and Ecology and Human Environment and Design majors and has proved popular with nonmajors as well. It has recently attracted the attention of faculty in other departments within the University, notably

Industrial Arts, and is under consideration as a requirement for majors in that curriculum. Consequently, the students in the course exhibit a variety of interests and levels of sophistication in the subject matter.

The enrollment figures for the course over the last five years are somewhat difficult to evaluate because of the change of curriculum and the fact that during certain periods two sections of the course were offered each term. However, in the two years since the revision of the course, the enrollment in Design for Living has increased 17.7 per cent as indicated in Table 1.[3]

TABLE 1.--Design for Living enrollment, 1970-72

| | 1970-71 | 1971-72 |
|---|---|---|
| Human Ecology Majors | 401 | 493 |
| Non-Majors | 259 | 284 |
| Total | 660 | 777 |

The general increase of student enrollment in the College would tend to indicate that this trend will continue.

Design for Living has traditionally been taught in a large lecture situation by one instructor and one graduate assistant (half- or quarter-time). Occasionally additional graders or clerical assistants have been available. The use of visual aids, commonly in the

form of slides and films, has been integrated into lectures. The very large student-teacher ratio has precluded most opportunity for class interaction in the form of question-and-answer periods or discussion groups.

Given a highly personal and somewhat subjective body of information, a very large and diverse group of students and a limited instructional force, a program of course development has been instituted in Design for Living with the intent of more efficiently and effectively helping students achieve the course objectives. This development has taken several forms, including a bibliography, film, visual testing devices and a series of fifteen short written assignments designed by Dr. Susan King Kilborn. These assignments were intended to offer the students an opportunity to apply the concepts presented in lectures to their own environments and to act as a medium of exchange between student and instructor in the absence of class interaction. This strategy proved effective in contributing to the perceptual development of the students and received a positive response from them as well.

The major drawback of the system was its inefficiency in terms of the time required to grade the assignments. For a class of 259 (average class size, 1971-72) each set of assignments consumed approximately four hours to grade. For the series of fifteen papers,

a total of 60 hours per term and 180 hours per year were spent in reading and evaluating the assignments. The majority of this grading was performed by the investigator who, as a teaching assistant, received approximately $4.25 per hour. For the year, grading the papers cost an estimated $765.00. Considering other problems of grader subjectivity and time lapse between completion of the assignments and their return, the system seemed not only cumbersome but expensive, and an alternative was sought.

During the Winter and Spring terms of 1972, Dr. Kilborn investigated the use of a programmed slide-tape as a possible replacement for the assignment dealing with positive and negative space. The slide-tape demonstrated greater effectiveness than the assignment as an instructional strategy to increase perception of positive and negative space and was more efficient in that it required no time spent in grading papers as feedback was built in. However, it was unclear from these findings whether similar perceptual development could reasonably be expected to result from slide-tape presentations of other design concepts or what the characteristics were of the students who demonstrated the greatest perceptual development as a result of each instructional strategy. The present study was devised to answer these questions.

The design principle of proportion, a chronically difficult concept to teach, was selected for investigation in this study and a programmed slide-tape and a written assignment related to that concept were developed. The effectiveness of these two instructional strategies was to be evaluated through a comparison of verbalized perception of proportion by the students using them. Occupational interests were selected as an indication of student characteristics and the relationship of interests to perceptual development of the students using either the slide-tape or the written assignment was to be investigated. The relative efficiency of the two strategies was to be measured through a comparison of faculty time, student time, development costs and operating costs.

The following hypotheses were generated for investigation in this study:

Hypothesis 1:

The factual, analytical and intuitive perception of proportion verbalized on the post-test will be significantly greater for the experimental group than for the control group.

Hypothesis 2:

The factual, analytical and intuitive perception of proportion verbalized on the post-test will be significantly different for subjects scoring in the upper and lower quarter of each interest dimension within each group.

Hypothesis 3:

The experimental instructional strategy will be generally more efficient than the control strategy.

Through the information gathered in this study, it is hoped that further insight will be gained concerning the relative value of programmed slide-tapes and written assignments in teaching basic design concepts.

## NOTES--CHAPTER I

[1]Michigan State University, Michigan State University Catalog (East Lansing, Mich.: University Editor's Office, 1971), p. A77.

[2]Ibid.

[3]Michigan State University, Registrar's Enrollment Reports (East Lansing, Mich.: Office of the Registrar, 1970-72).

# CHAPTER II

# REVIEW OF LITERATURE

The following review of literature will be presented in several segments in support of the problem under investigation. The review will begin with a brief examination of some of the social pressures necessitating the evolution of educational systems, followed by a discussion of certain innovations designed to meet these challenges; specifically educational technology and the related fields of systems theory and programmed instruction. Following this will be a discussion of some of the unique problems in teaching environmental design and perceptual development. Finally, an examination of the application of educational technology to this subject area and a discussion of the relationship of personality factors to learning and perceptual development will be presented.

## Society's Challenge to Education

It has become highly fashionable to condemn educational institutions in the United States. The pending

lawsuit against a public school system by a California high school graduate makes it abundantly clear that not all the needs of all of the students are being met by all the schools at all times. However, in their eagerness to condemn, the critics tend to ignore the tremendous challenges our society has presented to educational systems and the efforts of educators to meet them. The sources of these challenges to education in general and to Human Ecology specifically will now be examined.

James Finn identifies eight sources of pressure on educational systems in today's society: (1) Population explosion; (2) Information explosion; (3) Rise of depressed sectors of mankind; (4) Desire to improve quality of life; (5) Rate of innovation compared to rate of research and development; (6) Need to meet individual needs in a complex, technical society; (7) A new value system; and (8) Economic pressures.[1] While each of these may present a serious obstacle to educators in meeting the needs of the society they serve, the concepts of the information explosion, or the tremendous increase in the amount of information to be processed, and that of the population explosion, are central to the changing nature of American education and bear closer examination.

Dorsett discusses the problem of information overload in the following way:

> It has been said that each new generation is born a race of savages. Until relatively recent times, the fact that a child is born knowing nothing of the accumulated information and wisdom of all previous history has not proved particularly troublesome. When civilization was moving at a reasonably leisurely pace, parents could get the job started and then look to the schools to take over and impart enough information to convert the aforementioned savages into useful members of society. In the last third of the 20th century, however, it has become abundantly clear that all the society's teachers and all the society's textbooks are not sufficient to the task of keeping information flowing to our country's 50,000,000 students as fast as it is being generated.[2]

The roots of the information explosion, and its impact on education, may be found in the Industrial Revolution. The phenomenal technological advancements in all fields not only began a tremendous increase in new knowledge, but also ushered in new devices for the dissemination of that information more quickly. The rate of change begun during that period has continued at such a rate that it might be said that the only constant in our society is change.

Alvin Toffler deals extensively with the concept of information overload in his book, Future Shock. He states that:

> Today change is so swift and relentless in the techno-societies that yesterday's truths suddenly become today's fictions, and the most highly skilled and intelligent members of society admit difficulty in keeping up with the deluge of new knowledge--even in extremely narrow fields.[3]

He then further pursues the point as follows:

> New knowledge either extends or outmodes the old. In either case it compels those for whom it is relevant to reorganize their store of images. It forces them to relearn today what they thought they knew yesterday.[4]

The effects of the information explosion are felt in all disciplines, Human Ecology being no exception. Not only has there been a huge increase in the amount of technical information relevant to the study of man's shelter, food and clothing, but the discipline itself has broadened its perspectives to encompass a much wider body of information from related fields. Creekmore discusses this expansion as follows:

> Traditionally home economics has been concerned with the physical characteristics and, to a lesser extent, with the aesthetics of food, clothing, and shelter. In recent years we have come to recognize that these environmental resources, as they are used by man, are rich in social and psychological implications and meanings. Thus, the "things" of home economics, man's near environment, can be studied from the physical, socio-psychological (including economic), and the aesthetic points of view. The knowledge about man can also be categorized into three similar aspects--the physical or biological, the behavioristic or socio-psychological, and the expressionistic or aesthetic. These categories roughly parallel the larger areas of knowledge known as the natural sciences, the social sciences, and the arts. Although home economics does not concern itself with all phases of these areas, the fundamental knowledge relative to man and his near environment which is developed in each provides the basis on which to build and an approach to the study of the interaction process.[5]

Thus it may be seen that the study of man's interaction with his environment includes a broad base of information, and new knowledge in these fields will bear relevance to the discipline of Human Ecology.

The impact of a second major challenge to education, the population explosion, is revealed in the following statistics:

> The national bill for higher education came to more than $20 billion in 1969-70, when more than 7,500,000 students--triple the number of the mid-1950s and more than five times the pre-World War II figure--were attending one or another of the 2,500 institutions of higher education. These institutions now enroll more than 40 percent of the population of college age, compared with 14 percent in 1939 and 8-10 percent in Great Britain today.[6]

While it is quite true that the rate of population growth in the United States has declined in recent years, the fact remains that there are not only greater numbers of students to be dealt with than ever before, but also that these students are remaining in school longer.

Within the College of Human Ecology, this population growth can be witnessed in the undergraduate enrollment figures presented in Table 2.[7]

TABLE 2.--College of Human Ecology undergraduate enrollment, 1968-72

| Fall '68 | Fall '69 | Fall '70 | Fall '71 | Fall '72 |
|---|---|---|---|---|
| 1,367 | 1,381 | 1,363 | 1,569 | 1,795 |

As in most other colleges, Human Ecology faces more students each year who must be taught to process an expanding body of information. Coping with the combined

effects of the information and population explosions presents a formidable task.

In light of these pressures, it has become necessary that the course content and methods of presenting an ever-increasing body of knowledge to greater numbers of students be revised. The process of instructional development is geared toward the need for academic programs to " . . . evolve and take on new dimensions as changes appear in the greater society."[8] Faced with a breadth of information from within the basic discipline as well as new information from related fields, and an increasing student enrollment, it is vital that this development process occur in Human Ecology to ensure that it will meet its stated goal " . . . to contribute to the improvement of the human condition for individuals and families in the complex of American society today."[9]

The next section of this review of literature will deal with some of the particular manifestations of the development process in education which are directed toward better meeting the challenges of society.

## Educational Technology, Systems Theory and Programmed Instruction

The technological revolution which has brought about a major challenge to the educational system in this country has not occurred in total isolation from

that institution. The implications and potential for the application of technological development in the educational sector of society are discussed by DeKieffer.

> It is obvious, even to the casual observer, that a revolution in communications is under way. This revolution is generated by the rapid developments in the fields of mass communications media and mass instructional media, such as radio, television, teaching machines, and other mechanical devices that assist in teaching and learning. The introduction of these innovations into the field of education has made necessary a wholly new evaluation of teaching methods and classroom techniques and procedures.[10]

Many educators are of the opinion that the only way to keep American education viable is to revolutionize it by mechanization to stay in step with the fast-paced, rapidly changing, mass techno-society in which it exists. A decentralized, highly personalized, future oriented method of instruction is envisioned by Toffler who states that "This trend will be sharply encouraged by improvements in computer-assisted education, electronic video recording, holography, and other technical fields."[11] The application of technology in education will make it possible to disperse more information to more people in a shorter length of time, as well as offering the advantage of more individualized instruction. However, this innovation in education cannot occur arbitrarily. It requires careful planning and execution to be effective, and the guidelines may be found in part in systems

theory and its application in programmed instruction, both of which will be more closely examined before proceeding.

Bela Banathy, in his book, Instructional Systems, identifies the systems approach as " . . . common sense by design."[12] Systems theory is actually based on principles of cybernetics and draws on the disciplines of philosophy, logic, communications and psychology. Its application to education is revolutionary because it provides a model for viewing education as a very complex sector of a larger environment and allows for the precise definition of educational goals, processes and outputs.

Systems, as defined by Banathy, are:

> Assemblages of parts that are designed and built by man into organized wholes for the attainment of specific purposes. The purpose of a system is realized through processes in which interacting components of the system engage in order to produce a predetermined output. Purpose determines the process required, and the process will imply the kinds of components that will make up the system. A system receives its purpose, its input, its resources, and its constraints from its supra-system. In order to maintain itself, a system has to produce an output which satisfies the supra-system.[13]

That education is a system, and therefore subject to systems theory, should be obvious from this definition. It is decidedly a man-made complex with a specific purpose--to impart information. Its processes are the various means of instruction directed toward the output of educated individuals. Education is a subsystem of

the suprasystem of society which determines the purpose, resources and constraints of education. However, to prevent education from becoming dissonant with its suprasystem, the application of systems theory may be indicated.

Systems theory requires that a system's purpose, processes and outputs be constantly reexamined, redefined and revised in order to maintain a compatible relationship with its environment, and ultimately, to survive. Through the application of these concepts to education, that system can be brought more in tune with the demands of the society it serves. The major systems concepts applied to education indicate that the following model may be used in designing any segment of instruction.

1. Formulate specific learning objectives, clearly stating whatever the learner is expected to be able to do, know, and feel as an outcome of his learning experiences.
2. Develop tests to measure the degree to which the learner has attained the objectives.
3. Examine the input characteristics and capabilities of the learners.
4. Identify whatever has to be learned so that the learner will be able to perform as expected.
5. Consider alternatives from which to select learning content, learning experiences, components, and resources needed to achieve the stated objectives.
6. Install the system and collect information from the findings of performance testing and systems evaluation.
7. Regulate the system. The feedback from testing and evaluation will serve as a basis upon which the system will be changed--by design--in order to ensure ever-improving learning achievement and optimum systems economy.[14]

While these steps may seem fairly obvious, they are, in fact, a major departure from the relatively intuitive approach to instruction which has prevailed in much of our educational system. In light of the tremendous expansion of information and student numbers, it is absolutely essential that we know what we want to teach, how we are going to teach it, and the characteristics of the learners, both before and after receiving the instruction, before we blithely proceed. It is also crucial that we constantly reexamine instructional systems to ensure that they are both efficient and effective. It is these principles which have led to another major innovation in education and one which further contributes to its ability to cope successfully in our society; programmed instruction.

Programmed instruction is largely the result of the need to impart large amounts of information to large numbers of highly varied individuals. When it was first developed, the concept of programmed instruction was primarily product oriented. That is, programmed instruction was defined in terms of the characteristics of the program which were that information was broken down into very small segments, active student response was required frequently and immediate feedback was always provided. Many of these early programs earned the reputation of being boring and tedious and were of doubtful value as instructional tools.

Later, research on the characteristics of programmed instruction indicated that the size of the information step and the amount of student response and reinforcement could be highly variable in some programs and learning could still occur. These findings brought educators to the present state of the art which is more process oriented. In other words, the ability of programmed instruction to teach is not a result of how the program looks, but rather of how it is developed. A program which follows a logical, systematic process of development may be a successful instructional strategy regardless of the size of the steps, the frequency of student response or the amount and frequency of feedback, although these characteristics are admittedly important in a programmed series.

Inherent in this concept of programmed instruction are some very basic ideas of systems theory. Dorsett indicates this relationship in the following:

> Before program design even begins, the desired end products of it must be clearly defined. These end products include the responses the student is supposed to be able to make upon completion of the program as well as the skills and understandings to be learned. This definition might require a long-overdue revision of courses and requirements in order to determine the necessary content of teaching. In addition, it is necessary to test the program, which is usually done by administering the program to a student, then revising it to accommodate the difficulties encountered. The process would be repeated with successive students until a satisfactory program is gained.[15]

Bearing this relationship in mind, programmed instruction can be thought of as being:

> Concerned with the selection and arrangement of educational content based upon what is known about human learning. It is a process of constructing sequences of instructional material in a way that maximizes the rate and depth of learning, fosters understanding and the ability to transfer knowledge to new situations, facilitates retention, and enhances the motivation of the student. It is an explicit process; it is what an effective teacher does intuitively.[16]

There are certain other characteristics of programmed instruction which further distinguish it from traditional methods of teaching as well as contributing to its effectiveness as an instructional strategy. The first of these is that programmed instruction may occur with or without the presence of a teacher. Consequently, the teacher is freer to spend time with individual students either in offering assistance where needed or in developing other activities. This can be advantageous to the student as well in that he need be less reliant on the attention of the teacher and still proceed through a body of information.

Another attribute of programmed instruction is its adaptability to various methods of presentation. Programs can take the form of a textbook, an audio-visual presentation of several types including filmstrips and slide-tapes, computer-assisted instruction or teaching machines. Such devices allow programmed instruction to occur in a variety of settings and include

a variety of content. Research on programmed instruction through all of these devices indicates that it may be successful, regardless of the method of presentation. Again, this points to the fact that it is the process, rather than the product, which is crucial in programmed instruction.

The use of audiovisual aids in programmed instruction bears particular relevance to this study. The combination of these two instructional strategies represents the coupling of two very effective teaching techniques--the presentation of information through the discipline of systems theory and sensory stimulation through two channels--auditory and visual. The characteristics of programmed instruction having been previously examined, the investigator will now proceed with a closer view of the role of audiovisual aids in instruction.

Audiovisual aids are not new in teaching. Gerlach and Ely point out that:

> Good teachers have been using instructional media for centuries. Jesus drew pictures in the sand and used objects in the environment as teaching media. Comenius wrote Orbus Pictus (The World in Pictures) in 1658; it was the most popular illustrated textbook ever written for children. Pestalozzi held that sense impression is the only true foundation of human knowledge. His influence was felt throughout the nineteenth century. As new inventions brought about new technologies, the educational community derived benefits from the new developments--printing, recording, photography, cinematography, radio, television, and the computer all contributed to the vast array of resources now available to nearly every teacher.[17]

This discussion includes all types of instructional media, but the present study is concerned only with audio-visual materials which are, according to DeKieffer, " . . . those experiences and devices used in a teaching situation which employ the use of sight and/or sound."[18] He classifies such devices into three groups: Projected materials, nonprojected materials and audio materials.[19]

That these devices are useful in teaching has been supported by a large body of research. Several qualities of audiovisual materials have been indicated as reasons for their usefulness in the teaching situation. DeKieffer lists these as follows:

1. They stimulate a high degree of interest in students--and interest is an important factor in learning.
2. They provide a concrete basis for the development of understandings and thought patterns, thereby reducing the number of purely verbalistic responses made by students.
3. They supply the basis for developmental learning and thereby make learning more permanent.
4. They provide experiences not easily secured in other ways and hence contribute to the depth and variety of learning.
5. They contribute to the growth of understanding, thereby contributing to vocabulary development.
6. They offer a reality of experiences which stimulate individual activity on the part of the learner.
7. They motivate students to investigate, thereby increasing voluntary reading.[20]

Given the attributes of audiovisual aids plus those of programmed instruction, the advantages of pairing the two teaching strategies in an instructional system should be obvious. It is difficult, however, to make any definitive statement concerning the optimal

combination of the two methods. Although a great deal of research has been conducted comparing the effectiveness of programmed instruction presented by a variety of audio-visual devices, no conclusive evidence favoring one form over all others is available, as reported in a review by Campeau.[21]

The research on programmed instruction in general does indicate that when prepared systematically, it can be effective regardless of the method of presentation, as was previously indicated. Taber et al. reiterate this position in stating that the characteristics of the subject matter are among the most important factors in selecting the medium for a programmed sequence.

> The stimuli for some subject matter can be displayed by print on paper, and the response to them can be made by a pen or pencil. The stimuli for other subject matter may require the display of sound and ideally the detection of correct vocal responses.[22]

In other words, the peculiarities of the instructional setting are more relevant to the decision about the method of presentation than any conclusive research finding.

In light of this information, the investigator will now consider the particular subject area of interest in this study--environmental design--and review some of the problems of teaching it and the relevance of audio-visual programmed instruction.

## Design Instruction and Audiovisual Teaching Programs

Before examining the use of audiovisual teaching programs in design instruction, it is necessary to consider the rationale for teaching the subject. The justification for teaching art and design is troublesome to philosophers and teachers, as well as to students. The nature of the subject matter is highly personal and somewhat subjective, and information about design and art is condemned as interfering with the "aesthetic experience."[23] Students tend to agree with this point of view, saying that the analysis of art spoils their interaction with it. Teachers of design often share a feeling that certain people have an innate capability in this area, and require no instruction, while others who lack this sensitivity cannot be taught.

Some of these ideas may be justifiable to a limited extent when dealing with the fine arts which exist simply for the aesthetic pleasure they can produce. However, environmental design, which includes such things as housing, clothing, interior design and industrial design, must be viewed in a different perspective due to the utilitarian considerations it encompasses.

Papanek, in discussing environmental design, states that "All men are designers. All that we do, almost all the time, is design, for design is basic to

all human activity."[24] As both producers and consumers of design, all people have a responsibility to make rational decisions about the design of their environment, and consequently, have a right to the information which will allow them to make those decisions. The ecological crisis in which we are now involved may be attributed in part to both a lack of awareness and a lack of responsibility by people in general with respect to the design qualities of their environment. Sommer states that:

> Rather than to exclude people from making design decisions because they are ignorant, the most feasible solution is to educate them. Many people have become so accustomed to ugliness and congestion that they don't know anything else.[25]

In other words, people are unaware that they can have any impact on the design of their environment, and the first step toward awakening them and toward fostering responsibility in decision-making is to educate them concerning the alternatives which are available. This is not to say that design educators should legislate taste, but rather that all people have a right to be aware of the alternatives which are available to them in controlling the design of their environment. This concept can be summarized as follows:

> People want a voice in the design and use of their buildings, streets, parks, and cities. They want to be more than spectators and consumers in a world designed and managed by remote professionals. They want to be more than passengers on a spaceship; they want to help design and personalize their cabins and passageways and to have a go at the controls.[26]

This view of design represents a radical departure from what has been a prevailing attitude toward that body of information. It is interesting that just as design educators tend to resist innovation in their philosophy, so do they resist, even more strongly, technological innovation in the instructional process. Rasmussen points out the irony of this fact when he states that:

> Teachers of music, art and industrial arts are probably in the forefront of those who admit that the arts have not, as yet, found ways of taking full advantage of available instructional media. It is, therefore, of interest to recall that the arts could hardly have entered the curriculum at all without media utilization.[27]

Although referring to several forms of the fine arts, this statement is particularly applicable to environmental design. The very nature of the subject matter demands the extensive use of visual aids. However, the degree of media utilization in design instruction has not progressed much beyond the use of still pictures. Rasmussen indicates several reasons for this deficiency, the first being what he terms a " . . . pro-personal, anti-mechanical approach to instruction."[28] Many instructors of design tend to view the use of media as a poor substitute for the real thing and regard with suspicion the imposition of machines on a highly personal subject matter. This would seem to represent a rather shortsighted philosophy

in two respects. First, any reasonable substitute is better than nothing when the real thing is unavailable, and second, it totally ignores the benefits which might be derived from the use of technology.

The fact that "Some teachers feel not only an innate bias against what they term mechanical, but also a frustrating inability to cope with the manipulation of equipment"[29] is cited as a second reason for the lack of media utilization in design instruction. Anyone who has been extensively involved with instructional media can well appreciate the helpless feeling which is experienced when a mechanical breakdown occurs. However, most audiovisual devices are exceedingly simple to use, and with a minimum of practice, their operation can be mastered. Many school systems provide personnel especially to cope with these problems.

A third problem cited is that "It is sometimes difficult for arts teachers to know just when a given instructional aid will be wanted."[30] This argument is perhaps more a condemnation of the state of design curricula than of the appropriateness of media in this type of instruction. The point made is simply an indication of how desperately design instruction requires more clarification--in short, it requires the application of systems theory. It is also clear that design instruction could benefit from the highly individualized

nature of a great many audiovisual teaching aids which can be made available at the convenience of the student.

A final argument offered against the use of media in design instruction is that "The quality of instructional aids for the arts has too often been poor."[31] This would seem to be the most valid of these somewhat indefensible arguments. Most media specialists would agree that no media is better than poor quality media. However, there is little excuse for poor quality media since audiovisual aids of tremendous variety are available, some quite inexpensively. It requires only time to critically examine the selection and determine what is most suitable for a student's particular needs.

Having demonstrated the weakness of the arguments offered against media innovation in design instruction as well as having pointed out the potential for the application of systems theory in that discipline, the investigator will now examine the studies of various audiovisual instructional systems used in teaching design.

Rasmussen states that:

> The development of systems packages in which audio, visual, and evaluative techniques are combined appears to offer great potential in the arts area. Such packages can be designed for group or individual instruction. They may well provide part of the answer to the problem of insufficient arts personnel in the elementary grades, and make possible an enriched curriculum for talented students at all grade levels. Further, the development of such packages, and the research which goes

> into that development, will tell arts educators more than they have ever before known about what constitutes effective teaching and learning in their own subject area.[32]

In spite of this bright future for mediated learning systems in design education, there is a distressing lack of reported research on such programs, very likely reflecting the resistance of design educators to adopting such an approach. One particularly relevant study was conducted by Yoder who developed an auto-tutorial system using audiovisual methods to teach selected fine arts principles related to various ways of rendering a visual image on a two-dimensional surface. He selected a group of nonart majors and administered the instrument and a related booklet to half of them. The others were presented with the same material via a lecture and the booklet. The groups were compared on the following variables:

1. Time required to complete either instructional system: The experimental group required an average of 35 minutes per person compared with 40 minutes per person for the control group. This totals to a potential savings of 18 1/2 hours of instructor time for the class.[33]

2. Post-test performance: The experimental group averaged 2.08 mean points higher than the control group on the post-test.[34]

3. Final course grade: The experimental group earned an average grade of 2.7 compared with 2.46 for the control group, the difference being attributed to the flexibility of the auto-tutorial system in allowing students to proceed at their own rate and to review if necessary.[35]

It was also reported that the students in the experimental group showed a positive response toward the auto-tutorial system. On a questionnaire, 185 of 200 responses indicated this positive reaction.[36]

One limitation of this study should be taken into account when evaluating these results. Since no control was exercised over the Hawthorne effect, it could be that some of the differences were due to a change in normal classroom procedures and the heightened interest this might have produced in the experimental group. In spite of this limitation, the study does lend credibility to the assertion that audiovisual programs are both effective and efficient means of design instruction.

Another relevant study was conducted by Kilborn (King) in which the perceptual development of students instructed via a lecture-assignment series dealing with the design concept of positive and negative space was compared with that of a group of students instructed in the same concept via a lecture and programmed slide-tape presentation. It was found that the slide-tape

presentation was more effective both in short- and long-term learning. Ninety-nine and three-tenths per cent of the experimental group were able to apply the concept on a short-term post-test as compared with 82 per cent of the control group. On the long-term post-test, 50 per cent of the experimental group and only 30 per cent of the control group recalled and applied the concept.[37]

While both of these studies indicate the usefulness of audiovisual teaching programs in design instruction, neither of them examine the characteristics of the students beyond citing an increase in the quantity of demonstrated learning. Much research in programmed instruction using a variety of methods of presentation indicates that the performance of students exposed to such instructional strategies is closely related to their individual characteristics. Haskell states that:

> Research undertakings which have been concerned with examining the effects of individual learner differences as they interact with various instructional methods provide some indication that identification of such learner characteristics may be useful for prescribing different instructional approaches for different individuals.[38]

It is highly likely that certain personality factors found in various students would contribute to or detract from their ability to perform successfully in any given instructional setting. It is important to assess this interaction in any development process in order to discover the best method of instruction for each individual.

This relationship was investigated by Haskell in a study attempting to discover the relationship of performance on a programmed unit to personality dimensions measured by the Guilford-Zimmerman Temperment Survey. It was discovered that students who exhibited a methodical and agreeable temperment were better suited to programmed instruction than those characterized as aggressive.[39]

In another study by Majer, similar findings were reported in an attempt to discover the characteristics of learners who were successful in a computer-assisted course in physics. The best performers in such a sequence were found to be less mature, more sensitive and not scientifically oriented. Students who were autonomous, had a high degree of interest in science and were mature in their academic style were more successful in a traditional instructional setting.[40]

While the personality characteristics which distinguished the successful students in these programmed instructional settings may not be universal in all situations where programmed instruction is used, the findings do clearly indicate the relationship between learning in various instructional settings and personality differences. The implications of these studies for the present investigation will be examined more closely since the development of perception is an ability somewhat distinct from the skills investigated by Majer and Haskell.

Perception cannot be taught in the same sense that physics was taught in Majer's study, nor can it be measured directly. However, perception results from experience, and certain experiences may be formulated to develop perception. This perceptual development can then be measured in terms of visual literacy, defined by Yochim as: "An attribute which is generally associated with a high degree of perceptual skill, (is) achieved through a constant and judicious viewing, and experiencing through other senses, one's visual world."[41] Experiences which will develop this ability may take an infinite variety of forms, including audiovisual learning systems, and inferences about perceptual development resulting from these experiences may be made by measuring observable indications of perception, such as what a person says.

In a sense, then, perception is a learned ability and the findings of studies indicating a relationship between personality characteristics and performance in various learning situations has relevance to the study of perceptual development. It is reasonable to assume that the perceptual development of individuals using different instructional strategies will be related to personality differences. The present study was undertaken to clarify this relationship through an examination of the development of perception of proportion in the environment resulting from two different instructional

methods and personality characteristics expressed through choice of occupational interests.

## Definitions and Assumptions

The definitions adopted in this study and the assumptions upon which it is based will be presented in this section.

### Definitions

Occupational Interests.--Operationalized as areas of professional and skill interests in fourteen dimensions as measured by the California Occupational Interests Survey (COPS).

Perception.--Conceptualized as " . . . a series of mental processes involved in internalizing, interpreting and reacting to sense stimuli both cognitively and emotionally. When verbalized it will communicate one's awareness of, and response to, . . . art."[42] In this study, perception will be measured by King's Content Analysis of Design Perception using the following categories:

a. Factual Statements.--" . . . a correct or incorrect representation of what actually occurs, but it is, nevertheless the verbalization of what is seen by the individual at this level of perception."[43]

b. Analytical Judgments.--" . . . the interpretation of what is present beyond that which appears as fact. Something is present to substantiate the judgment."[44]

c. Intuitive Judgments.--" . . . the interpretation beyond what is present or apparent, based on the individual response to what is seen. Nothing appears to substantiate directly an intuitive judgment."[45]

Programmed Slide-Tape.--The visual instrument employed as an instructional strategy by the experimental group of the study. It is an audiovisual teaching system developed following the techniques of programmed instruction and designed to increase awareness and critical judgment of proportion in the environment through still slides and a tape recording.

Proportion.--Conceptualized as a design principle which " . . . refers to the size relationships of parts to the whole and to one another."[46]

Written Assignment.--The alternative visual instrument employed as an instructional strategy by the control group of the study. It is designed to increase awareness and critical judgment of proportion in the environment through analysis of a still photograph.

Assumptions

1. The Fall, 1972, class of Design for Living, H.E.D. 143, will be representative of all H.E.D. 143 classes.
2. The programmed slide-tape and written assignment used in this study are of equivalent content and are reliable instruments to increase awareness and critical judgment of proportion in the environment.
3. The perception pre-test and post-test are reliable and valid indicators of perception of proportion.
4. The investigator's scoring of the perception pre-tests and post-tests is reliable and valid.
5. The experimental and control groups are equivalent through random assignment.

## NOTES--CHAPTER II

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[27]Warren I. Rasmussen, "Instructional Process and Media Integration in the Creative Arts," in Instructional Process and Media Innovation, ed. by Robert A. Weisgerber (Chicago: Rand McNally & Co., 1968), p. 152.

[28]Ibid., p. 153.

[29]Ibid.

[30]Ibid.

[31]Ibid.

[32]Ibid., p. 160.

[33]Walter Yoder, "The Application and Evaluation of a Pilot Study on the Effect of a Self-Instructional Unit Concerning Basic Design Principles for Selected Non-Art Majors" (unpublished Ph.D. dissertation, Michigan State University, 1970), p. 52.

[34]Ibid., p. 43.

[35]Ibid., p. 54.

[36]Ibid., p. 52.

[37]Susan King Kilborn, "Measurement and Development of Perception" (paper presented at the 63rd annual meeting of the American Home Economics Association, Detroit, Michigan, June 28, 1972), p. 4.

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# CHAPTER III

# METHODOLOGY

The procedure followed in this study will be presented in three sections: (1) Selection and development of the measures; (2) Selection of the sample; and (3) Method of data collection.

## Selection and Development of the Measures

### The Visual Instrument

The visual instrument used in this study was a programmed slide-tape dealing with the design principle of proportion and developed by the investigator. The development process followed a Nine-Step Instructional Development Model illustrated in Figure 1. The development activities in each of the nine categories will be examined in detail.

Define Problem/Opportunity.--The problem which motivated this study is discussed in detail in Chapter I. Briefly stated, the problem was that the relatively successful instructional strategy of lectures and written

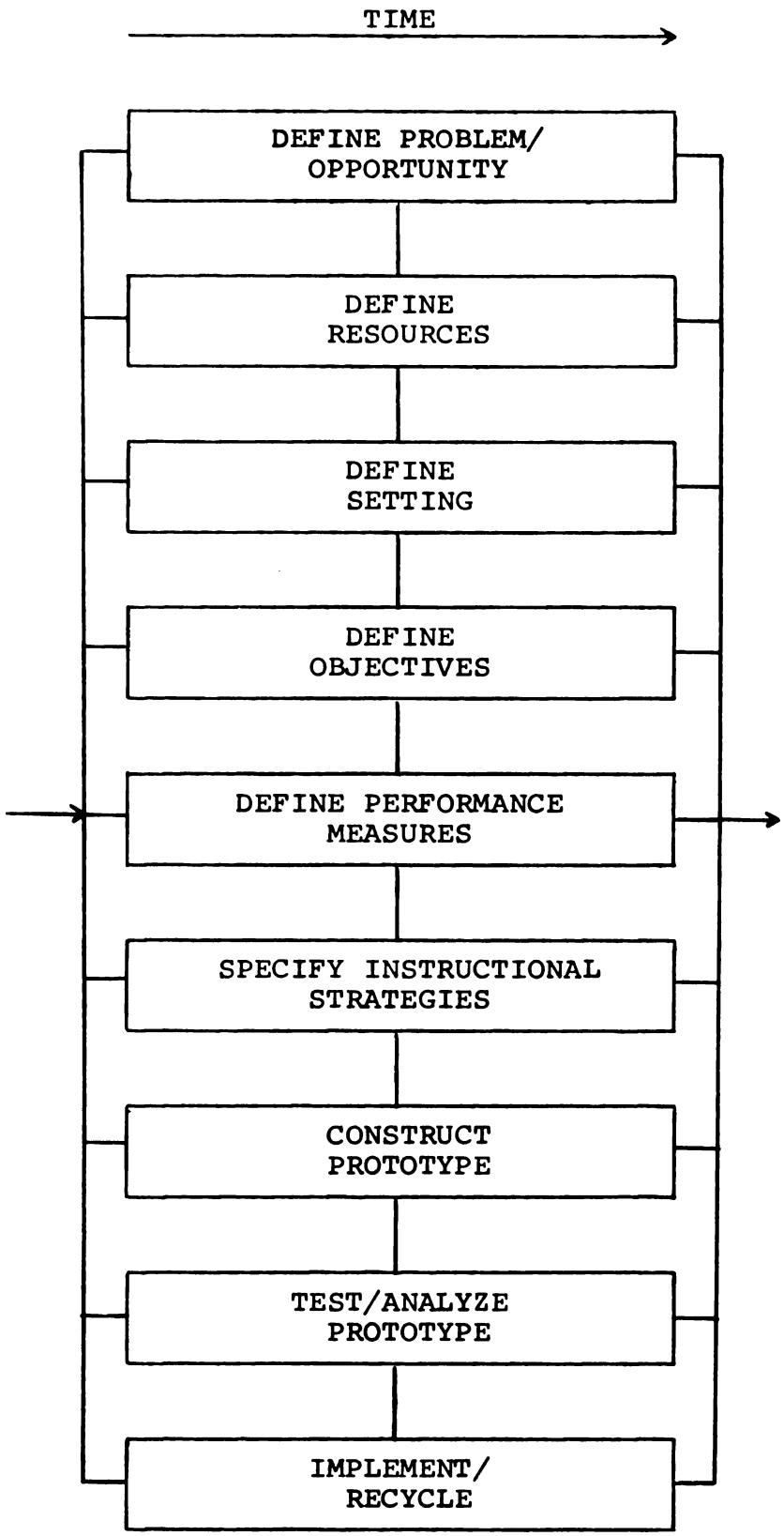


Figure 1.--Nine-Step Instructional Development Model[1]

assignments to increase perception of design in H.E.D. 143, Design for Living, was untenable in terms of grader time and expense. Some alternative to this strategy was sought which would be equally or more effective in increasing awareness of design elements and principles in the environment, and more efficient in terms of student and grader time, as well as long-range economic costs.

Define Resources.--Fortunately, resources were plentiful and readily available for this project. Personnel within a well-equipped Instructional Media Center helped to plan and implement a solution to the indicated problem. Expert advice and assistance were made available during the various stages of the audiovisual production and development. Funding was provided through the College of Human Ecology and the Educational Development Program. Physical resources included classroom facilities with a fully equipped media booth in which a variety of audiovisual devices could be operated.

Define Setting.--The physical setting has already been described, as have some of the characteristics of the course, Design for Living. The audience was analyzed on the basis of information about the students in a number of previous H.E.D. 143 classes. It was anticipated that the sample used in the study would number

about 260 students, the majority of whom would be Freshmen and Sophomores and majors in the College of Human Ecology. It was also expected that these students would represent a variety of levels of sophistication concerning the subject matter and would have diverse expectations about the course.

These projected characteristics proved similar to those of the class used in data collection in this project which numbered 259, 204 of whom were subjects for the study. A Personal Inventory (reproduced in Appendix A) revealed that 80 per cent of these students were enrolled in one of the various majors within the College of Human Ecology. Their fields of interest included such diverse subjects as Criminal Justice and Home Economics Education, and their training in design ranged from none to a maximum of 16 years, 4.25 years being the average.

Other than the physical resources available in the classroom, this setting included a limited staff. Other than the instructor, there would be only one assistant to operate the audiovisual equipment, so that a solution geared to an in-class, group setting would have to be operable by these two individuals.

Define Objectives.--A general objective for development was that a more efficient and equally or more effective instructional strategy to increase

perception of design elements and principles in the environment would be produced to replace written assignments. After selecting the design principle of proportion, a traditionally troublesome concept to teach, the following specific behavioral objectives were generated:

1. Students in H.E.D. 143 will be able to identify correctly each of ten illustrations of the various types of proportion such as equal proportion (all parts the same size), unequal proportion (all parts of different, apparently unrelated sizes), and golden section proportion (parts of different sizes, related in an orderly progression).

2. Students in H.E.D. 143 will be able to state the reasons for their decisions in identifying the illustrations of the different types of proportion.

3. Students in H.E.D. 143 will be able to write a statement of defense of their overall judgment of the various proportions in illustrations of environmental settings, indicating the following characteristics of proportion in their defense: Unequal and Golden Section proportion--interesting, contrasting, chaotic and lacking in unity; Equal proportion--harmonious, rhythmic, monotonous and lacking in variety.

Two program objectives were also generated:

a. Students will correctly respond to a minimum of 80 per cent of the questions on the slide-tape on proportion.

b. After completion of the slide-tape, students will write significantly more factual statements and analytical and intuitive judgments related to proportion on a perception post-test than they did on a similar pre-test.

Define Performance Measures.--In view of the general objective that the development process should be aimed at increasing perception of proportion in the environment, it was necessary to measure perception of that principle. The tremendously complex nature of perception nearly defies measurement. However, a measure was available which analyzes verbalized perception in terms of quantity and quality of response. This measure, King's Content Analysis of Design Perception, developed in 1967 by Dr. Susan King (Kilborn), consists of an open-ended question, asking for a description of the design effect of an environmental setting. The responses are coded into three categories based on Jung, which are defined as follows:

> Factual Statements: The concept used here is derived from Jung's concept of sensing, being the conscious awareness of that which appears to be present. The factual statement may be a correct or incorrect

> representation of what actually occurs, but it is, nevertheless, the verbalization of what is seen by the individual at this level of perception.
> Analytical Judgments: The concept used here is derived from Jung's concepts of feeling and thinking, being the interpretation of what is present beyond that which appears as fact. Something is apparent to substantiate the judgment.
> Intuitive Judgments: The concept used here is derived from Jung's concept of intuiting, being the interpretation beyond what is present or apparent, based on the individual response to what is seen. Nothing appears to substantiate directly an intuitive judgment.[2]

The measure was later strengthened by clearer specification of each category as follows:

> Factual Statements:
> a. Description or name of an element.
> b. Classification of an item.
> c. Qualification of a visual picture.
> d. Verbalization of a principle evident in picture, stated as seen (two to three proportion).
> Analytical Judgments:
> a. Descriptive adjective stimulated by something in picture.
> b. Positive or negative comment.
> c. Reason for positive or negative comment, might be stated as principle.
> d. Associated with category or appropriateness.
> e. Association with current or historic fashion image (too long, modern, fashionable, victorian).
> f. Verbalization of a design principle which implies projected feeling (top heavy).
> g. Descriptive word used as association (looks like a kite).
> Intuitive Judgments:
> a. Suggests specific occasion.
> b. Relates to individual's experience.
> c. Associated with larger social order.
> d. Inferences about model.
> e. Suggestion or preference for change.
> f. Something is lacking in picture on which individual is inspired to comment.[3]

An example of each of these categories in the present study might be: Factual Statement--"It is equal

proportion." Analytical Judgment--"It is monotonous." Intuitive Judgment--"It reminds me of the kitchen in my Grandmother's house."

This measure was originally developed for use in a study by King (Kilborn) (1967) and it was found to successfully distinguish among different groups. Later studies by Pankowski (1969), King (Kilborn) (1969) and Boehme (1970) lent further support to the reliability and validity of the test with similar findings of its ability to consistently distinguish among groups.

This measure was used as both the pre- and post-tests for this study, and a copy of this test may be found in Appendix B. Three slides were selected to represent various aspects of the environment including an interior, a housing exterior and a fashion model, and were used as visual stimulation in the pre- and post-tests, with ten minutes allowed for the description of each slide.

Specify Instructional Strategies.--As indicated previously, a slide-tape presentation was selected for this study. This decision was based on all the information gathered about the problem, resources, setting and objectives as well as the information about the success of another slide-tape used in this situation and described in the problem statement of Chapter I. The slide-tape is also consistent with the use of

slides during the lectures in H.E.D. 143, is less expensive and more flexible than film, is easy to use in either a group or an individual setting and can be adapted, with slight modifications, to either situation. A group presentation was selected for this study because of the negative reaction of another Design for Living class to the suggestion of an individual adaptation for use outside the classroom.[4]

Construct Prototypes.--The original slide-tape was developed by the investigator following the principles of programmed instruction and included active response and immediate reinforcement. It was a linear construction, designed to be used in a group situation. The slide-tape was intended to increase awareness and judgment of proportion in the environment, and the visuals were selected to represent all aspects of the natural and man-built environments. Music was incorporated into the audio portion of the slide-tape during response intervals. A response sheet was prepared to accompany the slide-tape providing feedback to both the instructor and student as to progress. A copy of this response sheet may be found in Appendix C. The slide-tape presupposes some basic information about proportion as it is intended as a follow-up activity to a lecture on that topic to replace a written assignment.

Test/Analyze Prototype.--The prototype was tested on a group of ten women students enrolled in an upper-level design course in Human Environment and Design. These students were selected because they were assumed to have been exposed to the prerequisite information necessary for completion of the slide-tape as they had all taken Design for Living at a previous time. (This information would be provided in the lecture in the actual instructional setting.) Another consideration in the selection of this group was that, having taken H.E.D. 143, their suggestions and criticisms of the slide-tape would be made recognizing the requirements and limitations of that course and would consequently be more relevant than those of strangers to the course.

The testing procedure loosely followed a process developed by Abedor for the evaluation of self-instructional mediated learning systems. This procedure is a step-by-step model for testing and evaluating the weaknesses and strengths of mediated learning systems. The graphic representation of this procedure appears in Figure 2.

Due to the constraints of time and availability of the testing group, the ten students were not evaluated on their S.A.T. scores. Also, as the main purpose of this test was to determine the weaknesses of the prototype, no learning measure other than the response sheet

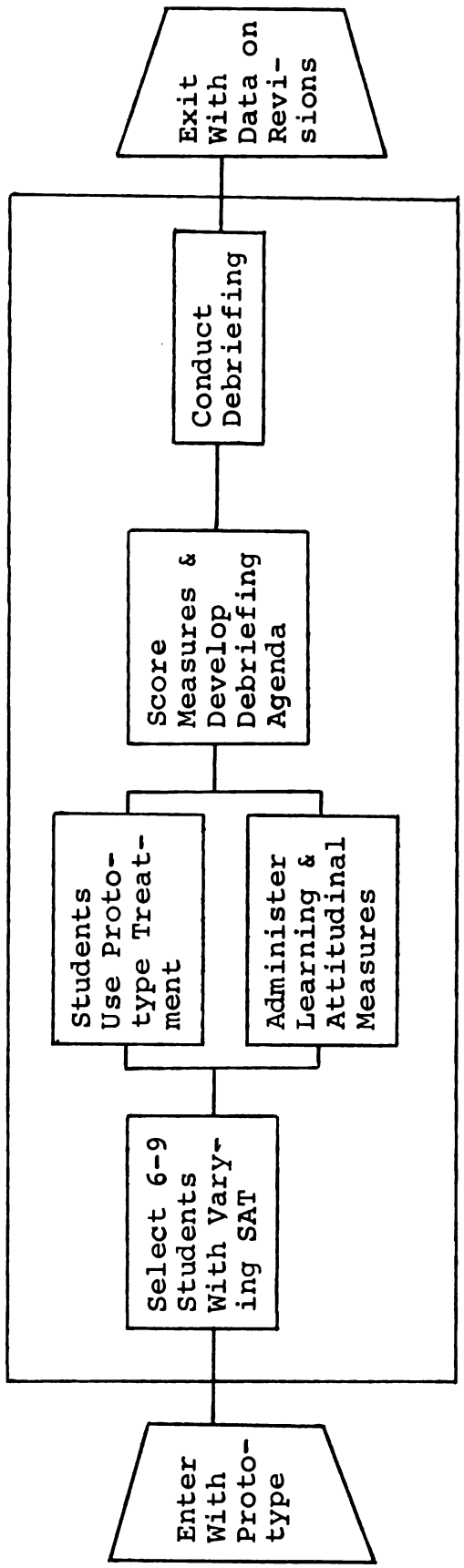


Figure 2.--MK II Student Group Tryout and Debriefing Technique[5]

for the slide-tape was administered. The response sheets did prove useful in providing sufficient information about the trouble spots in the slide-tape. A Student Reactionnaire, also developed by Abedor and designed to be used in this procedure as a guide to debriefing, was administered and is reproduced in Appendix D.

Again, due to the constraints of time, these measures were not formally scored until after the testing session was completed, and as a result, the debriefing was less formal than that suggested by Abedor. However, his prescription to place oneself on an equal status with the testing group was followed with success, and the debriefing was conducted on that basis. The investigator asked the test group for help in assessing the slide-tape, and valuable information was elicited in an informal exchange of ideas indicating the weaknesses and strengths of the instrument. On the basis of this informal debriefing as well as the information in the Student Reactionnaire and on the response sheets, the slide-tape was recycled. A graphic representation of the actual procedure followed in this prototype tryout is found in Figure 3.

Implement/Recycle.--It was evident from the prototype tryout that the slide-tape required some revisions before use in the experimental situation. None of the test group achieved the program objective

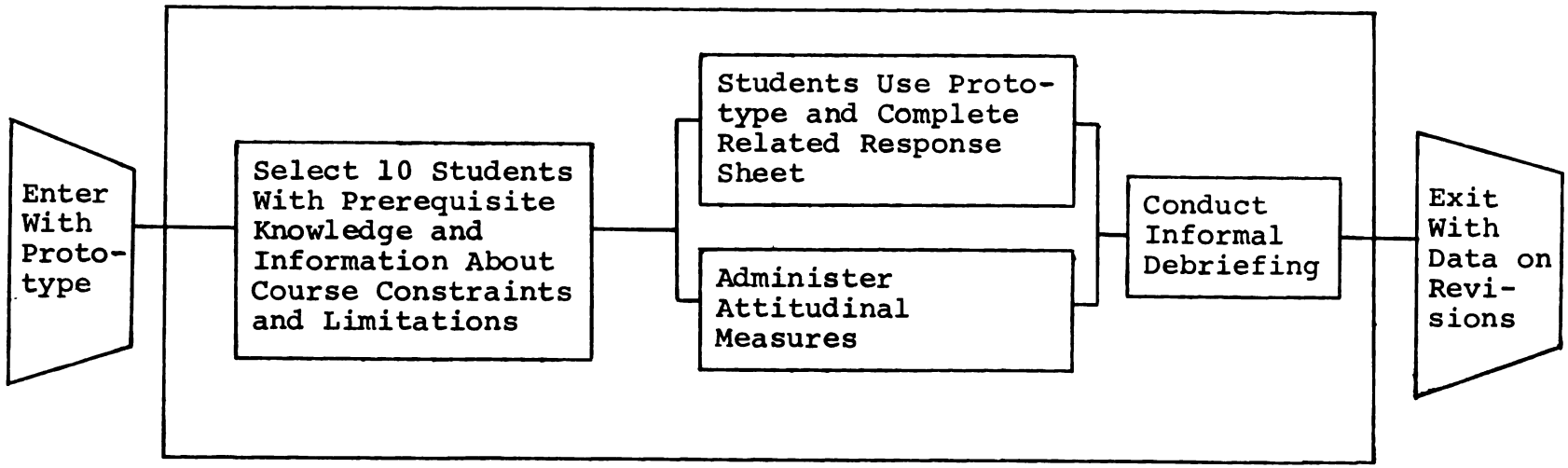


Figure 3.--Actual Student Group Tryout and Debriefing Technique

of 80 per cent accuracy on the response sheet, and an observation of common errors plus comments made in the debriefing led to the replacement of several of the visuals with clearer illustrations.

A second major revision consisted of allowing twice as much time for responses on several questions. A lack of time was cited in the debriefing as a major cause of incorrect or incomplete answers, rather than lack of comprehension. A related problem discovered during the debriefing was confusion over when to respond and which slides related to which questions. This problem was remedied by changes in the script.

A final major weakness in the prototype was discovered in reviewing the Student Reactionnaire. The students indicated a lack of understanding of precisely what they were supposed to be learning. This led to a concise statement on the audio portion of the slide-tape of the general objective of the exercise.

Several positive reactions were obtained from the testing group during the debriefing. The most encouraging for the investigator was a general enthusiasm for the slide-tape concept for use in Design for Living, lending support to the development process. Other positive aspects cited included the use of music and the investigator's voice in the audio part of the instrument.

After completing the indicated changes, the slide-tape was ready for use as the visual instrument in the study. It is estimated that the time required for the complete development process totaled approximately sixty-five hours and cost $188.26 for materials.

The Alternate Visual Instrument

As an alternate to the slide-tape, a written assignment was devised for the control group in this study. This instrument evolved from several similar assignments used in previous Design for Living classes and paralleled the slide-tape in its objectives and in the type of problem presented. The assignment, which is reproduced in Appendix E, consisted of three parts, the first of which required that students select one of several photographs of environmental settings in which they perceived various proportional relationships. These photographs were of the same settings as those in the slide-tape to increase the similarity of the experiences. The second part of the assignment requested the students to sketch the forms illustrating two different proportions in the setting and classify each according to whether equal, unequal or golden section proportion was represented. The final section of the assignment required that the students evaluate these proportions as part of the total setting and state and defend their judgments.

The Interest Measure

A final instrument required for this study was a measure of occupational interests. The California Occupational Preference Survey (COPS) was selected for this purpose. This measure is designed for high school and college students and measures a variety of interest dimensions through ranking of a series of activities on a four-point scale according to whether the respondent would or would not like to participate. A total of 168 items are rated and the dimensions measured include:

(1) Science Professional
(2) Science Skilled
(3) Technical Professional
(4) Technical Skilled
(5) Outdoor
(6) Business Professional
(7) Business Skilled
(8) Clerical
(9) Linguistic Professional
(10) Linguistic Skilled
(11) Aesthetic Professional
(12) Aesthetic Skilled
(13) Service Professional
(14) Service Skilled

The measure was selected because of the range of interests evaluated, the appropriateness to the age

group, the availability of the test and its reliability and validity. Although there is always a danger in such measures that respondents can skew their response patterns, this measure has been evaluated through split-halves and stability coefficients over time intervals of up to two years. The authors report a median stability coefficient of .63 for the two-year period and found that the highest or second highest score was repeated in 83 per cent of the cases studied. Positive intercorrelations among the fourteen scales ranged from +.12 to +.85 for high school females and from +.16 to +.87 for high school males.[6] The measure is also straightforward and easy to administer and score.

## Selection of the Sample

The sample for this study consisted of the students enrolled in Design for Living during the Fall, 1972 term. These students were randomly assigned to two groups, a control and an experimental group. Certain individuals were eliminated from the sample for a variety of reasons including dropping the course, nonattendance at the proportion lecture, noncompletion of one of the various measures, or repetition of the proportion slide-tape or assignment due to failure on the first attempt. The final sample consisted of 204 individuals, with 101 in the control group and 103 in the experimental group. A frequency count of the sex

and class standing of this sample indicated that it was composed of 198 women (97.1%) and 6 men (2.9%). The distribution of class standings is indicated in Table 3.

TABLE 3.--Frequency count of sample class standing

| | N | % |
|---|---|---|
| Freshmen | 76 | 37.3 |
| Sophomores | 59 | 28.9 |
| Juniors | 60 | 29.4 |
| Seniors | 9 | 4.4 |
| Total | 204 | 100.0 |

## Method of Data Collection

Data were collected during the Fall, 1972, term from the students enrolled in H.E.D. 143, Design for Living. At the first class meeting, the perception pre-test was administered to everyone in the class. The test, described previously, consisted of three slides selected to represent different aspects of the natural and man-built environments. Ten minutes were allowed for response to each slide. The pre-test was administered to students not in attendance up until the beginning of class lectures, using the rationale that until that time, their knowledge of design would not change. Four such students were included in the final sample. The tests were coded by the investigator using King's Content Analysis of Design Perception, and a numerical score

was assigned for the factual statements and analytical and intuitive judgments relating to proportion for each slide individually and for the three slides collectively.

At the second class meeting, the interest measure (COPS) was administered. As it was assumed that the information elicited by this measure would remain fairly constant over time, students not in attendance on that day were allowed to complete the test at any time during the term. This measure was also scored by the investigator, using a standard procedure, and a numerical score ranging from 0 to 36 was assigned for each of the fourteen interest dimensions.

It was desirable to control for the Hawthorne effect in testing the proportion slide-tape, so a similar slide-tape on the design concept of positive and negative space was presented to the entire class as a desensitizing agent prior to the actual experiment. This slide-tape, described in the problem statement in Chapter I, and the proportion slide-tape were very similar in that both required active response and provided immediate feedback as to the correct answers. A written response sheet accompanied the slide-tape and was collected and graded on a credit/no-credit basis. Credit was given for having completed the slide-tape, and the reason for scoring the response sheets was simply to know who had not participated and consequently would be eliminated from the sample.

The class was then randomly assigned to one of the two groups prior to the lecture on proportion which was scheduled for approximately half-way through the term. The fifty-minute lecture on that design principle was presented by the investigator to the entire class. Attendance was taken to ensure that everyone included in the sample had been exposed to this information. Following the lecture, the control group was given the written assignment, to be completed outside of class and returned for grading on a credit/no-credit basis. The subjects in the control group were excused from attending lecture on the class meeting following the proportion lecture.

The experimental group was not required to complete the written assignment but was required to attend class on the meeting following the proportion lecture. At that time, the proportion slide-tape was administered to those subjects and the response sheets were collected and graded on a credit/no-credit basis. Credit was given for 80 per cent or better accuracy on the slide-tape response sheet and on the assignment for correct identification of two proportional relationships in an environmental setting and justification of the overall evaluation of these proportions in the total design. Subjects who failed to satisfy these criteria on the first attempts were allowed to repeat the assignment

or the slide-tape until the criteria were met. Among the members of the experimental group who completed the slide-tape, only one failed to achieve the 80 per cent performance standard and repeated this activity once. Four of the members of the control group who completed the written assignment failed to meet the stated criteria and repeated the activity. These individuals were subsequently eliminated from the sample.

The post-test was administered approximately three weeks after the experiment. The same format and the same slides were used that were given on the pre-test with ten minutes again being allowed for response to each slide. Three students were included in the sample who took the post-test at a later time. It was assumed that their knowledge of design would not change since no further information about the elements and principles of design was to be provided in lectures. The post-tests were coded by the investigator and a numerical score was assigned for factual statements and analytical and intuitive judgments for each slide individually and for the three slides as a group.

As a check of reliability on the coding of the pre- and post-tests, a random sample of 10 per cent of these was selected from the control and experimental groups and were co-scored by the measure's developer, Dr. Susan King Kilborn. Of a total of 173 responses

related to proportion, agreement was found on 170 or 97.9 per cent of the coded responses, indicating reliability in the investigator's scoring.

Along with the post-test, a course evaluation was completed by each subject. Two questions were designed to obtain the students' reactions to the slide-tape presentations in order to determine their disposition toward such an instructional strategy. This evaluation is reproduced in Appendix F and is discussed further in Chapter IV.

## NOTES--CHAPTER III

[1]Kent Gustafson, "Toward a Definition of Instructional Development" (paper presented to the Association for Educational Communications & Technology, Philadelphia, Pennsylvania, March, 1971), p. 17.

[2]Susan E. King, "Perception of Art Elements and Principles in Clothing as Verbalized by Three Selected Groups of College Women" (unpublished M.A. thesis, Pennsylvania State University, 1967), p. 5.

[3]Susan E. King, "Perception and Creativity in Clothing and Social Experiences for Selected Groups of University Women" (unpublished Ph.D. dissertation, Pennsylvania State University, 1969), pp. 47-49.

[4]Susan King Kilborn, "Measurement and Development of Perception" (paper presented at the 63rd annual meeting of the American Home Economics Association, Detroit, Michigan, June 28, 1972), p. 4.

[5]Allan J. Abedor, "Development and Empirical Test of a Model for Formative Evaluation of Self-Instructional Multi-Media Learning Systems" (paper presented to the Association for Educational Communications and Technology, April 19, 1972), p. 12.

[6]Robert H. Bauernfeind, "California Occupational Preference Survey," Journal of Educational Measurement, VI, No. 1 (Spring, 1969), 57.

# CHAPTER IV

## RESULTS AND DISCUSSION

The following hypotheses were proposed and examined in this study:

Hypothesis 1:

The factual, analytical and intuitive perception of proportion verbalized on the post-test will be significantly greater for the experimental group than for the control group.

Hypothesis 2:

The factual, analytical and intuitive perception of proportion verbalized on the post-test will be significantly different for the subjects scoring in the upper and lower quarter of each interest dimension within each group.

Hypothesis 3:

The experimental instructional strategy will be generally more efficient than the control strategy.

For each main hypothesis, several sub-hypotheses were generated and tested. The results of the analysis and interpretation of each of these hypotheses will be presented in this chapter.

Hypothesis 1:

The factual, analytical and intuitive perception of proportion verbalized on the post-test will be significantly greater for the experimental group than for the control group.

This hypothesis was subjected to several statistical tests. Since the subjects in the sample were randomly assigned to either the control or experimental group, a normal distribution of individual differences within each group was assumed. However, the sample was not randomly selected in that it consisted of the students enrolled in Design for Living during the Fall, 1972, term. Consequently, it was imperative to control statistically for unknown differences between the two groups in order to obtain a more precise indication of treatment effects. Multivariate analysis of covariance was selected as a method of statistical analysis because of its ability to adjust for these unknown differences.

Prior to testing for differences between the control and experimental groups, two preliminary tests were made to determine the relationship between the perception pre-test and post-test scores. The results of this analysis are reported below.

Sub-Hypothesis 1:

There is no relationship between the factual, analytical and intuitive pre-test scores and the factual, analytical and intuitive post-test scores.

The relationship of the pre-test scores on the factual, analytical and intuitive variables to the post-test scores on those variables was determined through multivariate analysis of covariance. A significance level of $\alpha = .05$ was adopted and it was determined that the null hypothesis could not be rejected ($P < .29$). Performance on the post-test cannot be predicted from the pre-test scores.

The group means of the pre-test scores presented in Table 4 provide some indication of the reason for this lack of relationship between the pre-test and post-test scores.

TABLE 4.--Mean pre- and post-test scores

| | Factual | Analytical | Intuitive |
|---|---|---|---|
| Pre-Test | | | |
| Control | .12 | .94 | .08 |
| Experimental | .12 | .68 | .05 |
| Post-Test | | | |
| Control | 3.65 | 2.45 | .09 |
| Experimental | 3.96 | 1.63 | .05 |

The very small values represented in these scores and the slight differences observable between the two groups indicate that the sample was quite homogeneous in its low level of perception upon entry. Consequently, any

differences in post-test scores would be the result of some intervening activity.

It will be noted that the control group was superior on the pre-test analytical score. This difference was consistent on individual slides, and no obvious explanation can be offered.

Sub-Hypothesis 2:

There is no relationship between the factual, analytical and intuitive pre-test scores and the factual, analytical and intuitive post-test scores on individual slides.

The relationship of the pre-test score for each slide on the factual, analytical and intuitive variables to the post-test scores on those variables was determined through a multivariate analysis of covariance. A significance level of $\alpha = .05$ was established and the null hypothesis could not be rejected ($P < .11$) as would be expected on the basis of the result of the analysis of Sub-Hypothesis 1. For individual slides, the post-test scores cannot be predicted from the pre-test scores.

As was the case with Sub-Hypothesis 1, the group means presented in Table 5 for the pre-test scores on each variable for individual slides indicate the reason for this lack of relationship. The means are so small and such minor differences occur between groups, the sample can be considered homogeneous in its lack of perception of proportion at the pre-test.

TABLE 5.--Mean pre- and post-test scores: Individual slides

| | Slide 1 | | | Slide 2 | | | Slide 3 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Fact | Anal | Intui | Fact | Anal | Intui | Fact | Anal | Intui |
| Pre-Test | | | | | | | | | |
| Control | .04 | .09 | .01 | .03 | .38 | .04 | .05 | .49 | .03 |
| Experimental | .03 | .07 | .00 | .07 | .26 | .01 | .02 | .35 | .04 |
| Post-Test | | | | | | | | | |
| Control | .81 | .54 | .04 | 1.23 | .94 | .04 | 1.62 | .96 | .02 |
| Experimental | .68 | .45 | .00 | .83 | .48 | .04 | 2.47 | .72 | .02 |

Following these tests, two sub-hypotheses were tested to determine the differences between the post-test scores of the two groups, for the three slides combined and individually.

Sub-Hypothesis 3:

There is no difference between the control and experimental groups on the factual, analytical and intuitive post-test scores.

This hypothesis was tested using multivariate analysis of covariance with the pre-test scores as the covariates. Using a significance level of $\alpha = .05$, the null hypothesis was rejected ($P < .05$). The univariate analysis revealed that the difference resulted from the analytical post-test score as indicated in Table 6.

TABLE 6.--Univariate analysis of covariance: Post-test scores

| Variable | Univariate F | P < |
|---|---|---|
| Factual | .67 | .41 |
| Analytical | 6.18 | .01* |
| Intuitive | 1.00 | .32 |

An examination of the group means presented in Table 4 indicates that the difference favors the control group with a mean on the analytical post-test score of 2.45 compared to the experimental group mean of 1.63.

These findings indicate that the analytical perception of proportion of the control group is significantly greater than that of the experimental group. Further clarification of the source of the difference was sought through a comparison of the post-test scores on individual slides.

Sub-Hypothesis 4:

There is no difference between the control and experimental groups on the factual, analytical and intuitive post-test scores on individual slides.

This hypothesis was tested using a multivariate analysis of covariance with the pre-test scores as the covariates. Adopting a significance level of $\alpha = .05$, the null hypothesis was rejected ($P < .005$). The univariate analysis reveals that the source of the difference is the analytical post-test score on slide 2 and the factual post-test score on slide 3, as indicated in Table 7.

TABLE 7.--Univariate analysis of covariance: Post-test scores individual slides

| Slide | Variable | Univariate F | P < |
|---|---|---|---|
| 1 | Factual | .38 | .54 |
| 1 | Analytical | .42 | .52 |
| 1 | Intuitive | .63 | .43 |
| 2 | Factual | 3.45 | .06 |
| 2 | Analytical | 8.01 | .01* |
| 2 | Intuitive | .03 | .87 |
| 3 | Factual | 10.47 | .002* |
| 3 | Analytical | 2.55 | .11 |
| 3 | Intuitive | .003 | .96 |

The group means presented in Table 5 indicate the direction of these differences. The control group mean on the analytical post-test score for slide 2 is .94 as compared with .48 for the experimental group. This difference favors the control group and is the source of the difference found in the test of Sub-Hypothesis 3. The control group mean for the factual post-test score on slide 3 is 1.62 compared to 2.47 for the experimental group. This difference favors the experimental group, but apparently was not strong enough to show up on the test of Sub-Hypothesis 3.

On the basis of this analysis, research Hypothesis 1 is only partially confirmed. The post-test scores for the perception of proportion are significantly greater for the experimental group only on the factual variable on one slide. The control group was found to have a significantly greater perception of proportion only on the analytical variable of a different single slide. No differences were discovered on slide 1 or on the intuitive variable of any of the three slides. Further clarification of these somewhat inconsistent findings was sought through further analysis.

The findings in Sub-Hypotheses 1 and 2 that the pre-test and post-test scores do not covary makes the use of analysis of covariance somewhat inappropriate in testing Sub-Hypotheses 3 and 4 in that degrees of

freedom are sacrificed with no corresponding increase in precision. While Sub-Hypotheses 3 and 4 were rejected on the basis of this analysis, the investigator attempted to clarify these findings through a simple analysis of variance. The results of this analysis are reported below.

Sub-Hypothesis 3a:

There is no difference between the control and experimental groups on the factual, analytical and intuitive post-test scores.

Maintaining a significance level of $\alpha = .05$, an analysis of variance indicated that the null hypothesis can be rejected with greater certainty ($P < .04$). The univariate analysis again indicates that the source of the difference is the analytical post-test score, favoring the control group, as indicated in Table 8.

TABLE 8.--Univariate analysis of variance: Post-test scores

| Variable | Univariate F | P < |
|---|---|---|
| Factual | .47 | .49 |
| Analytical | 6.83 | .01* |
| Intuitive | 1.13 | .29 |

Sub-Hypothesis 4a:

There is no difference between the control and experimental groups on the factual, analytical and intuitive post-test scores on individual slides.

Adopting a significance level of $\alpha = .05$, an analysis of variance confirmed the results of the test of Sub-Hypothesis 4 in that the null hypothesis was rejected with greater assurance ($P < .002$). The univariate analysis again indicates that the source of this difference is the analytical score on slide 2, favoring the control group and the factual score on slide 3, favoring the experimental group. However, a further source of difference is discovered in the factual score on slide 2. A comparison of the group post-test means presented in Table 5 reveals a control group mean of 1.23 and an experimental group mean of .83 for the factual variable of slide 2, indicating that the difference favors the control group. The results of the univariate analysis are found in Table 9.

TABLE 9.--Univariate analysis of variance: Post-test scores individual slides

| Slide | Variable | Univariate F | P < |
|---|---|---|---|
| 1 | Factual | .44 | .51 |
| 1 | Analytical | .48 | .49 |
| 1 | Intuitive | 2.06 | .15 |
| 2 | Factual | 4.62 | .03* |
| 2 | Analytical | 9.62 | .002* |
| 2 | Intuitive | .001 | .98 |
| 3 | Factual | 10.22 | .002* |
| 3 | Analytical | 2.24 | .14 |
| 3 | Intuitive | .001 | .98 |

The inconsistent nature of these findings led to an examination of several intervening variables which might have affected the data in some way. Since the groups were not matched for class standing, which was assumed to have been randomized in the assignment procedure, the composition of the control and experimental groups was examined to determine whether a predominance of subjects of a particular class standing would be found in one or the other of the groups. The composition of each group may be found in Table 10.

TABLE 10.--Frequency count of group class standing

| | Freshmen | | Sophomores | | Juniors | | Seniors | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|
| | N | % | N | % | N | % | N | % | N | % |
| Control | 40 | 39.6 | 32 | 31.7 | 25 | 24.8 | 4 | 3.9 | 101 | 100 |
| Experimental | 36 | 35.0 | 27 | 26.2 | 35 | 34.0 | 5 | 4.8 | 103 | 100 |
| Total | 76 | 36.3 | 59 | 28.9 | 60 | 29.4 | 9 | 4.4 | 204 | 100 |

These figures confirm the randomization of the two groups with respect to class standing. The control and experimental groups are shown to be homogeneous in composition, and class standing is rejected as having influenced the data.

A second variable which was considered as having had some possible effect on the findings was the attitude of each group toward their respective treatment. However,

a course evaluation revealed that the two groups were nearly identical in their ranking of the two activities. On a rating scale of 1 = low to 7 = high, the average rating of the proportion slide-tape by the eighty-five members of the experimental group who responded was 5.28. For the ninety-three control group subjects who responded, the average rating of the written assignment was 5.21. It is therefore not the case that a great difference in participant attitude might have affected the results.

A third variable over which no control was exercised was the amount of time the subjects in the control group were allowed to spend on the written assignment. While the experimental group was allowed only twenty-seven minutes (the length of the slide-tape), it was found that the average time spent by the control group was fifty-seven minutes, or over twice that spent by the experimental group. In order to determine what effect, if any, this difference might have had on the post-test scores of the two groups, the scores of the sixteen subjects in the control group who reported taking thirty minutes or less to complete the written assignment were compared to the scores of a randomly selected, matched sample from the experimental group. Using a significance level of $\alpha = .05$, the analysis of variance revealed no differences in the factual, analytical or intuitive post-test scores of these

subjects ($P < .64$). However, due to the nonrandom selection of the sample from the control group, no definitive statement can be made on the basis of this finding concerning the effect of time on post-test performance.

A final consideration which may have affected the data is the subject matter of the slides. No discernable pattern can be discovered in the differences in perception of the two groups, and it is possible that the content of the slides might have somehow influenced these findings. For example, the significantly greater verbalized factual perception of the control group on slide 2 and the significantly greater verbalized factual perception of the experimental group on slide 3, might indicate that something in the content of slide 2 was highly stimulating to the control group, while for some reason slide 3 was more inspiring to the experimental group. Had one group been consistently higher in their factual perception on all of the slides, or even on two of them, this might be interpreted as indicating a difference in the effectiveness of the instructional strategy used by that group. However, in the absence of this kind of consistency in the findings, the content of the slides must be considered as having been a possible source of the variation. An evaluation of these effects is beyond the scope of this study.

Hypothesis 2:

The factual, analytical and intuitive perception of proportion verbalized on the post-test will be significantly different for the subjects scoring in the upper and lower quarter of each interest dimension within each group.

Three preliminary tests were performed on Hypothesis 2, and the results are reported under Sub-Hypotheses 1, 2 and 3.

Sub-Hypothesis 1:

There is no difference between the interest scores of the experimental and control groups.

Adopting a significance level of $\alpha = .05$, this sub-hypothesis was subjected to an analysis of variance and the null could not be rejected ($P < .8$). There is no significant difference between the scores of the two groups on any of the fourteen dimensions of interest. This finding was desirable in that it indicates that the two groups are homogeneous with respect to these variables, and consequently comparisons may be drawn.

Prior to comparing the individuals in each group who scored in the upper and lower quarter of each of the interest dimensions, it was decided to first determine where strong relationships of interest score and post-test score could be found for the groups as a whole and to follow these relationships up with further analysis. Accordingly, correlations were derived for

each group between the factual, analytical and intuitive post-test scores and each of the fourteen interest scores. The findings of this analysis are reported below.

Sub-Hypothesis 2:

There is no correlation between the factual, analytical or intuitive post-test scores and the scores on the fourteen interest dimensions in the control group.

A significance level of $\alpha = .01$ was adopted for this test indicating a minimum correlation of $\pm .25$. As the correlations reported in Table 11 indicate, the null hypothesis could not be rejected for any of the variables.

Sub-Hypothesis 3:

There is no correlation between the factual, analytical or intuitive post-test scores and the scores on the fourteen interest dimensions in the experimental group.

Using a significance level of $\alpha = .01$ and a minimum correlation value of $\pm .25$, the null hypothesis could not be rejected for any of these variables as indicated by the correlations reported in Table 12.

The lack of any significant correlations for either group as a whole indicates that no relationships of interest and post-test scores would be revealed if the groups were to be further partitioned. No further

TABLE 11.--Post-test and interest score correlations: Control group

| Interest Dimension | Factual Post | Analytical Post | Intuitive Post |
|---|---|---|---|
| Science Professional | -.0590 | .0036 | -.0488 |
| Science Skilled | -.0667 | -.0135 | -.1209 |
| Technical Professional | -.1297 | -.1158 | -.0643 |
| Technical Skilled | -.1295 | .0004 | .0240 |
| Outdoor | -.1792 | -.0456 | .0670 |
| Business Professional | .0185 | -.0337 | -.0813 |
| Business Skilled | .0099 | -.0573 | -.1618 |
| Clerical | .0948 | -.0683 | -.1482 |
| Linguistic Professional | -.0281 | .1279 | .0602 |
| Linguistic Skilled | .1335 | .1127 | .0468 |
| Aesthetic Professional | .0465 | -.0158 | -.0633 |
| Aesthetic Skilled | .0477 | -.0026 | -.1457 |
| Service Professional | .0651 | .1058 | -.0432 |
| Service Skilled | .0394 | -.0447 | -.1334 |

TABLE 12.--Post-test and interest score correlations: Experimental group

| Interest Dimension | Factual Post | Analytical Post | Intuitive Post |
|---|---|---|---|
| Science Professional | .1267 | .0109 | .0028 |
| Science Skilled | .0549 | .0276 | -.0232 |
| Technical Professional | -.1051 | .0151 | -.0529 |
| Technical Skilled | -.1665 | .0524 | .0736 |
| Outdoor | -.1373 | .0002 | .1284 |
| Business Professional | -.0946 | -.0634 | -.0807 |
| Business Skilled | -.0915 | -.0170 | -.0828 |
| Clerical | -.0273 | -.0486 | -.1095 |
| Linguistic Professional | -.0006 | -.0147 | -.0564 |
| Linguistic Skilled | -.0150 | -.0224 | -.1028 |
| Aesthetic Professional | -.0591 | .0777 | .0405 |
| Aesthetic Skilled | -.0627 | .0473 | .0133 |
| Service Professional | -.1160 | -.0916 | .0221 |
| Service Skilled | -.0182 | -.0088 | .0439 |

analysis was conducted and research Hypothesis 2 was rejected on the basis of these findings.

It would seem from these results that in so far as interests would influence the learning processes, either of the instructional strategies used in this study would be equally effective for students with various patterns of interest. This would allow an instructor a great deal of latitude in selecting one or the other of the strategies without fear of placing a certain group of students with particular interests at a disadvantage.

Hypothesis 3:

The experimental instructional strategy will be generally more efficient than the control strategy.

The relative effectiveness of the slide-tape and the written assignment was examined statistically through the analysis of research Hypotheses 1 and 2. These findings indicate no great differences in the usefulness of the two strategies in instruction. The relative efficiency of the written assignment and slide-tape will be examined through a nonstatistical comparison of the following: Faculty Time, Student Time, Development Costs and Operating Costs.

Faculty Time:

The time involved in grading the written assignment for 260 students is four hours. Due to the design of the slide-tape to supply immediate reinforcement, the student can, in essence, evaluate his own work, so no faculty time is required to grade response sheets.

During the study, the response sheets were scored to ensure that the program objective of 80 per cent accuracy was being met. For the group of 132 students who completed the slide-tape (29 were later dropped from the experimental group) scoring consumed about two hours. For a group of 260 students (the size of the group upon which the four-hour estimate is based) this time would be doubled, and equal the time for the written assignment. Consequently, on this basis, the two strategies are equal, except that scoring the response sheets for the slide-tape is entirely unnecessary. Because the instructor can assume 80 per cent or better mastery through the slide-tape and need not score the response sheets, the slide-tape is superior on this variable.

Student Time:

A second comparison of efficiency can be made on the basis of time required for students to complete one or the other of the instructional strategies under consideration. The slide-tape runs for twenty-seven minutes, while the average time reported for completion

of the written assignment was fifty-seven minutes, or more than twice the time consumed by the slide-tape. On the basis of the findings of research Hypothesis 1, students using the slide-tape become essentially equal in their perception of proportion in less than half the time required using the written assignment. On the basis of student time, the slide-tape is clearly more efficient.

Development Cost:

The development of the programmed slide-tape cost $188.26 for materials and consumed sixty-five hours. Although no payment was made for the time spent on this activity, an hourly rate of $4.25, the same rate paid the investigator as a teaching assistant, will be assumed. Consequently, the total development of the slide-tape may be estimated as:

| | |
|---|---|
| $188.26 | (Materials) |
| 276.25 | (65 hours X $4.25 per hour) |
| $464.51 | (Total) |

Assuming that with minor changes (updating or replacing worn slides or repairing or replacing worn tape) the slide-tape will have a minimum life expectancy of ten years, the per term development cost may be estimated as $15.48 ($\frac{\$464.51}{10 \text{ Years X } 3 \text{ Terms}}$). Considering an average class size of 260 students per term, this cost breaks down to $.06 per student. Consequently,

it is obvious that in a large group situation, over the long run, the development cost of the slide-tape is minimal. This economic consideration becomes even more attractive when the reasonable assumption is made that cost of development will decrease as the developer becomes more proficient.

The development costs of the written assignment are impossible to evaluate. It is assumed that some time and effort were expended in creating this product, but the monetary value to be assigned cannot be determined.

Operating Cost:

The operation of the programmed slide-tape cost nothing under the circumstances of this study. Although certain equipment is required to use the slide-tape, this equipment was available to the investigator without charge. Since the response sheets are self-scoring, no payments to graders need be taken into account.

The written assignment does involve certain operating costs. For a group of 260 students, reading and evaluating the assignments consumes approximately four hours. Assuming an hourly rate of $4.25 earned by the investigator as a teaching assistant, the per term operating cost of the assignment is $17.00 or 6.5 cents per student for a class of 260. This figure does not take into account the cost of training graders.

These comparisons must be examined in light of the total instructional setting in order to determine which strategy is more efficient. It is clear that in a large group setting, such as the one for which the slide-tape was developed, the low per-student development cost and the high savings in grader time, student time and operating costs make the slide-tape highly efficient. However, in a small classroom situation, the development cost of the slide-tape may not be justifiable, and the assignment might be more attractive, especially since the operating cost incurred by grader time would decrease as student numbers drop. The decision to use either of these instructional strategies must take into account the total instructional environment as well as these findings on efficiency.

One final comparison of the two strategies was made in terms of student attitude. While not a measure of efficiency, it is valuable to understand the reaction of students to a teaching situation, and this comparison is included here to provide this information.

On the course evaluation (reproduced in Appendix F), all students were asked to rank either the written assignment or the slide-tape on a rating scale of 1 = low to 7 = high. Eighty-five of the 103 subjects in the experimental group responded and the average rating of the slide-tape was 5.28. The 93 of the 101 members

of the control group who responded assigned an average rating of 5.21 to the written assignment. Consequently, the slide-tape and written assignment may be considered to be essentially identical in the level of positive response of the students using them.

A further indication of attitude toward the slide-tape was provided by the response to another question asking all the students whether or not they would like more slide-tape presentations on the various design concepts. Of the responding eighty-five students who used both the positive and negative space and the proportion slide-tapes, 57 or 67 per cent responded positively. Of the ninety-three students responding who used only the positive and negative space slide-tape, 66 or 71 per cent responded positively. These findings indicate that student response to the slide-tape concept in general and to the proportion slide-tape in particular is positive.

# CHAPTER V

# CONCLUSIONS AND IMPLICATIONS

## Summary of the Findings

The results of the analysis of each of the research hypotheses examined in this study will be summarized individually.

### Hypothesis 1:

> The factual, analytical and intuitive perception of proportion verbalized on the post-test will be significantly greater for the experimental group than for the control group.

This hypothesis was only partially confirmed. An analysis of variance of post-test scores revealed a significant difference favoring the experimental group only on the factual score for slide 3. The control group was found to have significantly greater factual and analytical perceptions only for slide 2. No differences were found on slide 1, the analytical score for slide 3, or the intuitive scores of any slide. No reasonable explanation could be found for these results, and it is suggested that the differences which were revealed occurred as a result of the subject matter of the slides,

rather than from any difference in the effectiveness of the two instructional strategies.

Hypothesis 2:

The factual, analytical and intuitive perception of proportion verbalized on the post-test will be significantly different for the subjects scoring in the upper and lower quarter of each interest dimension within each group.

This hypothesis was rejected. Analysis of correlation between the interest scores and post-test scores in each group revealed no relationships for any of the variables. This would indicate that neither instructional strategy discriminates against students with varying interests. On the basis of these data, in so far as interests affect learning, it can be assumed that students with any pattern of interests can learn equally well using either a slide-tape or written assignment to develop perception of proportion in the environment.

Hypothesis 3:

The experimental instructional strategy will be generally more efficient than the control strategy.

On the basis of a nonstatistical comparison, this hypothesis was confirmed. The slide-tape on proportion was found to be more efficient than the written assignment in terms of faculty time, student time and operating and development costs in a large group setting. Student attitude was equally positive toward both strategies.

On the basis of these findings, no definitive conclusion may be made concerning the relative effectiveness of the two instructional strategies as means of developing perception of proportion in the environment. It was found that the post-test scores of neither group were related to their interests, and that the slide-tape demonstrates greater efficiency in a large group setting. These findings and certain limitations of the study indicate directions for further research.

## Recommendations for Further Research

The findings related to the relative effectiveness of the slide-tape and written assignment are somewhat inconsistent. It seems that the subject matter of the slides may have affected the perception post-test scores in as much as no pattern could be discovered in the differences which were revealed between the two groups. Further research is needed to clarify these differences in which several slides of similar subject matter be used. Perhaps there is also some relationship between perception of a particular setting and certain personality characteristics. These questions are beyond the scope of the present study, but could be investigated in future research.

Another suggestion concerning the comparison of the effectiveness of the two instructional strategies used in this study is related to the relatively limited

scope of the study. The experimental slide-tape was a 27-minute presentation in a class which met for three hours a week over a ten-week interval. The written assignment was an activity which consumed approximately one hour of the thirty. It is very likely that these activities were so short that any differences between the groups simply did not register. The study could be expanded to include several slide-tapes or possibly a complete course using the slide-tape method of presentation. This would afford a broader basis for comparison.

Expanding the scope of the study as suggested above would tend to alleviate a problem discovered with the perception measure in this study. By considering the verbalized perception of only one concept of design, proportion, the scores obtained were so minute and the variations between groups so small, differences were all but nonexistent. A study concerned with several design concepts presented through a slide-tape format would not encounter this problem.

Another suggestion for further research is related to the time difference discovered between the control and experimental groups. Although a comparison of post-test scores for a matched sample controlled for time revealed no differences, due to the nonrandom selection of the control group sample, no conclusions can be drawn on that basis. In a future study, control

could be exercised to equalize the time allowed both groups to shed further light on any differences in effectiveness of the slide-tape and assignment. Other controls might be exercised over grade point average, amount of previous art training or academic major as well.

While the findings concerning the lack of relationship between post-test and interest scores might be interpreted as meaning that the two instructional strategies do not discriminate against students with particular interests, it could also be that an interest measure is not sensitive to differences in learning style. Many outside factors such as anticipated economic gain, social status or amount of training required might influence the decision on a given occupational interest. Further research is needed to clarify the characteristics of individuals who perform best using the programmed audiovisual method of instruction. The results of this study should not be interpreted as meaning that everyone learns best in the same way, but only that the COPS measure is perhaps insensitive to differences in learning style.

One final suggestion for future investigation relates to the development of the programmed slide-tape used in this study. As an indication of the value of following the instructional development process, it would be interesting to compare the effectiveness of a

systematically developed slide-tape to one prepared in a more spontaneous manner.

It is hoped that some of these suggestions may be followed up to gain a clearer insight into the usefulness of programmed audiovisual presentations used in design instruction in large group settings. The benefits to students in art and design curricula which may be derived are more than enough justification for the effort expended.

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# APPENDICES

# APPENDIX A

# PERSONAL INVENTORY

APPENDIX A

PERSONAL INVENTORY

Name_____ Student Number_____

Campus Address_____

Campus Phone_____ Age_____ Sex: M_____ F_____

Home Town_____

Approximate Size of Your High School_____

Level at M.S.U. (check one)

Freshman_____ Junior_____ Graduate_____

Sophomore____ Senior_____ Other_____

Grade Point Average at M.S.U. (if applicable)_____

Your major (or contemplated major) at M.S.U._____

_____

What are your primary academic interests?_____

_____

_____

What career or profession are you preparing for?_____

_____

Number of years of art or design training at the following levels:

| | | | |
|---|---|---|---|
| Grade School | _____ | Junior College | _____ |
| Junior High | _____ | Art School | _____ |
| Senior High | _____ | M.S.U. | _____ |
| Summer Classes | _____ | Other University | _____ |
| Summer Camp | _____ | Other | _____ |

# APPENDIX B

# PERCEPTION MEASURE

# APPENDIX B

## PERCEPTION MEASURE

Describe the total design effect of the slide. Include details and general impressions. Describe the feelings you get from what you see and your response to the design as an aesthetic or unaesthetic composition.

# APPENDIX C

## PROPORTION SLIDE-TAPE RESPONSE SHEET

APPENDIX C

PROPORTION SLIDE-TAPE RESPONSE SHEET

| | | |
|---|---|---|
| 1. | a. Classify the type of proportion represented. | a. |
| | b. Explain your answer to part a. | b. |
| 2. | a. Classify the type of proportion represented. | a. |
| | b. Explain your answer to part a. | b. |
| 3. | a. Classify the type of proportion represented. | a. |
| | b. Explain your answer to part a. | b. |
| 4. | a. Classify the type of proportion represented. | a. |
| | b. Explain your answer to part a. | b. |
| 5. | a. Classify the type of proportion represented. | a. |
| | b. Explain your answer to part a. | b. |

| | | |
|---|---|---|
| 6. | a. Classify the type of proportion represented.<br>b. Explain your answer to part a. | a.<br>b. |
| 7. | a. Classify the type of proportion represented.<br>b. Explain your answer to part a. | a.<br>b. |
| 8. | a. Classify the type of proportion represented.<br>b. Explain your answer to part a. | a.<br>b. |
| 9. | a. Classify the type of proportion represented.<br>b. Explain your answer to part a. | a.<br>b. |
| 10. | a. Classify the type of proportion represented.<br>b. Explain your answer to part a. | a.<br>b. |

| | |
|---|---|
| 11. Find one example of each type of proportion in this setting. | a. Equal:<br>b. Unequal:<br>c. Golden Section: |
| 12. Find one example of each type of proportion in this setting. | a. Equal:<br>b. Unequal:<br>c. Golden Section: |
| 13. State and defend your overall evaluation of the total effect of the proportions in this setting. | 13. |
| 14. State and defend your overall evaluation of the total effect of the proportions in this setting. | 14. |

| | | |
|---|---|---|
| 15. | State and defend your overall evaluation of the total effect of the proportions in this setting. | 15. |
| 16. | State and defend your overall evaluation of the total effect of the proportions in this setting. | 16. |

# APPENDIX D

# STUDENT REACTIONNAIRE

APPENDIX D

STUDENT REACTIONNAIRE

Please be frank and honest in answering the following questions. Remember, you are our prime source of information regarding what needs to be revised.

KEY: 1 means you strongly agree; 2 means you agree; 3 means you are uncertain; 4 means you disagree; and 5 means you strongly disagree.

| | | |
|---|---|---|
| 1. | I had sufficient prerequisites to prepare me for this lesson. | 1 2 3 4 5 |
| 2. | I was often unsure of what, exactly, I was supposed to be learning. | 1 2 3 4 5 |
| 3. | After completing the lesson, I felt that what I learned was either directly applicable to my major interest, or provided important background concepts to me. | 1 2 3 4 5 |
| 4. | Manipulating the equipment, or equipment breakdowns often distracted my attention. | 1 2 3 4 5 |
| 5. | Listening to the tapes and watching the slides became tedious or boring. | 1 2 3 4 5 |
| 6. | This lesson was very well organized. The concepts were highly related to each other. | 1 2 3 4 5 |
| 7. | A professional speaker (announcer) should be used to make the tapes. | 1 2 3 4 5 |
| 8. | The audio tape moved too fast for me, there was too much information. | 1 2 3 4 5 |
| 9. | There was too much redundancy. I was bored by the repetition of ideas. | 1 2 3 4 5 |
| 10. | There was a lot of irrelevant information in this lesson. | 1 2 3 4 5 |

| | | |
|---|---|---|
| 11. | The workbook* was excellently designed. I could easily follow the instructions and perform the exercises. | 1 2 3 4 5 |
| 12. | Frequent reference to and use of the workbook* was distracting. | 1 2 3 4 5 |
| 13. | Often the tape and slides seemed unrelated to each other. | 1 2 3 4 5 |
| 14. | This lesson had very serious gaps and lacked internal continuity. | 1 2 3 4 5 |
| 15. | The examples used to illustrate main points were excellent. | 1 2 3 4 5 |
| 16. | The vocabulary used contained many unfamiliar words. I often did not understand what was going on. | 1 2 3 4 5 |
| 17. | The pre-test and final exam questions did a good job of testing my knowledge of the main points of the lesson.** | 1 2 3 4 5 |
| 18. | The questions during the lesson gave me valuable feedback on how I was doing. | 1 2 3 4 5 |
| 19. | Many of the things I was asked to do, or questions I was asked to answer during the lesson seemed like needless busy work. | 1 2 3 4 5 |
| 20. | At the end of the lesson I was still uncertain about a lot of things (and had to guess on many of the final exam questions.**) | 1 2 3 4 5 |
| 21. | I believe I learned a lot, considering the time spent on this lesson. | 1 2 3 4 5 |
| 22. | I would recommend extensive modifications to the lesson before using it with other students. | 1 2 3 4 5 |

23. For you, what was the most difficult part of the lesson?

_____

24. What was the easiest part of the lesson?_____

_____

25. What were the three worst things about this lesson?

_____

_____

_____

| | | | | | |
|---|---|---|---|---|---|
| 26. I understood most of the concepts and vocabulary immediately after completing the lesson. | 1 | 2 | 3 | 4 | 5 |
| 27. I think this whole procedure of trying out new materials with students is a waste of time. | 1 | 2 | 3 | 4 | 5 |
| 28. I would prefer a textbook or lecture version of this lesson rather than the slide-tape/workbook* version. | 1 | 2 | 3 | 4 | 5 |
| 29. I often needed to go back over a portion of the lesson to fully understand it.** | 1 | 2 | 3 | 4 | 5 |
| 30. After completing the lesson, I was more interested in and/or favorably impressed with the general subject matter than I was before the lesson. | 1 | 2 | 3 | 4 | 5 |

31. Please write below any comments, suggestions, or changes which you believe will improve this lesson. Thank you.

*Replace "workbook" with "response sheet."

**Question (or section of question) eliminated due to lack of appropriateness.

# APPENDIX E

# WRITTEN ASSIGNMENT

APPENDIX E

WRITTEN ASSIGNMENT

Select one of the photographs in the first floor display case in the Human Ecology Building (near the Grand River entrance) and indicate the number of the picture you choose. Briefly sketch the basic forms or shapes which clearly illustrate two different proportional effects in that photograph. (Your artistic skill is not a consideration in grading!) Identify the type of proportion represented in each sketch. State and defend your aesthetic judgment of the two proportions in terms of their effect in the total design of the setting.

Number of your picture _____

1. Type of proportion _____

   Sketch the basic forms or shapes:

2. Type of proportion _____

   Sketch the basic forms or shapes:

3. State and defend your aesthetic evaluation of the effect of the two proportions in the total design of the setting?

4. How long did you need to complete this assignment?

# APPENDIX F

# COURSE EVALUATION

APPENDIX F

COURSE EVALUATION

Indicate your rating of each of the following aspects of 143 on the scale: 7 = high rating; 1 = low rating.

1. What is your overall evaluation of the course?

7 6 5 4 3 2 1

2. Rate each of the following class activities in terms of relevance and helpfulness:

Films:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Why Man Creates | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
| Design in Movement | 7 | 6 | 5 | 4 | 3 | 2 | 1 |

Assignments:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| #1 - Definition of Design | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
| #2 - Positive/Negative Space Slide-Tape | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
| #3 - Proportion (out of class) | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
| Proportion Slide-Tape | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
| #4 - Found Objects | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
| #5 - Kresge | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
| Slides: | 7 | 6 | 5 | 4 | 3 | 2 | 1 |

3. Would you like to have more slide-tapes on various elements and principles of design?

Yes _____ No _____

4. Would you like to have the lecture slides available for study aids?

Yes _____ No _____

5. Any other comments? Criticisms? Suggestions?