TEACHING DESIGN IN THE YEAR 2000: A MODIFIED
DELPHI STUDY OF THE PERCEPTIONS OF
DESIGN EDUCATORS

DISSERTATION

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by

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The problem of this study is to predict how basic design will be taught in the year 2000 in the United States of America according to the perceptions of design educators who were polled using a Delphi exercise. Basic design is an introductory course in design disciplines covering fundamental principles, components, and applications of design.

This study has a twofold purpose. The first is to predict how basic design will be taught in the year 2000 to allow design educators to better prepare for the future. The second is to provide a basis for further research that might address specific areas in the future of teaching design.

The Delphi method of futures forecasting was selected for this study because it allowed the panel of design educators to be polled anonymously so that their responses would not be influenced by the other panelists. The Delphi panel consisted of twenty-eight design educators selected from the seventy-two schools in America that offer a graduate program in design.
The first round of Delphi questioning asked the panelists to predict how basic design will be taught in the year 2000. The responses fit into one of four categories: problem solving, computer technology, video and educational media, and no significant change. Round two provided a simple rank ordering of those categories. Round three asked the panelists to determine the degree of implementation for specific topics within each category.

The results listed the topics that the panelists predicted would definitely be implemented into basic design: teaching the problem solving process, visual thinking, and creativity; and a unit on computer graphics. This study concludes that design educators may need to evaluate and revise basic design course objectives and activities to reflect an increased emphasis of the creative problem solving process and the impact and use of computer technology.
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# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIST OF TABLES</td>
<td>vi</td>
</tr>
<tr>
<td>LIST OF ILLUSTRATIONS</td>
<td>vii</td>
</tr>
<tr>
<td>I. INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>Introduction</td>
<td></td>
</tr>
<tr>
<td>Statement of the Problem</td>
<td></td>
</tr>
<tr>
<td>Purposes of the Study</td>
<td></td>
</tr>
<tr>
<td>Significance of the Study</td>
<td></td>
</tr>
<tr>
<td>Research Questions</td>
<td></td>
</tr>
<tr>
<td>Limitations of the Study</td>
<td></td>
</tr>
<tr>
<td>Definition of Terms</td>
<td></td>
</tr>
<tr>
<td>II. REVIEW OF RELATED LITERATURE</td>
<td>9</td>
</tr>
<tr>
<td>Introduction</td>
<td></td>
</tr>
<tr>
<td>The Information Age</td>
<td></td>
</tr>
<tr>
<td>Design</td>
<td></td>
</tr>
<tr>
<td>Creative Problem Solving</td>
<td></td>
</tr>
<tr>
<td>Computer Technology</td>
<td></td>
</tr>
<tr>
<td>Educational Media</td>
<td></td>
</tr>
<tr>
<td>Design Education</td>
<td></td>
</tr>
<tr>
<td>Uses of the Delphi Method</td>
<td></td>
</tr>
<tr>
<td>Modifications to the Delphi Method</td>
<td></td>
</tr>
<tr>
<td>III. METHODS AND PROCEDURES</td>
<td>41</td>
</tr>
<tr>
<td>The Delphi Method</td>
<td></td>
</tr>
<tr>
<td>The Delphi Panel</td>
<td></td>
</tr>
<tr>
<td>Collection of Data</td>
<td></td>
</tr>
<tr>
<td>Procedures for Analysis of Data</td>
<td></td>
</tr>
<tr>
<td>IV. PRESENTATION OF DATA</td>
<td>59</td>
</tr>
<tr>
<td>The Delphi Panel</td>
<td></td>
</tr>
<tr>
<td>Round One</td>
<td></td>
</tr>
<tr>
<td>Round Two</td>
<td></td>
</tr>
<tr>
<td>Round Three</td>
<td></td>
</tr>
</tbody>
</table>

iv
V. CONCLUSIONS AND RECOMMENDATIONS .............................................. 71

Summary
Findings
Conclusions
Recommendations for Further Research

APPENDICES .................................................................................. 87

BIBLIOGRAPHY ............................................................................... 105
LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.</td>
<td>Study Sequence Timetable</td>
<td>50</td>
</tr>
<tr>
<td>II.</td>
<td>Participation Chart</td>
<td>50</td>
</tr>
<tr>
<td>III.</td>
<td>Participation by State</td>
<td>60</td>
</tr>
<tr>
<td>IV.</td>
<td>Design Disciplines of Panelists</td>
<td>61</td>
</tr>
<tr>
<td>V.</td>
<td>Responses to Questionnaire 1</td>
<td>63</td>
</tr>
<tr>
<td>VI.</td>
<td>Responses to Questionnaire 2</td>
<td>64</td>
</tr>
<tr>
<td>VII.</td>
<td>Rank Ordered Responses to Questionnaire 2</td>
<td>66</td>
</tr>
<tr>
<td>VIII.</td>
<td>Responses to Questionnaire 3</td>
<td>67</td>
</tr>
<tr>
<td>IX.</td>
<td>Rank Ordered Responses to Questionnaire 3</td>
<td>69</td>
</tr>
</tbody>
</table>
# LIST OF ILLUSTRATIONS

<table>
<thead>
<tr>
<th>Figure</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Panelist Location Map</td>
<td>59</td>
</tr>
</tbody>
</table>
CHAPTER I

INTRODUCTION

The year 2000, the turn of the century, will mark the end of one millennium and the beginning of another. In his book, *Forecast 2000*, George Gallup, Jr. makes predictions concerning vital issues facing the United States of America. One of those issues is education. According to Gallup (6) the role, methods, and impact of education have been changing throughout the history of this country. In the 1980s there is an increasing pressure on education to adapt to the needs of the student who needs to compete economically and technologically on the global scene (6).

The immediate future is and will continue to be a period of accelerated change greatly influencing the designer (2). The next fifteen years may show a pronounced change in design education including a greater use of computer technology (6).

This consideration leads to two important questions. How will basic design be taught in the year 2000? How can design educators, those who are involved directly or indirectly with the teaching of design, prepare for the changes that may be coming in design education? A study to identify the perceptions of design educators on how basic
design will be taught in the year 2000 can be the first step to answering these questions. This futures study uses a Delphi exercise to poll a panel of design educators across the United States to determine their perceptions of how basic design will be taught in the year 2000.

Statement of the Problem

The problem of this study is to determine how basic design will be taught in the year 2000 in the United States of America according to the perceptions of design educators.

Purposes of the Study

The purposes of this study are to (1) predict, according to the perceptions of design educators, how basic design will be taught in the year 2000 to allow design educators to better prepare for the future and (2) provide a basis for further research that might address specific areas in the future of teaching design.

Significance of the Study

This study is significant for the following reasons.

1. It provides, by predicting how basic design will be taught in the year 2000, a rationale for design teachers to teach design in a manner that may better reflect the needs and influences of the future. As Cetron and O'Toole (4) warn, better information is needed about tomorrow and more help with tomorrow.
Futurists, those seriously trying to explore the future, recognize the difficulty or even possibility of trying to predict what will happen in years ahead, but they insist that in this rapidly changing world they must try to do it anyway (5). Whitney (16) agrees, stating that we need the foresight to see where we are going. Determining some notion of what may happen would help avoid the crises and take advantage of the opportunities that shall be encountered ahead (5). As Adelson and Aroni note in The Delphi Method, edited by Linstone and Turoff (12), actions in the present are inevitably influenced by which images one carries of prospects in the future. Cetron and O'Toole (4) agree that it is important to predict the future because times are changing so fast that we can no longer prosper by ad-libbing responses to future events.

2. It provides a foundation for future research. This study of the perceptions of design educators can help narrow the scope of the problem and be the first step to a greater understanding of teaching design in the year 2000. Gallup (6) states that because it is difficult to predict specific future events, one should first think in broad categories and massive movements. Subsequent studies could focus on specific areas of concern within the teaching of design. Madeja (13) emphasizes that further research is needed to improve the state of education in the United States.
3. It is practical and timely. The results of the study can be used immediately as support and rationale for improving design education, if necessary. Toffler (15) warns that education must be at the forefront of the information age and Borg and Gall (3) note that conducting research offers the best chance there is for bringing about real improvements in education.

4. Finally, it is widely applicable. Design teachers in various design disciplines will be able to use the findings and conclusions of this study in guiding decisions regarding the future of teaching design. Teachers of other subjects may find this study useful as a model for examining how their subject fields will be taught in the year 2000.

Research Questions

To achieve the purposes of this study the following questions were addressed.

1. How will basic design be taught in the year 2000 in the United States of America as predicted by a panel of design educators?

2. What recommendations can be made concerning teaching design in the year 2000 based on conclusions and implications drawn from the panel predictions?

Limitations of the Study

This study is subject to the following limitations.

1. According to Gallup (6), any attempt to prophesy
the future will involve some degree of speculation and assumption of future world events. Unexpected major events that may completely change the course of history cannot be anticipated. Gallup refers to this as the surprise factor.

2. Linstone and Turoff (12) caution that the responses from the panelists can be expected to be influenced to a slight degree by personal esteem and group self-concept.

3. The Delphi panel, the Delphi questionnaires, the findings of the Delphi exercise, and the resulting conclusions and recommendations are considered only as they apply to teaching design in the United States of America.

Definition of Terms

The term Basic Design has restricted meaning and is defined for this study as a foundation course offered in an art or design department of a college, university, or community college. It is usually required as a prerequisite and preparation for intermediate and advanced courses in any of the various design disciplines such as architectural design, communication or graphic design, fashion design, industrial design, interior design, or theater design. Basic Design may also be called Design Fundamentals, General Design, or Design I.

The content of basic design usually includes definitions and applications of the design elements and principles including, but not limited to, color, line, shape, texture, balance,
and unity. Lauer (10) states, however, that no two designers will ever agree on the same list of design elements and principles. Also covered in basic design is the design process, the act of solving a design problem. It is also called the creative process or the problem solving process. Although the term design may be difficult to clearly define (1, 7, 11), many sources agree that design is the act of problem solving (1, 2, 7, 9, 14) and is an act of creative behavior (1, 7, 8, 9, 11).


CHAPTER II

REVIEW OF RELATED LITERATURE

Introduction

To hazard a guess at what the future will bring is risky but certainly fun (41). In the year 2000 the strongest and most stable country in the world will be the United States of America (7), but no matter how old one is in the year 2000, profound change will have been written into one's life. Cetron and O'Toole (7) predict that the majority of Americans will be better off in the year 2000 than they are today. They will feel better, look better, and live longer. Of course, there will be change but it will not be the kind of change that worsens one's lot in life.

Human affairs are undergoing a new revolution comparable to the industrial revolution that launched the machine age. Electronic circuitry, microprocessors, and computer generated imagery threaten to radically alter our culture's images, communication processes, and the very nature of work itself (33). Mandell (32) concurs, emphasizing that computer hardware has developed at an incredibly rapid pace in the past two decades, a pace that will likely continue. The current rapid advancement of technology,
however, will in a few years seem to have been moving very slowly, according to Schnake (41).

Microcomputers are affecting most people's lives, not only the lives of college students, in one way or another. Possibly, in another generation everyone will use a microcomputer at work and most people will probably have one at home also (32). In the 1985 to 1990 time frame, significant shifts in purchasing patterns for commercial graphic arts and visual media support will occur as computer graphics and digital communications become more common in corporations and design studios (11).

The designer's role in the future lies in the direction the field pursues in the next few years (46). Hiesinger (20) warns that the qualities of good design must follow the changes of history, and the changes of technology. Society will have a greater need for innovation and creative problem solving skills in the future (30, 34).

Edward Cornish, while President of the World Future Society, noted that the future cannot be studied because the future does not exist, but one can study ideas about the future, perceptions of what might happen (8). It is important to be able to predict the future because times are changing so fast one can no longer prosper by ad-libbing responses to future events (7). Needing the foresight to see where one is going (46), one needs better information about tomorrow and more help with tomorrow (7).
The Information Age

The information age began in 1975 when more Americans were employed in information processing jobs than in industrial jobs (39), yet Americans are only now realizing that the information environment is upon them (46). The information age should not be confused with a coming era sometimes called the age of consciousness or the new age. Russell (39) predicts that the age of consciousness will pick up momentum in the 1990s but not become a dominant force in global society until the year 2005.

Alvin Toffler (43), author of The Third Wave and Future Shock, suggests that the information age is the third great age in history, following the agricultural age and the industrial age. The impetus for the transition from the industrial age to the information age came from the rapid and explosive developments in technology, particularly those associated with the computer (45). This technology revolution touches the lives of almost everyone and is expected to accelerate beyond its present pace (21). The information environment is presenting us with a situation as complex and rapidly changing as mankind has ever faced (46). Bevlin (5) agrees, adding that the information age is and will continue to be a period of change greatly influencing the designer.

The challenge to designers will be to give clarity, order, and meaning to this deluge of electronic data.
Whitney (46) strongly states that designers must determine their role in this new age. If they do not, others will and the alternative may be their obsolescence. The central question facing the design field is not simply how to use new computer tools to produce solutions more rapidly; but to use computers to gain a clearer understanding of what should be designed to fit the new context of the information environment (46).

Design

Design has become one of those words having such a wide range of reference that one can no longer be really certain just what it means. In different contexts the word design can represent such varied situations that the visible design products appear to share little in common (26). According to Hanks (17) and Bayley (4), design can mean different things to different people.

Design might be termed the process of creative problem solving as it demands creative behavior from its participants (24). Design is the organization of parts into a coherent whole (5). The activity of design is to improve existing conditions and to find clear paths out of dilemmas (24). The planning and patterning of any act toward a desired, forseeable end constitutes the design process (35). Design is the conscious effort to impose meaningful order (35). Design is a series of decisions taken one at a time. Each
time a decision is made, the choices narrow, until there remains only one best solution (5). Design evokes the idea of pattern making, an idea that can be traced back to the Middle Ages and the Italian word *disegno* which means drawing. In this sense the tapestries and stained glass windows of the great cathedrals can be said to have been drawn, or designed, in the same way that contemporary industrial designers try their ideas for mass produced objects in preliminary sketches and working drawings (4).

Lawson (26) asks if one really needs a simple definition of design or should one accept that design is too complex a matter to be summarized in less than a book. The answer is probably that one shall never find a single satisfactory definition but that the searching is probably more important than the finding (26).

What is certain, according to Bayley (4), is that with mechanized mass production and the new industrial and social arrangements it entailed, design and the designer achieved a new and unprecedented status. Just like the cathedral craftsmen of old, the modern designer is someone who gives form to an idea. The term design is itself a modern invention, a product of the machine age; before then the same person who created an object in his mind when on to build it. This modern concept of design is inseparable from the division of labor and the other economic changes brought about by the Industrial Revolution (4).
Design embraces the activity and products of the architect, the engineer, the craftsman, the decorator, and the artist. All these different designers perform the same function; finding the best solution to a problem given certain guidelines or limitations in which to work (17). The subject or design covers a wide range of activities, from materials technology at the hard end to styling and marketing at the soft one, and involving a complex network of ideas which create and define the material content of the modern world (4). In an age of mass production when everything must be planned and designed, design has become the most powerful tool with which man shapes his tools and his environments and by extension, society and himself (35).

All men are designers and design is basic to all human activity (35). Bevlin (5) agrees that everyone is affected by design and states that design is considered to be one of the most important factors in a person's life. Hanks (17) adds that if one does not design, he or she is at least ruled by the designs of others. Design governs every aspect of human endeavor including the visual arts, industry, communication, and transportation (5). Everything that man makes is designed, but not everything is well designed. Good design only comes about when products are made with attention both to their functional and their aesthetic qualities (4).
Despite its significance, the study of design is in its infancy (4). Unlike painting and architecture there are not yet many books or articles on the subject and there has been, according to Bayley (4), very little theoretical writing devoted to design in this century. Design theory, like design practice, has in recent years become eclectic. No longer concerned to advance a single theory about either an aesthetic or a process, it simply aims to understand design in its social context (4).

Creative Problem Solving

Although everyone is a problem solving designer (17, 35), some, according to Koberg (24), do it better than others. One is involved in the design process while embarking on numerous problem solving journeys. The more one understands this design process of creative problem solving, the more interesting and meaningful those problem solving journeys will be (24). Society will have a greater need for innovation and creative problem solving skills in the future (30, 34).

Since problem solving skills may depend on gaining access to the usually less dominant right hemisphere of the brain and neuroscientists have provided a conceptual base for right-brain training, Edwards (13) concludes that educators in the future will be able to teach the whole brain. These new discoveries will also help free human creative abilities
An understanding of how the brain works chemically is growing so fast that neuroscientists are on the verge of devising better treatments, based on new drugs and medicines, for memory retention and learning (7). Computers, playing an increasingly important role in the design process, may also influence the way designers think (26).

Traditionally, the end product of the design process differentiates between designers. Lawson (26) thinks this is like putting the cart before the horse, for the solution is something which is formed by the design process and has not existed in advance of it. The real reason for classifying design this way has very little to do with the design process but is instead a reflection of our increasingly specialized technologies (26).

The inventive element of design is essentially independent of expert experience in a field (26). The design process includes a series of components. Electronic devices cannot be factored into each of these. For example, the machine cannot make the difference between a routine approach and a creative approach (20). While such developments will affect designers, Heisinger (20) feels that the design process itself will not change from what it was a long time ago. Different designers use the same design process but understand different materials, requirements, and ways to manifest their solutions. Many designers dabble in other fields, some quite regularly. Although each discipline may be
conditioned by its own design technology (26), the creative problem solving process of design remains the same basic component that is characteristic of all designs.

Computer Technology

The year 2000 is less than fifteen years away, and no matter whose crystal ball you look into, all of them clearly indicate that computers will be a significant factor in twenty-first-century living (32). In a recent Gallup poll, 1,346 participants were asked in what ways life in the United States in the year 2000 would differ from life today. The number one answer was that there would be a greater use of computer technology (15).

The first change that speaks directly to design is the use of the computer as a design tool. Interactive design stations allow designers to explore far more alternatives than have been possible with traditional tools (46). The possibilities with the computer are endless and fascinating (12) and Bickford (6) notes that the use of computer devices has allowed new creative efforts that were previously extremely difficult or impossible to achieve. The world of electronics has developed devices that greatly expand the range of the designer's work and the speed with which he does it (20). Computers have redefined the limits of art (32) and have made possible the creation of images once found only in dreams. Since picture-making by computer is
here to stay (28), artists now have the opportunity to work in a totally new art form (31). Professional artists can now use minicomputers and mainframe equipment to create animation and surrealistic scenes and to superimpose human actors upon computer generated backgrounds (32).

The computer offers almost unlimited opportunities for experimental activity. The search for new forms, new materials, and new tools has led artists to explore many branches of technology with interesting results. This drive for originality may one day be seen as an expression of neurosis; an exaggeration of the individuality of artists to counterbalance the collective enterprise of science (27).

Designers now seem ready to accept the idea of computers as tools, replacing hand labor in the repetitive aspects of the design process (46). Computer-aided design is no longer a new idea. Since computing power became available people have sought to define a role for computers in the design process (26). The one certain things is that the computing concept is only beginning to find its range of applications (41). Although some artists who use computers frequently claim that the electronic system is simply another tool, there is an implication, according to Lewell (27), that the artist uses it merely to reveal what he has already visualized imaginatively.

The central question facing the design field is not simply how to use these computer tools to produce solutions
more rapidly; but to use them to gain a clearer understanding of what should be designed to fit the new context of the information environment (46). Most of the discussion about the use of computers in design is focused on computer graphics, and computer-aided design and manufacturing. Although using computers as an aid in production will be useful, the main aid to design will be helping in the analytical and planning processes (46). Computers are ideally suited to helping designers analyze, organize, and evaluate information. The analytical aspects of the design process, however, seem to be forgotten in all of the discussions about computer supported design. It is here that the computer has a critical role to play. If one looks at the general divisions of the design process (defining the problem, research, idea development, forming the solution, production, and evaluation), computer applications can be found to support each one (46).

The electronic studio is distinguished by its use of computers, and new media and electronic methods, to produce print, audiovisual, and technical media. The quality of work produced by electronic studios can be on par with traditional studio products and can be achieved with savings in areas such as time, labor, and materials (11).

Gottschall (16) cautions that technological wonders will not do all of one's work. Computers, as tools, cannot replace creativity. Technology can, however, free the
artist for greater creative thought (2). Massimo Vigenelli, in a speech at the Stanford Conference on Design in 1982, stated that the assistance of technology will free the designer to design.

It must also be acknowledged that some of the primary benefits of the computer have no relevance in the fine arts (27). Speed, which is so essential in the applied arts, is one example. Another is the ability to accomplish routine tasks with the help of automation, since no task is strictly routine for the fine artist (27). Unlike the applications of the computer in graphic design and illustration, where it is clearly the servant of the artist, in many works that have found their way into art galleries the computer has apparently become the master of the artist (27).

For today's generation of designers there is little doubt that the computer represents a big challenge. Lewell (27) feels that computers are difficult to master and have little use until they are given specific tasks to perform. There is also the ever-present danger that this complex technology can distract designers from their true vocation. Neither the inner world of feelings and imagination, nor the external world of appearances and perceived reality receive sufficient attention if designers are struggling to master the tools of their craft. Like most technological developments, the graphic computer is an ambiguous gift: its benefits are almost exactly counterbalanced by its
disadvantages (27). Mandell (32) agrees that the current computer revolution will probably lead neither to an idealized utopia nor into a technological nightmare but to a state somewhere in between.

Educational Media

The graphic designer today works in a variety of media (27) and the future in education looks increasingly multi-media (47). The poster and the book, vital communication tools of the industrial revolution, will survive the new age of electronic technology as major art forms; the written word will remain (33). In addition to textbooks, handouts, slides, and films; media technology has provided video cassettes, audio tapes, the video quantizer, color mixing projectors, and computer courseware programs that can enhance the teaching of terminology, history, concepts, theorems, and components of design (21).

The combination of optical disks and computer programming has created a promising teaching tool called interactive video. Some educators believe it will replace the computer, the instructional film, and perhaps even textbooks (32). Interactive video merges graphics and sound with computer generated text by linking a videodisk player, a microcomputer, monitor, and disk drive with a videodisk and computer software. Using this equipment a student can watch news footage, learn about the most current advances,
and listen to speeches by famous designers. The interactive process begins when the student responds to computer generated questions and forms inquiries to put into the system (32).

Videodisk technology will change the way we share information. Students may receive homework packages consisting of software on a floppy disk and graphics on a videodisk to play on equipment in the home (32).

 Imageware will begin, by 1987, to supplement software as a means of enhancing the capabilities of electronic studio systems. Imageware refers to familiar items published in a digital form such as clip art, type fonts, and graphic templates. It will also include new categories of content and intelligent design and formatting tools specially adapted for the electronic studio environment (11).

Cable operators will offer educational programs tailored to specific interest groups. Cables will be wired between universities so students in one school can learn from professors in another (7). Many universities will be totally wired for computer communications. A university may have its own satellite for broadcasting to its students. A student might sign up for an electronically transmitted course at any time during the semester. To earn credit for the course the student must finish the course by completing the prescribed exercises. Any skill that is lacking will be improved by any of the dial-up courses available from the student's home microcomputer. Classes given throughout
the day will be monitored by students (41) and there will be regional and national education banks of information that can be reached by telephone (7).

Design Education

Art instructors recognize the importance of basic design as the foundation for future work in art (25). Basic Design is a foundation course offered as a preparation course for intermediate and advanced courses in design. The content of basic design usually includes definitions and applications of the design elements and principles although Lauer (25) states no two designers will ever agree on the same list of design elements and principles. The course also covers the creative problem solving process.

In today's mass market every consumer can be a design critic. That gives the consumer the power to affect his or her environment. The more discriminating people become, the more manufacturers will have to realize that merchandise must meet the demands made of it; as a result good design will have to become a fundamental part of any successful business (4). Madeja (31) emphasizes that design education should teach the new visual language created by electronics and computer technology. Though it is essential for a designer to have a good understanding of the technologies relevant to the field, this alone will not make a successful and productive designer (26). It is important not
just to be technically competent but also to have a well
developed aesthetic appreciation (26). Hiesinger (20)
expands on those objectives cautioning that design can only
be taught by getting to the heart of the problem that is to
be solved and design education must remain practical since
the analysis of realistic problems is the only way to find
useful solutions.

Aaron Marcus, a designer and a visual information
systems consultant, is concerned about the slow progress
design schools have made in trying to work with the new
electronic media (46). Marcus specifies that designers are
going to have to become more involved with computer graphics
(46). Lewell (27) disagrees, however, arguing that designers
have made genuine efforts to come to terms with new tech-
nology and adapt it to serve their own creative needs. The
design community is responding to this new age of electronic
circuitry by an involvement in media graphics, systems design,
and computer graphics. The tools, as has happened so often
in the past, are changing with the relentless advance of
technology, but the essence of design remains unchanged.
That essence is an ability to translate ideas and concepts
into visual form and to bring order to information (33).

Computers are a natural aid for designers. The computer
provides the support and organizational capacity that allows
a designer to fit the elements of the design process
together (46). Computers at the Institute of Design at the Illinois Institute of Technology are used to describe and evaluate design problems, structure complex information, and show the relationships between those pieces of information (46).

Graphic designers have a responsibility to adapt new technology and to express the trends of their times by inventing new forms and new ways of expressing ideas (33). Changing from manual drawing to computerized production will indeed speed things up; it will also expand the range of the designer's search, for the computer can be programmed to develop more views, more alternatives, with great speed. It will even show better responses to the statement of the problem and will quite possibly modify the statement itself in the interest of greater depth and precision (20). The need for clear and imaginative visual communications to relate people to their cultural, economic, and social lives has never been greater (33).

Many people unable to participate in today's educational offerings will be able to participate in future offerings (18). Together with the cable, the computer will change the facts of education (7). Future users of computers in education should integrate personal computers, communications networks, and videodisk capabilities into an exciting delivery system for educational services (18). Campus computing networks will give students access to a
computerized card catalog at the library, perform bibliographic searches of extensive data bases, offer electronic mail access to professors and fellow students, and broadcast course work. Interactive courses will be possible through teleconferencing, which will allow submission of graded work and grading via computer networks (18).

When asked what programs or plans should be undertaken to improve United States society, 24 percent of the respondents in a Gallup poll replied to improve the quality and accessibility of education. This was the number one answer. When asked what steps an individual should take to prepare for the future, the number one answer was better and more education (15). Madeja (31) emphasizes that research and development of curriculum are needed to improve the state of education in the United States. In no prior era of history have so many public and private bodies issued reports recommending reform in United States education (38). Colleges and universities have long been catalysts for new ideas. Research conducted in a broad range of disciplines has often sparked ideas and social changes (32).

Uses of the Delphi Method

In addition to methods such as trend extrapolation and scenario writing, futures forecasters use the Delphi method. Based on the premise of anonymously polling experts in the appropriate field, the Delphi technique of futures
forecasting consists of administering a series of questionnaires, usually called rounds (8). Recognizing the difficulty in defining the Delphi method (19), Linstone and Turoff, editors of *The Delphi Method* (29), offer the following as a generally acceptable definition.

Delphi may be characterized as a method for structuring a group communication process so that the process is effective in allowing a group of individuals, as a whole, to deal with a complex problem (29, p. 3).

The Delphi method was developed after World War II by two Rand Corporation researchers, Olaf Helmer and Norman Dalkey, to determine the number of atomic bombs required by enemy forces to put the United States out of commission in a war. The project was named after the oracle at Delphi in ancient Greece (8).

The Rand Corporation felt that human judgments are useful for generating forecasts and that the consensus forecast of a number of informed individuals is likely to be better than the forecast of a single individual. Helmer and Dalkey also knew that if a group of experts is summoned to give their opinion on something, a great many group interactions may occur that detract from the development of a good forecast. To get around this difficulty, Helmer and Dalkey developed the Delphi poll requiring each expert to be consulted separately and perhaps not even know the other experts who are participating (29).
In the Delphi method there is an attempt, according to Gallup (15), to encourage both the logical processes and the intuitive capabilities of the experts to emerge. Futurologists, spiritual heirs of the Delphi method, are emerging in the wake of works by Alvin Toffler and John Naisbitt (15). Cetron and O'Toole (7) think the surprising thing about the Delphi pool is that it works. In tests in which people are asked for the answers to improbable questions, the Delphi pool provides the closest answer time after time.

According to Linstone and Turoff (29) the three phases of the Delphi method are to select and survey a panel of experts in the field in question, note and clarify any trends developing in the answers, and survey the experts again but this time let them know what the other members have predicted and allow them to respond. The first round is unstructured and open ended in order to elicit initial ideas and predictions. In subsequent rounds the Delphi panel is provided with the results from the first round and polled again to clarify and specify their predictions by denoting rank orders or degrees of importance.

According to Dalkey and others (10), the Delphi method has been used by organizations and individuals to examine judgments, values, decisions, perceptions, and recommendations on policy and expectations. Many Delphi studies
involve forecasting future events and technological developments (10).

Over 1000 Delphi studies have appeared in literature demonstrating highly diversified applications (42). Linstone and Turoff (29) and Dalkey and others (10) agree that the use of the Delphi technique is varied as illustrated by its use in the fields of government, business, industry, public transportation, health care, and education.

Scholars have conducted hundreds of Delphi polls and the consensus seems to be that the method offers one way to develop forecasts that may be at least a little better than could be obtained from a single expert or from a group of experts meeting together (8). The technique has been used to validate teaching competencies, analyze career education content, and to clarify educational objectives (36); to determine the perceived reading skill needs of community college students as determined by community college content area faculty (9); to determine the factors that contribute to success in administering AA high schools in Texas (1); and to implement a framework for remedial reading for seventh and eighth grades (22).

Modifications to the Delphi Method

Originally the Delphi technique was used in long-range forecasting in highly technical organizations, however, Erffmeyer (14) notes that it can now be used for any purpose
for which a committee or decision-making group is appropriate. Linstone and Turoff (29) state that there are a number of different objects having the Delphi label and if anything is "true" about Delphi today, it is that in its design and use Delphi is more of an art than a science.

Judd (23) emphasizes that there is no single monolithic structure to the Delphi technique. Erffmeyer (14) agrees, stating there are no hard and fast rules to guide the design of a Delphi study. The Delphi method is not a singular nor unchanging approach to problem solving about the future (23).

Early Delphi studies followed a traditional Delphi format as a forecasting technique, but the Delphi method and its application have since been in a period of evolution, both with respect to how it is applied and to what it is applied (19). Delphi practitioners faced with designing and labeling their study either apply the traditional use of the Delphi as a forecasting tool or, according to Henson (19), design their own Delphi study which may or may not include the word modified in the title indicating some variation in application, procedures, or goals from some other Delphi study. Preble (37), who reviewed a large number of Delphi studies in a variety of public sector settings, concluded that the research intentions of the studies examined varied widely and often required modifications of the conventional Delphi method.
Linstone and Turoff (29) state that variations to the original Delphi methodology can be created for particular applications. Waggoner (44) adds that the application of the Delphi methodology with variations is commonplace today. Erffmeyer (14) concurs that the widespread use of the Delphi technique has led to many variations in format and implementation among practitioners.

Government planners and policymakers have used the Delphi method as a multipurpose research tool and have made the necessary modifications (37) and, according to Preble (37), most of these modifications proved satisfactory to the study designers. The use of the Delphi method in the public sector has been growing rapidly, due in part to the flexible nature of the Delphi method which allows modifications to the classical Delphi method (37). In most cases, according to Preble (37), these modifications have allowed the basic character of Delphi to be preserved as well as preserving its advantages over other forecasting methods.

There are many manipulations that can be developed in designing a Delphi study (29). There are, according to Linstone and Turoff (29), many different views on what are the proper, appropriate, best, or most useful procedures for accomplishing the various specific aspects of Delphi.

A Delphi dissertation at the University of Florida employed a modified Delphi technique to establish simple priority rankings of objectives for a program of general
education in the community college (19). As Bardecki (3) suggests, the Delphi rounds should be kept as simple as possible to encourage participation and response from the panelists. That study departed from the usual Delphi procedure and was labeled a modified Delphi (19). Another modified Delphi study conducted to forecast future developments in the library field solicited predictions of coming events, grouped those into categories, and asked the participants to predict when each event might take place and if they had a preference for that event occurring (37).

In a study in the field of education, the researchers reviewed the classical Delphi and then developed a number of modifications which they felt would increase the range, applicability, and utilization of the Delphi technique (37). Another Delphi researcher altered the round two question and direction of the study after compiling responses from the first round (23). Another avoided the normal first step in a Delphi forecast (that of asking the panel to respond to a general question). That researcher began the first round where some other Delphi studies would be entering the second round (23).

A unique feature of the Delphi as a group communication process is the fact that, according to Henson (19), the Delphi relies on individual, anonymous response so that each participant can respond according to his or her own perceptions. In a Delphi study concerning management of water
sources of the Great Lakes, several significant modifications were made, motivated by the perceived threat of a manipulated consensus (29). Sackman (40) also cautions that the traditional Delphi technique produces manipulated convergence of opinion.

Sackman (40) recommends changes in the Delphi technique such as dropping statistical feedback of probabilities and consensus forcing procedures. Sackman (40) questions the notion that convergence improves the accuracy of a forecast. Predictions may be altered by this encouraged convergence toward a mean emphasized by the researcher which may weaken the usefulness of soliciting anonymous personal predictions (40).

The goal of the Delphi procedure is to arrive at a meeting of the minds, consensus among the experts. Sackman (40) notes that the Delphi procedure arrives at such a consensus by feeding back the "correct" answer, by rewarding conformity, and effectively penalizing individuality (40). Authentic consensus should not, according to Sackman (40), refer to changes of opinion associated primarily or exclusively with bandwagon statistical feedback.

An experiment was conducted by Scheibe, Skutsch, and Schofer, and reported in The Delphi Method by Linstone and Turoff (29), concerning the effect of feedback in a Delphi study. The experiment results suggest that the Delphi respondents are sensitive to the feedback of distributions
of scores from the group as a whole. These results seem to indicate that most respondents are both interested in the opinions of the other members of the group and desirous of moving closer to the perceived consensus (29).

Sackman (40) asserts that the Delphi technique deliberately manipulates responses toward minimum dispersion of opinion in the name of consensus. The presentation of medial opinions (after the first round) and the coercion toward conformity are reassuringly represented to the reader as reasoned consensus (40).

According to Sackman, forcing a consensus of opinion inhibits open exploration of new domains. Exploration can lead to polarization of opinion that undermines consensus in the traditional Delphi technique. Delphi should maximize exploration, highlight controversy, strive to map out the unknown, and encourage free and informed choice (40).

Some researchers, according to Preble (37), have labeled their Delphi studies as either exploratory or normative. The exploratory Delphi attempts to predict the future while the normative Delphi attempts to shape the future toward desired goals (37). The exploratory objective views Delphi as an educational technique to help participants, the researcher, and subsequent users to explore a problem more thoroughly, leading to greater insight on the target problem (40).

In planning for the future, the Kantian inquiry system, according to Linstone and Turoff (29), seeks to get as many
perspectives on the nature of the problem as possible. Problems which involve the future cannot be formulated and solved in the same way that one solves problems in arithmetic, usually by a single well-structured approach (29). In dealing with the future, one is not dealing with the concrete realities of human existence, but, if only in part, with the hopes, dreams, plans, and aspirations of men and women. Since different people have different predictions, Linstone and Turoff (29) suggest the best way to analyze these predictions would be to compare them with one another. It would seem the best way to get a handle on the future, according to Linstone and Turoff (29), is to draw forth explicitly as many different plans for the future as possible and examine many different alternatives.

Linstone and Turoff (29) report that recently there have been a number of Delphi studies which, in contrast to the original consensus Delphis, begin to take on the characteristics of a Kantian style of inquiry. The initial Delphis were characterized by a strong emphasis on the use of consensus by a group of experts as the means to converge on a single model or position on some issue. In contrast, the explicit purpose of the Kantian style of Delphi study is to elicit alternatives so that a comprehensive overview of the issue can take place (29).

In terms of communication processes, while a consensus Delphi is better suited to setting up a communication
structure among an already informed group that possesses the same general core of knowledge, a Kantian, or contributory, Delphi attempts to design a structure which allows many informed individuals in different disciplines or specialties to contribute information or judgments to a problem area which is much broader in scope than the knowledge that any one of the individuals possess (29).

Consensus on a single definition is not the goal, but rather the eliciting of many diverse points of view and potential aspects of the problem (29). The Kantian contributory Delphi hopes to present the decision maker with several alternative models of the problem to better clarify both the problem and the nature of the objectives, which after all are part of the problem (29). This study is patterned after the exploratory, contributory Kantian style of Delphi technique.
CHAPTER BIBLIOGRAPHY


CHAPTER III

METHODS AND PROCEDURES

The Delphi Method

The Delphi technique of futures forecasting consists of administering a series of questionnaires, usually called rounds. According to Linstone and Turoff (9) the Delphi method has three phases:

1. Select and survey a panel of experts in the field in question,

2. Note and clarify any trends developing in the answers, and

3. Survey the experts again but this time let them know the results of the previous survey and allow them to respond.

The Delphi method requires each panel member to be consulted separately and perhaps not even know the other experts who are participating (9). The first round is unstructured and open ended with the purpose of eliciting initial ideas and predictions. Subsequent rounds attempt to clarify and specify those initial predictions.

The Delphi method of futures forecasting was selected for this study because this study meets the following
criteria for using the Delphi method as established by Linstone and Turoff (9).

1. The problem does not lend itself to precise analytical techniques but can benefit from subjective judgments on a collective basis.

2. More individuals are needed than can effectively interact in a face-to-face exchange.

3. Time and cost make frequent group meetings infeasible.

4. Disagreements among individuals may be so severe that the communication process must be refereed and anonymity assured.

5. The heterogeneity of the participants must be preserved to assure validity of the results. The study must avoid domination by quantity or by strength of personality to minimize a bandwagon effect.

6. The time demanded of the respondents is minimized over other forms of group communication techniques such as committee meetings, conferences, and seminars.

7. Fears of potential embarrassment or repercussions of disagreements among the respondents is removed.

Originally the Delphi technique was used in long-range forecasting in highly technical organizations, however, Erffmeyer (5) notes that it can now be used for any purpose for which a committee or decision-making group is appropriate.
Linstone and Turoff (9) state that there are a number of different objects having the Delphi label and if anything is "true" about Delphi today, it is that in its design and use Delphi is more of an art than a science. Judd (8) emphasizes that there is no single monolithic structure to the Delphi technique. Erffmeyer (5) agrees, stating that there are no hard and fast rules to guide the design of a Delphi study. The Delphi method is not a singular nor unchanging approach to problem solving about the future (8).

Delphi practitioners faced with designing and labeling their study either apply the traditional use of the Delphi as a forecasting tool or, according to Henson (7), design their own Delphi study which may or may not include the word modified in its title indicating some variation in application, procedures, or goals from some other Delphi study. Linstone and Turoff (9) state that variations to the original Delphi methodology can be created for particular applications. Waggoner (13) adds that the application of the Delphi methodology with variations is commonplace today. Erffmeyer (5) concurs that the widespread use of the Delphi technique has led to many variations in format and implementation among practitioners, due in part, according to Preble (11), to the flexible nature of the Delphi method which allows modifications to the classical Delphi method. These modifications have allowed the basic character of Delphi
to be preserved as well as preserving its advantages over other forecasting methods (11). There are, according to Linstone and Turoff (9), many different views on what are the proper, appropriate, best, or most useful procedures for accomplishing the various specific aspects of Delphi.

This study, predicting how design will be taught in the year 2000, was modified from the original or classical Delphi technique to (1) encourage free and open exploration by not forcing a consensus of opinion or coercing the panelists to revise their answers to approach a mean, (2) eliminate this forced consensus of opinion by not providing statistical feedback that might encourage the panelists to alter their original answers for the sake of convergence of opinion, and (3) maximize the applicability and usefulness of the study by keeping it broad and exploratory in nature. For this study the classical Delphi technique was modified in the following areas.

1. This study sought key word categories from Questionnaire 1, simple rank ordering of those categories in Questionnaire 2, and degrees of implementation of specific topics within those categories in round three, a procedure suggested by Linstone and Turoff (9). The purpose of the study is to determine a broad overview of the problem facing design educators and to encourage open, exploratory thought. As suggested by Linstone and Turoff (9), consensus on a single definition is not the goal, but rather the
eliciting of many diverse points of view and potential aspects of the problem. This study is patterned after the Kantian or contributory Delphi because the explicit purpose of a Kantian style of Delphi study is to elicit alternatives so that a comprehensive overview of the issue can take place (9). This simple rank ordering and determining degrees of implementation provided an easy and convenient forum for the Delphi panelists. As Bardecki (1) suggests, the rounds and questionnaires were kept as simple as possible to encourage participation and response from the panelists.

2. Rounds two and three of the modified Delphi technique reported results of the previous round but, to avoid forced manipulation of convergence, did not report the mean response. The traditional Delphi technique, according to Sackman (12), deliberately manipulates responses toward minimum dispersion of opinion in the name of consensus. By forcing a consensus of opinion the traditional Delphi technique inhibits open exploration of new domains (12). A Delphi study should prod conformers and reward outliers to maximize exploration, highlight controversy, and map out the unknown by encouraging free and informed choice (12). The Kantian style of Delphi technique was selected also because it is best suited to problems which are difficult to formulate because the nature of the problem does not admit of a clear consensus or a simple analytic attack (9).
The origin, applications, and modifications to the Delphi method are discussed more fully in Chapter II, Review of Related Literature.

The Delphi Panel

The Delphi panel is a group of people selected to participate in the Delphi exercise. These panelists should meet the following criteria as established by Linstone and Turoff (9).

1. The panelists should be able to identify with the subject of the Delphi inquiry. The principal interest of the panelists is the particular qualities or insights each seeks to contribute.

2. They may be interested in the study as a jumping-off point for further self-directed inquiry.

3. The panelists should center their interests on the specific issue questioned and on its continuance, survival, and enhancement.

4. They should be, according to Scheele in The Delphi Method by Linstone and Turoff (9), stakeholders (those who are or will be directly affected), experts (those who have an applicable specialty or relevant experience), or facilitators (those who have skills in clarifying, organizing, synthesizing, and stimulating).

The panelists selected to participate in this Delphi exercise should be directly involved in the teaching of
design at the university level and specifically design teachers in graduate design programs because of their propensity to conduct research and their stake in the future of teaching design. The information derived from a panel that is too large could prove unwieldy and a panel that is too small might not provide enough information. Therefore, McLaughlin (10) recommends that the number of Delphi panelists be greater than 25 but less than 100 in order to more easily manage the study. Dalkey and others (3) concur, stating that Delphi panels with twenty-nine panelists have reached conclusions with minimal error.

To select a panel of design educators at the graduate level the Directory of Graduate Programs: 1984 and 1985 (4) was consulted. This directory lists over 12,000 degree-granting graduate programs from 814 accredited graduate institutions in the United States. According to this directory there are seventy-two schools that offer a graduate program in design (see Appendix A for a complete listing). This population of graduate level design educators meets all three of the role criteria established by Scheele in that they are stakeholders, experts, and facilitators.

A cover letter was mailed to the chairperson of the art department in each of these seventy-two schools. Addresses for the art department chairpersons were obtained from the HEP 1985 Higher Education Directory (6). The cover letter
asked the chairperson to select a design facility member who was interested in the future of teaching design and was currently teaching Basic Design. Writing to the chairpersons and asking them to select the participants placed greater importance and motivation for the faculty members to respond since they were being asked by their chairperson instead of by the researcher.

Collection of Data

The Delphi exercise for this study consisted of three rounds of questioning. Sackman (12) cites the Delphi critic, J. P. Martino, who states that in many Delphi studies, there is no advantage in going beyond two rounds, but according to Linstone and Turoff (9), past Delphi studies have shown that three rounds proved sufficient to attain stability in the responses. Further rounds tended to show very little change, and excessive repetition was unacceptable to the participants (9).

The first round questionnaire package was mailed to the Art Department Chairperson in each of the seventy-two schools forming the Delphi population. This package included the following materials needed to initiate the Delphi study.

1. A cover letter (see Appendix B) explaining the study and asking the Department Chairperson to select a design faculty member to participate in the study.
2. An explanatory letter to the participating Delphi panelist (see Appendix C).

3. Questionnaire 1 (see Appendix D).

4. A stamped and addressed return envelope.

Based on criteria established by Borg and Gall (2), these materials stated the purpose of the study, provided motivation for participation (to better prepare for the future of teaching design), gave responsible return deadlines, and were brief and clearly written. To associate the study with a professional institution, as suggested by Borg and Gall (2), the stationery and envelope used were from Brookhaven College of the Dallas County Community College District where the researcher was an instructor at the time the study was conducted. The envelopes were hand addressed to express a personal touch. This initial package was mailed on September 27, 1985 (see Table I).

Round one ended when at least twenty-nine responses were received, each indicating a willingness to participate as a Delphi panelist in this study. This exceeded the minimum figure of twenty-five as suggested by McLaughlin (10) and met the figure of twenty-nine as suggested by Dalkey and others (3) for a manageable number of Delphi participants. Of the initial population of seventy-two schools, thirty questionnaires were returned by October 20, 1985. This established a return rate of 42 percent from the initial
TABLE I

STUDY SEQUENCE TIMETABLE

<table>
<thead>
<tr>
<th>Date Completed</th>
<th>Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1985:</td>
<td></td>
</tr>
<tr>
<td>September 27</td>
<td>Round 1 Questionnaire Mailed</td>
</tr>
<tr>
<td></td>
<td>Completion Time</td>
</tr>
<tr>
<td>October 14</td>
<td>Deadline, Round 1 Analysis, Develop Questionnaire 2</td>
</tr>
<tr>
<td>November 1</td>
<td>Round 2 Questionnaire Mailed</td>
</tr>
<tr>
<td></td>
<td>Completion Time</td>
</tr>
<tr>
<td>November 18</td>
<td>Deadline, Round 2</td>
</tr>
<tr>
<td>November 27</td>
<td>Follow Up Letters Mailed</td>
</tr>
<tr>
<td>December 3</td>
<td>Analysis, Develop Questionnaire 3</td>
</tr>
<tr>
<td>December 20</td>
<td>Round 3 Questionnaire Mailed</td>
</tr>
<tr>
<td></td>
<td>Completion Time</td>
</tr>
<tr>
<td>1986:</td>
<td></td>
</tr>
<tr>
<td>January 17</td>
<td>Follow Up Letters Mailed</td>
</tr>
<tr>
<td>February 5</td>
<td>All Data Collected</td>
</tr>
</tbody>
</table>

seventy-two schools as shown in the Participation Chart in Table II.

TABLE II

PARTICIPATION CHART

<table>
<thead>
<tr>
<th>Participants</th>
<th>Number</th>
<th>Percent of Initial</th>
<th>Percent of Round 1</th>
<th>Percent of Round 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Population</td>
<td>72</td>
<td>100</td>
<td>n.a.</td>
<td>n.a.</td>
</tr>
<tr>
<td>Completing Round 1</td>
<td>30</td>
<td>42</td>
<td>100</td>
<td>n.a.</td>
</tr>
<tr>
<td>Completing Round 2</td>
<td>29</td>
<td>40</td>
<td>97</td>
<td>100</td>
</tr>
<tr>
<td>Completing Round 3</td>
<td>28</td>
<td>39</td>
<td>93</td>
<td>96.5</td>
</tr>
</tbody>
</table>
One panelist dropped out in each of the last two rounds. The number of panelists responding to the full three rounds of Delphi questioning was twenty-eight, 93 percent of the thirty who responded to the initial questionnaire (see Appendix E for a list of the twenty-eight Delphi panelists).

The second questionnaire, with cover letter (see Appendix F), was created from the responses to the first questionnaire and was mailed on November 1, 1985, with a return deadline of November 18. Included in this mailing was an explanation sheet (see Appendix G) giving the results of Questionnaire 1 and explaining the key word categories used in Questionnaire 2 (see Appendix H). Definitions were given for these categories to provide the panelists with a common definition from which to work, as suggested by Borg and Gall (2). Twenty-eight questionnaires were returned by the deadline. Follow-up packages were mailed to the two panelists from whom questionnaires had not been received on November 27, 1985. This package consisted of the original cover letter, explanation sheet, and Questionnaire 2 in case the first package was misplaced or lost in the mail. A handwritten personal note at the bottom of the cover letter (see Appendix I) urged participation. One panel member responded that he had sent in Questionnaire 2 but there may have been a problem with the United States Postal Service. He filled out and returned another questionnaire. The total number of the original
thirty Delphi panelists responding to Questionnaire 2 was twenty-nine. The return rate of Questionnaire 2 to Questionnaire 1 was 97 percent.

The round three package consisting of a cover letter (see Appendix J), an explanation sheet (see Appendix K), and the third and final questionnaire (see Appendix L) was mailed on December 3, 1985. A deadline of December 20, 1985, proved to be too late in the Fall semester as some panelists did not return their questionnaire until after the semester holiday break. On January 17, 1986, eight follow-up letters (see Appendix M) were mailed to those panelists not yet responding. By February 5, seven of these eight questionnaires had been returned. The total number of Delphi panelists responding to Questionnaire 3 was twenty-eight. The return rate for Questionnaire 3 to Questionnaire 2 was 96.5 percent and 93 percent to Questionnaire 1. This total of twenty-eight falls within the number of Delphi panelists as recommended by McLaughlin (10) and within one of the number recommended by Dalkey and others (3).

Procedures for Analysis of Data

The first questionnaire, an open-ended form that asked the panel members to answer the question, "How will basic design be taught in the year 2000?" was written to allow the panelists to generate statements that would be used in the ensuing two rounds. Asking panelists to generate
statements representing their perceptions allows a wider range of responses in areas they consider relevant to the study and reduces the possibility of researcher bias since the panelists themselves determine both the specific items for the ensuing questionnaires and the scope of the items.

The responses to the first questionnaire were analyzed to determine any commonalities, generalities, or trends among the predictions concerning the future of teaching design. This trend-noting spotted repeated concepts, concerns, issues, and key words in the responses from the panel. These key words were compiled and listed on the second questionnaire.

Round two consisted of a cover letter to the panelists listing the key word categories with a brief explanation of each. The accompanying questionnaire listed the categories and asked the panelists to vote for the one category that was most likely to be included in teaching design in the year 2000. The purpose of round two and Questionnaire 2 was to clarify the responses from Questionnaire 1 and place the resulting key word categories in rank order. Linstone and Turoff (9) encourage the use of simple ranking since it is an interval scale that is easy and comfortable for the participants to understand. Many Delphi applications do not call for extremely sophisticated approaches to the analysis of responses and most procedures are inadequate
and inappropriate to analyze data on complex issues such as futures forecasting (9).

In most studies, according to Linstone and Turoff (9), a consensus of the panelists is assumed to have been achieved when a certain percentage of the votes falls within prescribed limits. For round two of this study, each key word category must receive over 50 percent of the panelist votes in order to be considered significant. Thus, a simple majority of the panelists must predict that the category will be included in teaching basic design in the year 2000. The votes for each category were calculated into percentages to determine if a majority consensus was reached.

Questionnaire 3 listed the key category predictions from the first questionnaire in the order of importance as ranked from the second questionnaire. Each key category included specific topics with explanations gleaned from the answers to Questionnaire 1. The questionnaire asked the panelists to vote whether the topic would definitely be included in teaching design in the year 2000 (stated as "Yes" on the questionnaire), might possibly be included ("Maybe"), or definitely would not be included in teaching design ("No"). The purpose of Questionnaire 3 was to determine the degree of implementation of the responses to Questionnaire 2. As Linstone and Turoff (9) state, one of the primary reasons for using the Delphi method is to determine not only which predictions one considers most important, but also the degree
to which each prediction is preferred over the other possibilities.

Sackman (12) recommends dropping statistical feedback of probabilities and consensus forcing procedures. Sackman (12) questions the notion that convergence improves the accuracy of a forecast. Predictions may be altered by this encouraged convergence toward a mean emphasized by the researcher which may weaken the usefulness of soliciting anonymous personal predictions (12). Authentic consensus should not, according to Sackman (12), refer to changes of opinion associated primarily or exclusively with bandwagon statistical feedback. Most Delphi panelists, according to Linstone and Turoff (9), are interested in the opinions of the other members of the group and desirous of moving closer to the perceived consensus. By forcing a consensus of opinion, according to Sackman (12), Delphi inhibits open exploration of new domains. A Delphi study should maximize exploration, highlight controversy, and strive to map out the unknown to encourage free and informed choice (12).

In this round, consensus was achieved for each topic whose percentage of "Yes" votes from the panelists fell into the top quartile limits (75 to 100 percent). This would indicate that the topic would definitely be implemented into teaching design in the year 2000 according to the predictions of the Delphi panelists. Topics whose combined
percentage of "Yes" and "Maybe" votes fell within the top quartile range would be considered as a strong possibility for inclusion in teaching design in the year 2000. The votes for each topic were calculated into percentages to determine quartile placement.

While the first questionnaire sought to collect divergent perceptions, the second and third questionnaires encouraged perceptions to converge, denoting the rank order of importance and the degree of implementation of specific topics into teaching design in the year 2000. From these findings, conclusions were reached for teaching design in the year 2000.


CHAPTER IV

PRESENTATION OF DATA

The Delphi Panel

This study, the teaching of Basic Design in the year 2000 as predicted by a panel of design educators, was conducted using the Delphi method of futures forecasting. The Delphi panel of design educators consisted of twenty-eight participants who completed all three rounds of Delphi questioning. They represented schools from all across the United States of America as shown in Figure 1.

*City for each Delphi Panelist

Fig. 1—Panelist location map
Nineteen states are represented including the top four most populous states: California, New York, Texas, and Illinois. The states represented by one or more Delphi panelists are shown in Table III ranked in decreasing order of population according to the 1980 census of the United States of America.

### TABLE III

**PARTICIPATION BY STATE**

<table>
<thead>
<tr>
<th>State</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>California</td>
<td>3</td>
</tr>
<tr>
<td>New York</td>
<td>3</td>
</tr>
<tr>
<td>Texas</td>
<td>2</td>
</tr>
<tr>
<td>Illinois</td>
<td>2</td>
</tr>
<tr>
<td>Florida</td>
<td>1</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>2</td>
</tr>
<tr>
<td>Indiana</td>
<td>1</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>1</td>
</tr>
<tr>
<td>Tennessee</td>
<td>1</td>
</tr>
<tr>
<td>Maryland</td>
<td>1</td>
</tr>
<tr>
<td>Louisiana</td>
<td>1</td>
</tr>
<tr>
<td>Washington</td>
<td>2</td>
</tr>
<tr>
<td>Alabama</td>
<td>1</td>
</tr>
<tr>
<td>South Carolina</td>
<td>1</td>
</tr>
<tr>
<td>Colorado</td>
<td>2</td>
</tr>
<tr>
<td>Oregon</td>
<td>1</td>
</tr>
<tr>
<td>Kansas</td>
<td>1</td>
</tr>
<tr>
<td>Nebraska</td>
<td>1</td>
</tr>
<tr>
<td>Idaho</td>
<td>1</td>
</tr>
</tbody>
</table>

The six most populous states represented also provided the most Delphi panelists with thirteen of the twenty-eight. These states provided 46 percent of the Delphi panelists in this study. Although all the panelists are design educators, the disciplines in which they teach varies as shown in
Table IV. The discipline listed as Basic Design includes Design Fundamentals and Visual Fundamentals.

**TABLE IV**

DESIGN DISCIPLINES OF PANELISTS

<table>
<thead>
<tr>
<th>Discipline</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Design</td>
<td>13</td>
</tr>
<tr>
<td>Graphic Design</td>
<td>13</td>
</tr>
<tr>
<td>Color, Color Theory</td>
<td>3</td>
</tr>
<tr>
<td>Illustration</td>
<td>2</td>
</tr>
<tr>
<td>Industrial Design</td>
<td>2</td>
</tr>
<tr>
<td>Interior Design</td>
<td>2</td>
</tr>
<tr>
<td>Painting</td>
<td>2</td>
</tr>
<tr>
<td>Architecture</td>
<td>1</td>
</tr>
<tr>
<td>Textiles</td>
<td>1</td>
</tr>
</tbody>
</table>

Some panelists teach in more than one discipline. Seven of the twenty-eight panel members teach Basic Design in addition to another discipline. Thirteen panelists teach Basic Design while twenty-three of the twenty-eight panelists, 82 percent, teach either Basic Design or Graphic Design. Twenty-six of the twenty-eight, 93 percent, teach Basic Design, Graphic Design, Industrial Design, Interior Design, or Architecture. The two panelists who do not teach design both teach color or color theory. In addition to teaching design, two of the panelists are involved in the administration of a design program.

**Round One**

The panel was queried in three rounds. In the first round, the panelists were asked for their name, school, and
design specialty (the discipline of design taught if other than Basic Design: graphics, interior, theater, architecture, etc.). The question in round one was stated as follows.

Based on your perceptions of the future and your knowledge of technological advances, educational reform measures, new media and materials, design topics/units, student testing and evaluation, classroom instructional methods, and changing students; and Ignoring your department's projected budget, facilities, and materials;

How will Basic Design be taught in the year 2000?

The answers ranged from two words ("By computer") to a full page and a half of predictions. The responses were analyzed to note any trends of key words repeated in the responses. There were widely diverse answers but some threads of continuity. The responses to Questionnaire 1 fell into four major categories as delineated by the mention of the key words: electronics and computer technology, the problem solving process in design, video and educational media, and no significant change from how design is currently taught. Some responses fit only into one of these categories while some mentioned key words that fit into a combination of these categories. These key words and phrases are listed in Table V with the number of times each was mentioned by a Delphi panelist.

The key word category of computer included the panelist responses of electronic technology, computer assisted instruction, teaching about the computer itself, the computer used as a tool for creating design compositions, student use on
one computer graphics system in the classroom, and multiple workstations with each student having his or her own computer terminal. The problem solving key word category included responses of teaching creativity, teaching visual thinking, introducing topics on the brain and mind, and teaching the process of creative problem solving: the procedure used to solve a given design problem. The video key word category encompassed using video programs as a primary source of information, using video programs as a supplement to other media, as a tool for creating design compositions, and providing a network for sharing information among schools of design. There were some other responses but not enough repeated mention to be considered a common key word or phrase.

TABLE V
RESPONSES TO QUESTIONNAIRE 1

<table>
<thead>
<tr>
<th>Key Word</th>
<th>Number of Times Mentioned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer</td>
<td>16</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>12</td>
</tr>
<tr>
<td>Video</td>
<td>6</td>
</tr>
<tr>
<td>No Significant Change</td>
<td>4</td>
</tr>
</tbody>
</table>

The key word category of computer technology was mentioned by sixteen of the twenty-eight panelists (57 percent). The category of problem solving was mentioned by twelve panelists (43 percent) and six panelists (21 percent) mentioned the key word category of video and media. Four
of the twenty-eight panelists (14 percent) responded that there would be no significant change in the teaching of Basic Design in the year 2000.

Round Two

The key word categories—computer technology, problem solving, and video—and their various combinations were listed on Questionnaire 2 which asked the panel members to mark which category they predicted would be implemented in teaching Basic Design in the year 2000. Table VI lists the categories, the number of responses each received and the percentage of the total for each category.

<table>
<thead>
<tr>
<th>Category</th>
<th>Times Mentioned</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
</tr>
<tr>
<td>Computer</td>
<td>1</td>
</tr>
<tr>
<td>Video</td>
<td>0</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>2</td>
</tr>
<tr>
<td>Computer and Video</td>
<td>0</td>
</tr>
<tr>
<td>Video and Problem Solving</td>
<td>1</td>
</tr>
<tr>
<td>Computer and Problem Solving</td>
<td>7</td>
</tr>
<tr>
<td>Computer, Video, and Problem Solving</td>
<td>16</td>
</tr>
<tr>
<td>No Significant Addition</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>28</td>
</tr>
</tbody>
</table>

The second column, Times Mentioned—Number, is the number of panelists that marked that category. The category
receiving the largest number of responses from the panel was the combination of all three key words from Questionnaire 1: computer, video, and problem solving. Fifty-seven percent of the panelists predicted this category would be implemented into design education. One panelist predicted no significant addition to design education. No panelist felt that the only changes would be in the categories of video or computer and video. Twenty-six of the twenty-eight predicted that the category of problem solving would be implemented into design education.

Round 2 of this Delphi study provided a rank ordering of the responses to the first questionnaire. Table VII shows each of the key word categories in Table VI listed individually in decreasing order with the number of responses, the percentage of the total, and the percentage of panelists marking that response. This breakdown provides another way of looking at the data to better determine the rank order of responses. The total percentage does not equal 100 percent due to rounding off of figures.

The key word category receiving the most number of responses was Problem Solving with twenty-six responses for 38 percent of all responses. Twenty-six of the twenty-eight panelists, 93 percent, predicted this category would be implemented in teaching design in the year 2000. Eighty-six percent, twenty-four of twenty-eight, feel that computer
TABLE VII
RANK ORDERED RESPONSES TO QUESTIONNAIRE 2

<table>
<thead>
<tr>
<th>Category</th>
<th>Responses</th>
<th>Percent of Panel</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Percent</td>
</tr>
<tr>
<td>Problem Solving</td>
<td>26</td>
<td>38</td>
</tr>
<tr>
<td>Computer</td>
<td>24</td>
<td>35</td>
</tr>
<tr>
<td>Video</td>
<td>17</td>
<td>25</td>
</tr>
<tr>
<td>None</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>68</td>
<td>99</td>
</tr>
</tbody>
</table>

technology will be implemented and 61 percent, seventeen of twenty-eight, predicted video will be used in design education. Each of the three key word categories received more than a majority (50 percent or more) of votes from the Delphi panelists and each is therefore considered to be of a significant consensus of opinion as a category to be included in teaching design in the year 2000.

Round Three

The third and final round listed the key word categories from Questionnaire 2 in their ranked order and asked for degrees of implementation for specific topics within each key word category. The specific topics were gleaned from the responses to Questionnaire 1 and explained in a cover letter to the panelists. Table VIII shows the responses with the number of times each specific topic is mentioned.
TABLE VIII
RESPONSES TO QUESTIONNAIRE 3

<table>
<thead>
<tr>
<th>Specific Topic</th>
<th>Number of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Problem Solving:</td>
<td></td>
</tr>
<tr>
<td>Brain and Mind</td>
<td>15</td>
</tr>
<tr>
<td>Visual Thinking</td>
<td>27</td>
</tr>
<tr>
<td>Creativity</td>
<td>24</td>
</tr>
<tr>
<td>Problem Solving Process</td>
<td>27</td>
</tr>
<tr>
<td>Computer Technology:</td>
<td></td>
</tr>
<tr>
<td>Instructional Aid</td>
<td>18</td>
</tr>
<tr>
<td>Unit on Computer Graphics</td>
<td>21</td>
</tr>
<tr>
<td>Tool for Creating Compositions</td>
<td>18</td>
</tr>
<tr>
<td>One or Two Systems</td>
<td>14</td>
</tr>
<tr>
<td>Multiple Workstations</td>
<td>14</td>
</tr>
<tr>
<td>Video:</td>
<td></td>
</tr>
<tr>
<td>Primary Source of Instruction</td>
<td>11</td>
</tr>
<tr>
<td>Supplement to Instruction</td>
<td>19</td>
</tr>
<tr>
<td>Tool for Creating Compositions</td>
<td>12</td>
</tr>
<tr>
<td>Network Among Schools</td>
<td>11</td>
</tr>
</tbody>
</table>

The respondents were asked to circle "Yes" if they predicted the topic would definitely be included in teaching Basic Design in the year 2000, to circle "Maybe" if they predicted the topic might be included in teaching Basic Design, and "No" if they felt the topic would not be included in teaching Basic Design in the year 2000.

Each column does not total twenty-eight. Some panelists did not respond to all the topics. Twenty-seven of the twenty-eight panelists felt Visual Thinking and the Problem Solving Process would definitely be included in teaching
basic design and one remaining panelist predicted they might be included in teaching basic design. The largest number of "No" votes, eight of twenty-eight, was in the topic category of Video as a Primary Source of Information. The category of problem solving received the most "Yes" votes, an average of twenty-three for each topic category, and the fewest "No" votes with an average of one for each topic category.

Table IX rank orders the specific topics with the greatest percentage of responses coming first and gives the percentage of total responses. Two topics have an identical percentage of responses and are listed in alphabetical order. The figures have been rounded off to facilitate comparison. Not all of the columns equal 100 percent as some of the panelists did not respond to all of the topics.

Each of the first three answers in the problem solving category received more "Yes" votes than any of the other categories. The topic receiving the most "Maybe" votes was using video technology for creating compositions. Using video programs as a primary source of information received the most "No" votes. There were five topic categories predicted to be either definitely or possibly included in teaching design in the year 2000, the only ones to receive no "No" votes at all. These five are to implement into design education the problem solving process of design, the topic of visual thinking, the topic of creativity, a unit on
### TABLE IX

**RANK ORDER RESPONSES TO QUESTIONNAIRE 3**

<table>
<thead>
<tr>
<th>Specific Topic</th>
<th>Percent of Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Problem Solving:</strong></td>
<td></td>
</tr>
<tr>
<td>Problem Solving Process</td>
<td>96</td>
</tr>
<tr>
<td>Visual Thinking</td>
<td>96</td>
</tr>
<tr>
<td>Creativity</td>
<td>86</td>
</tr>
<tr>
<td>Brain and Mind</td>
<td>54</td>
</tr>
<tr>
<td><strong>Computer Technology:</strong></td>
<td></td>
</tr>
<tr>
<td>Unit on Computer Graphics</td>
<td>75</td>
</tr>
<tr>
<td>Tool for Creating Compositions</td>
<td>64</td>
</tr>
<tr>
<td>Instructional Aid</td>
<td>64</td>
</tr>
<tr>
<td>Multiple Workstations</td>
<td>50</td>
</tr>
<tr>
<td>One or Two Systems</td>
<td>50</td>
</tr>
<tr>
<td><strong>Video:</strong></td>
<td></td>
</tr>
<tr>
<td>Supplement to Instruction</td>
<td>68</td>
</tr>
<tr>
<td>Tool for Creating Compositions</td>
<td>43</td>
</tr>
<tr>
<td>Network Among Schools</td>
<td>39</td>
</tr>
<tr>
<td>Primary Source of Information</td>
<td>39</td>
</tr>
</tbody>
</table>

Computer graphics, and using video programs as a supplement to instruction. The only three topic categories of the total thirteen topics to receive a higher percentage of "Maybe" and "No" votes than "Yes" votes are using video technology as a tool for creating compositions, as a network among schools, and as a primary source of information.

The topics that were placed in the top quartile limits (75 to 100 percent) by the percentage of "Yes" votes received are teaching the problem solving process, the topic of visual thinking, the topic of creativity, and a unit on computer
graphics. The topics that placed in the top quartile by their combined percentages of "Yes" votes and "Maybe" votes are teaching the topic of the brain and mind, using computer graphics to create compositions, using computer assisted instruction, having computer graphics workstations available for student use, using video programs as a supplement to instruction, using video technology as a tool for creating compositions, and using video capabilities to create a network among design schools for sharing information.
CHAPTER V

CONCLUSIONS AND RECOMMENDATIONS

Summary

This study was conducted to determine how basic design will be taught in the year 2000 according to the perceptions of design educators in the United States of America who participated in a Delphi method of futures forecasting. The purpose of the study was to predict how design will be taught in the year 2000 to allow design educators to better prepare for the future and to provide a basis for further research that might address specific areas in the future of teaching design. The study was significant in that it provided a rationale for design teachers to teach design in a manner that may better reflect the needs and influences of the future. It also is practical for design teachers in any of the design disciplines and is widely applicable throughout design education and in other academic teaching disciplines as a model for examining how other subject fields will be taught in the year 2000.

A review of related literature was conducted to determine some general and current feelings toward teaching design in the future. This review included the areas of the future and the year 2000, the information age, design, creative
problem solving, electronics and computer technology, educational media, design education, and uses of the Delphi method. As discovered in this review, the sources seem to agree that some change will likely occur in design and in design education within the next fifteen years.

The Delphi method for conducting research was selected for this study because it allowed an accurate means of obtaining predictions from experts in teaching design. Erffmeyer (2) notes that the Delphi technique of futures forecasting can be used for any purpose for which a committee or decision-making group is appropriate. Judd (4) feels it is important to realize that the Delphi method is not a singular nor unchanging approach to problem solving about the future as there is no single monolithic structure to the Delphi technique. Erffmeyer (2) agrees, stating there are no hard and fast rules to guide the design of a Delphi study. Delphi practitioners either apply the traditional use of the Delphi as a forecasting tool or, according to Henson (3), design their own Delphi format which may or may not include the word modified in the title indicating some variation in application, procedures, or goals from some other Delphi study.

This study was modified from the traditional or classical Delphi in that it sought primarily to determine simple rank ordering in round two and degrees of implementation in round three, a format and objective suggested by
Linstone and Turoff (5). Also, as suggested by Sackman (7), the mean responses were not reported in round three. This was done to avoid a forced manipulation of convergence of opinion, a result, according to Sackman (7), of providing the mean of responses and encouraging the panelists to change their responses in light of that given information. This study was patterned after the contributory, exploratory Kantian style of Delphi technique as discussed in Chapter II, Review of Related Literature.

The Delphi panel for this study was selected by asking for participation from a design educator in each of the seventy-two schools in the United States offering a graduate program in design. Twenty-eight panelists participated in the full course of the study.

The Delphi study consisted of three rounds of questioning, asking progressively more specific questions. Each round consisted of an explanatory letter and a brief questionnaire. Round one was a general question asking the panelists to predict how basic design will be taught in the year 2000. The two subsequent rounds of questioning were presented to the panelists to rank order their responses and to determine the degree of implementation of specific topics mentioned in their answers to Questionnaire 1. The responses to Questionnaire 3 were considered to have significant consensus of agreement if a topic received a high
enough percentage of votes to place it into the top quartile limits (75 to 100 percent) as suggested by Linstone and Turoff (2).

The data gathering process for this study produced the following summary.

1. The package containing Questionnaire 1 was mailed in September of 1985. The last responses to Questionnaire 3 were received in February of 1986.

2. Of seventy-two initial letters mailed, thirty design educators responded to Questionnaire 1, twenty-nine responded to Questionnaire 2, and twenty-eight of those responded to Questionnaire 3.

3. The Delphi panel of twenty-eight created a 39 percent retention of the original seventy-two. This panel of twenty-eight fell within guidelines for the number of panelists in a Delphi study as set by McLaughlin (3) and Dalkey and others (1).

4. Ninety-seven percent of the panelists responding to Questionnaire 1 responded to Questionnaire 2. The number of panelists responding to Questionnaire 3 was 96.5 percent of those responding to Questionnaire 2, and 93 percent of those responding to Questionnaire 1.

5. The twenty-eight Delphi panelists represented twenty-eight schools in twenty-eight cities in nineteen states in the United States of America, the only country in which the study was conducted.
6. Almost half of the panelists, thirteen of twenty-eight, teach Basic Design.

7. Twenty-six of the twenty-eight panelists, 82 percent, teach one of the design disciplines (Architecture, Basic Design, Graphic Design, Industrial Design, and Interior Design) and the remaining two panelists teach color or color theory.

8. Two of the panelists are administrators of a design program in addition to teaching design.

The following is a summary of responses from Questionnaire 1 which asked the Delphi panelists to predict how basic design will be taught in the year 2000. The responses, ranging from two words to a page and a half, could be grouped by shared key words into one of four categories: (1) computer technology, (2) the creative problem solving process, (3) video and educational media, and (4) no significant change or difference.

1. The responses from the panel agree with the review of literature conducted for this study that computer technology will have some impact on design education. Some panelists responded, however, that technology must be kept in its proper perspective. Computers will basically be production tools for the designer. One panelist feels that high-tech learning systems will complement intense individual one-on-one learning.
2. Computers will be used as an aid to instruction and as a medium for creating design compositions. One panelist predicts that the computer will probably have the most impact on the way basic design will be taught although it is difficult today to imagine what the possibilities will be. Another agrees, the computer will allow greater variables, more rapid imaging and organization and retrieval. One panelist predicts that computer art will have taken new directions, and computer art will introduce concepts that cannot be done by hand. Another feels students will be able to generate all ideas and images quickly on the computer. According to another panelist, a new method of teaching design will be to use computer graphics, television, and video and a mix of the old and new to explore the latest technologies in design education. Another feels that sophisticated computer hardware will be used as sketch tools for exploring alternatives. Computers are less toxic and quieter according to one panelist. Another predicts that computers will be used in combination with holography to create new forms of three dimensional communications not yet known today.

3. The panelists disagree on the degree of impact of computers on design education. One panelist feels that budget restrictions will preclude massive computer use in design education while another feels that the computer will not be used very widely in basic design, if it is allowed at all. This panelist feels design education will undergo
little significant change by the year 2000. Another feels that more computers and electronic media will be used and design rooms will be clean, sterile, and hum like electronic bees; the fun will be gone. Schools which can afford sophisticated computer hardware and software and various input and output devices, according to one panelist, may find it feasible to use at least some electronic technology to help demonstrate and clarify certain design concepts. Another panelist predicts that computers will be on the desks of all designers. Another agrees, stating that every student will have his or her own computer. There will be much less hand work which will allow for more time spent on ideas.

4. Panelists predict that in the year 2000 Basic Design will emphasize the problem solving process. One panelist said design educators will teach students to be creative problem solvers. Another predicted that design should be taught as a problem solving study, no matter what the year, as too many designers are being trained today who are technical wizards without the ability to be creative. Another panelist agreed, stating that students will most likely continue to manually produce various design exercises conceived to develop conceptual, creative, and dexterity skills. According to one panelist, the applications and tools of design may change but they may not drastically alter the design process. Another panelist predicted that design
educators will continue to attempt to teach students how to think and to prepare problems for solution using whatever media are at their disposal.

5. The panelists' responses agree with the review of literature conducted in this study that the problem solving process is the basic element of design and vitally important as a foundation for design education. One panelist predicts that although technology may change, the underlying principles of design will probably not change. Problem solving is the key to design education as stated by one of the panelists. The basic design course of the future, according to the predictions of another panelist, will include problem solving, the design elements and principles, hand work without computers, historical issues in design, and methods of visual communication.

6. The panelists predict that there will be an impact from new media, especially video. One panelist predicts that there will be increased and new use of videotapes produced by important designers and design schools and holography employing laser technology used in instruction of some design components.

7. There is agreement among the panelists with the literature reviewed that new media will be introduced and used in design education. One panelist predicts that television will play an important role through link up and discussion between designers and students with several
campuses involved. Videotape can also play an important role by presenting a variety of possibilities when used in an innovative and creative way.

8. One panelist wrote that design education has not changed in the last fifteen years, and it will likely not change in the next fifteen. Another agreed, stating that while new technologies may come and go, the basic premise of design, the creative problem solving process, will remain unchanged.

Questionnaire 2 asked the panelists to predict whether the categories derived from the answers to Questionnaire 1 would be implemented into design education in the year 2000 in order to provide a rank ordering of those categories. Following is a summary of those responses.

1. Each of the three key word categories: (1) creative problem solving, (2) computer technology, and (3) video and educational media, received a majority of votes (more than 50 percent) from the Delphi panelists.

2. The key word category of problem solving received more "Yes" answers than any other question. Ninety-three percent of the panelists, twenty-six of twenty-eight, predicted that topics within the category of problem solving would be implemented into design education.

3. Eighty-six percent of the panelists, twenty-four of twenty-eight, predicted that some aspects of computer technology would be implemented.
4. Sixty-one percent of the panelists, seventeen of twenty-eight, predicted the increased use of educational media, especially video, in design education.

Questionnaire 3 asked the panelists to predict for each topic, rank ordered from Questionnaire 2, whether it would definitely be implemented ("Yes"), possibly be implemented ("Maybe"), or definitely not be implemented ("No") into design education in the year 2000. The responses to this questionnaire produced the following summary.

1. The four topics which received a high enough percentage of "Yes" votes to place them into the top quartile limits are (1) teaching the problem solving process, (2) a topic on visual thinking, (3) a topic on creativity, and (4) a unit on computer graphics. These four topics did not receive any "No" votes.

2. Twenty-seven of the twenty-eight panelists, the highest number of "Yes" votes with 96 percent, felt topics on visual thinking and the problem solving process would definitely be included in teaching basic design. The single remaining panelist predicted they might be included in teaching basic design.

3. The seven topics which received a combined percentage of "Yes" and "Maybe" votes to place them in the top quartile are (1) the brain and mind, (2) using computer graphics to create compositions, (3) using computer assisted instruction, (4) having computer graphics workstations
available for student use, (5) using video programs as a supplement to instruction, (6) using video technology as a tool for creating compositions, and (7) a network among design schools for sharing information.

4. The topic receiving the most "Maybe" votes was using video technology as a tool for creating compositions.

5. The only three topics of the thirteen topic categories to receive a higher percentage of "Maybe" and "No" votes than "Yes" votes are (1) using video technology as a tool for creating compositions, (2) using video technology as a network among schools, and (3) using video programs as a primary source of information.

6. The largest number of "No" votes, eight of twenty-eight, 29 percent, was for the topic of using video programs as a primary source of information.

Findings

The following findings can be stated concerning teaching Basic Design in the year 2000 according to the predictions of design educators participating in this Delphi study.

1. Basic Design will be a preparation course for design disciplines and definitely include the following three topics, each of which received over 75 percent of the panelists' "Yes" votes: (1) an emphasis on creative problem solving skills, the basic process by which a design student solves a given design problem, (2) a unit covering visual
thinking as an integral component in the problem solving process, and (3) a unit on the nature of creativity and ways to be more creative.

2. Basic Design will definitely include, according to the percentage of "Yes" votes of the panelists, a unit on computer graphics as a tool for solving design problems and as a medium for production of design projects.

3. Basic Design in the year 2000 will most likely include the following seven topics since each topic received over 75 percent of the combined "Yes" and "Maybe" votes of the Delphi panel: (1) a discussion of the brain and mind as components of creative thinking; (2) use of a computer graphics system to create design compositions; (3) use of computer assisted instruction software programs to help teach design terms, concepts, and procedures; (4) computer graphics workstations available for student use; (5) use of videotape and videodisk programs as a supplement to classroom instruction on designers, design terms, and design elements; (6) use of video cameras, recorders, and computer software as tools for creating design compositions; and (7) a network among design schools of cable television, computers, and videodisk programs for sharing information on designers, techniques, and applications.
Conclusions

Based on the findings of this study the following conclusions can be drawn.

1. Design educators may need to evaluate and revise Basic Design course objectives, activities, and grading procedures to reflect that the panelists predict design will be taught in the year 2000 emphasizing the creative problem solving process as a basic element of design and develop a thorough discussion of creativity and visual thinking based on the latest neuroscientific discoveries and findings. Design educators may need to consider implementing activities and teaching methods to allow design students to become better creative problem solvers.

2. Design educators may need to evaluate and revise Basic Design course objectives, activities, and grading procedures to reflect the prediction of the panelists that Basic Design in the year 2000 will include a unit on computer technology and the application of computer graphics systems as they relate to basic design.

3. Design educators may need to evaluate and revise Basic Design course objectives, activities, and grading procedures to reflect the panelists' prediction that Basic Design in the year 2000 will include a discussion on the brain and mind; integrate the computer as an aid to design instruction and as an aid in the problem solving process; implement available design education software for use in
the design classroom, campus computer lab, or students' homes; include an introduction, discussion, and possibly hands-on experience with a computer graphics system used as a design production tool in the design classroom; use a greater variety of media especially videotape and videodisk programs for instruction with professional designers and creating design compositions; and establish and support a network among design schools using computers, cable television, and videodisk programs to share information, activities, and ideas.

Recommendations for Further Research

Based on the conclusions drawn from the findings of this study, the following recommendations can be made.

1. It is recommended that a study be conducted to determine the current degree of implementation in Basic Design of teaching creativity and the problem solving process.

2. It is recommended that a study be conducted to determine the current degree of implementation in Basic Design of the use of computer technology.

3. It is recommended that a study be conducted to determine the attitudes of design educators toward implementing computer technology and educational media into the design curriculum.

4. It is recommended that a follow-up study be conducted after an interval of at least five years to determine
if predictions of design educators concerning the topics from this study that were predicted to be most likely included in Basic Design will be changed to either "definitely included" or "definitely not included" as topics in teaching Basic Design in the year 2000.

5. It is also recommended that a follow-up study be conducted after an interval of at least five years to delineate what changes, if any, in design education may have been brought about by a changing society, new technological advancements, subject matter content of Basic Design, and changing school policies, procedures, and methods of instruction.


APPENDICES
Appendix A

Schools Offering Graduate Programs in Design


DP preceding a school denotes those schools which were represented by a Delphi panelist.

DP Auburn University
    Arizona State University
    Art Center College of Design
    Boston University

DP Bradley University
    Brigham Young University
    California Institute of the Arts
    California State University, Fullerton

DP California State University, Long Beach
DP California State University, Los Angeles
DP California State University, Northridge
DP Central Washington University
    CUNY, Brooklyn College
    CUNY, City College

DP Clemson University
DP East Texas State University
DP Florida State University
DP George Washington University
    Georgia State University
    Howard University

DP Idaho State University
    Illinois Institute of Technology

DP Indiana University, Bloomington
    Iowa State University

DP Louisiana Tech University
DP Massachusetts College of Art
    Massachusetts Institute of Technology
    Memphis State University
    Montana State University
    New Mexico State University

DP Northern Illinois University
    Ohio State University
    Old Dominion University
    Pratt Institute
    Purdue University, West Lafayette
    Rhode Island School of Design

DP Rochester Institute of Technology
    Rosary College
    Siena Heights College
    Southeastern Massachusetts University
    Stanford University
DP SUNY at Buffalo
DP Syracuse University
DP Texas Tech University
Texas Woman's University
DP Union for Experimenting College and Universities
University of California, Berkeley
University of California, Los Angeles
University of Chicago
University of Cincinnati
University of Delaware
DP University of Denver
University of Georgia
University of Illinois, Chicago Circle
University of Illinois, Urbana-Champaign
DP University of Kansas
University of Kentucky
DP University of Massachusetts, Amherst
University of Minnesota
University of Montana
DP University of Nebraska, Lincoln
University of Notre Dame
University of Oklahoma
DP University of Oregon
DP University of Tennessee, Knoxville
University of Texas, Austin
DP University of Washington
DP University of Wisconsin, Milwaukee
Virginia Commonwealth University
Washington State University
Wayne State University
West Texas State University
Brookhaven College

September 27, 1985

Dear Chairperson, Art/Design Department,

I need your help in selecting a design faculty member to participate in a study I am conducting.

The study, "Teaching Design in the Year 2000: A Delphi Study of the Perceptions of Design Educators", is being conducted to predict how design will be taught in the future in light of technological advances, educational reform measures, new media and materials, and the changing student.

I am asking for participation from each of the 72 schools that offer a graduate program in design as listed in the Directory of Graduate Programs: 1984 & 1985.

Would you please select a faculty member who is interested in the future of teaching design, preferably teaching Basic Design, and who would be willing to participate in this study which will require answering three brief questionnaires. Please forward the following enclosed materials to him or her:
1. Cover letter
2. The first questionnaire
3. A stamped addressed envelope

Thank you for your cooperation and attention to this study. I believe we will learn from our colleagues valuable information to help us better prepare for the future of teaching design.

Sincerely,

Jim Watson
Instructor, Fine Arts
Brookhaven College
Appendix C
Round One Panelist Letter

September 27, 1985

Dear Design Educator,

How will we teach design in the year 2000?
To answer that question I am conducting a study
titled, "Teaching Design in the Year 2000: A
Delphi Study of the Perceptions of Design Educators".

I would appreciate your participation in this
study as a representative from your school, one of
72 in the United States that offers a graduate
program in design.

There will be three brief questionnaires to
fill out and return to me during this fall semester.
The first, enclosed, asks for brief predictions
concerning the teaching of basic design (Design 1,
Design Fundamentals, Introduction to Design, etc.)
in the year 2000. The second and third questions
will address more specific concerns in design
education based on the answers to this first question.

Please complete the first questionnaire and
return it to me in the stamped envelope by Monday,
October 14, 1985.

I appreciate your assistance with this study.
Your views and those of our colleagues will help us
better prepare for the future of teaching design.
Thank you for your time and participation.

Sincerely,

Jim Watson
Instructor, Fine Arts
Brookhaven College
Box 3025
Dallas, TX 75221
214-620-4730
Teaching Design in the Year 2000:
A Delphi Study of the Perceptions of Design Educators

Questionnaire 1

1. Name:
(Your name is appreciated so that the next two brief questionnaires can be sent to you directly.)

2. School:

3. Design specialty:
(Your area of design if other than basic design: graphics, interior, theater, architecture, etc.)

4. Please answer the following question with short sentences or phrases:
   Based on your perceptions of the future and your knowledge of technological advances, educational reform measures, new media and materials, design topics/units, student testing and evaluation, classroom instructional methods, and changing students and ignoring your department's projected budget, facilities, and materials:
   "How will basic design be taught in the year 2000?"
Appendix E

Delphi Panelists and Addresses

J. John Agars
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Auburn AL 36849

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Eugene OR 97405

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Rochester NY 14623

Frank Morigi  
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Archbold Gymnasium  
Syracuse University  
Syracuse NY 13244

Donald E. Nichols  
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Buffalo NY 14214

John Norman  
Department of Art  
University of Denver  
Denver CO 80208

James W. Reidhaar  
School of Fine Arts  
Indiana University  
Bloomington, IN 47405
Paul Rutkovsky
Department of Art
School of Visual Arts
Florida State University
Tallahassee FL 32306

Douglas H. Teller
Department of Art
George Washington University
Washington DC 20052
Appendix F

Round Two Cover Letter

Teaching Design in the Year 2000:
A Delphi Study of the Perceptions of Design Educators

November 1, 1985

Dear Delphi Panelist,

Thank you for your response and participation in the study, "Teaching Design in the Year 2000: A Delphi Study of the Perceptions of Design Educators". The purpose of this study is to gather information that will allow us to better prepare for the future of design education. I appreciate your time, support, and thoughts.

Most respondents to Questionnaire 1, "How will basic design be taught in the year 2000?", agreed that teaching basic design will still include teaching the design elements and principles. Other predictions of how design will be taught in the year 2000 fell into these four categories:

1. Computer technology
2. Video and multi-media
3. Problem solving skills
4. Little or no change

Many respondents mentioned that a combination of the above answers would likely be implemented. Questionnaire 2 asks which category or combination you predict is most likely.

In order to complete this study (there is one more questionnaire) this Fall semester would you please fill out the enclosed Questionnaire 2 and return it in the enclosed stamped envelope by November 18.

Thanks again for your participation.

Sincerely,

Jim Watson
Instructor, Fine Arts
Brookhaven College
Appendix G

Round Two Explanation Sheet

Teaching Design in the Year 2000:
A Delphi Study of the Perceptions of Design Educators

Questionnaire 2

You will be asked to mark the one answer that most accurately describes your prediction of how design will be taught in the year 2000 in addition to teaching the design elements and principles.

Do not consider the amount of impact of the categories within each combination. This will be addressed in the third and final questionnaire. At that time you may denote how little or how extensive each category or combination may affect design education and make more specific predictions. Also please ignore your particular teaching situation, budget, enrollment, etc.

Listed below are explanations of the four most common predictions and on the next page a listing of those categories and all combinations. The lists are not necessarily in order of importance or frequency of response.

• Computer technology
  This includes using the computer as another drawing tool, teaching a unit on computer graphics, or having a computer workstation at the desk of each student.

• Video and multi-media
  Mentioned were the use of video taped interviews and instruction from professional designers and self-paced instructional units.

• Problem solving skills
  Predictions included a greater emphasis on thinking, visualising, and problem solving skills; and increased application of the creative process.

• No significant additions
  Basic design will be taught without the aid or use of computer technology, greater use of multi-media, nor increased emphasis of problem solving skills.
Teaching Design in the Year 2000: 
A Delphi Study of the Perceptions of Design Educators

1. Name:

2. Which one of the following best expresses your prediction of how basic design will be taught in the year 2000 in addition to teaching the design elements and principles?

   - Computer
   - Video
   - Problem solving
   - Computer and video
   - Video and problem solving
   - Computer and problem solving
   - Computer, video, and problem solving
   - No significant addition

3. Please return this page in the stamped and addressed envelope by November 18.
Appendix I

Round Two Follow-Up Letter

Teaching Design in the Year 2000: A Delphi Study of the Perceptions of Design Educators

November 1, 1985

Dear Delphi Panelist,

Thank you for your response and participation in the study, "Teaching Design in the Year 2000: A Delphi Study of the Perceptions of Design Educators." The purpose of this study is to gather information that will allow us to better prepare for the future of design education. I appreciate your time, support, and thoughts.

Most respondents to Questionnaire 1, "How will basic design be taught in the year 2000?", agreed that teaching basic design will still include teaching the design elements and principles. Other predictions of how design will be taught in the year 2000 fall into these four categories:

1. Computer technology
2. Video and multi-media
3. Problem solving skills
4. Little or no change

Many respondents mentioned that a combination of the above answers would likely be implemented. Questionnaire 2 asks which category or combination you predict is most likely.

In order to complete this study (there is one more questionnaire) this Fall semester would you please fill out the enclosed Questionnaire 2 and return it in the enclosed stamped envelope by November 18.

Thanks again for your participation.

Sincerely,

Jim Watson
Instructor, Fine Arts
Brookhaven College

I do appreciate your response and participation. Would you please return Questionnaire 2 so that your input can be included in the final phase of the study. Thanks.

Jim Watson
11-27-85
Appendix J
Round Three Cover Letter

Teaching Design in the Year 2000:
A Delphi Study of the Perceptions of Design Educators

December 3, 1985
Dear Delphi Panelist,

Thank you for your response to Questionnaire 2 in the study, "Teaching Design in the Year 2000: A Delphi Study of the Perceptions of Design Educators". Enclosed is the third and final questionnaire in this study.

According to the precepts of Delphi studies, the initial question was broad and open-ended, the second was more specific, and the third asks for more specific predictions.

The most common response to Questionnaire 2 was problem solving followed by computer technology and video. Most respondents marked that a combination of all three would impact the teaching of basic design in the year 2000. Questionnaire 3 asks you to predict the degree of implementation for topics within the categories of problem solving, computer technology, and video.

Please fill out and return Questionnaire 3 in the stamped and addressed envelope by December 20.

Thank you for your thoughts, time, and participation in this study.

Have a safe, enjoyable, and restful holiday break.

Sincerely,

Jim Watson
Instructor, Fine Arts
Brookhaven College
Teaching Design in the Year 2000:
A Delphi Study of the Perceptions of Design Educators
Questionnaire 3

Following are the categories from Questionnaire 2 and specific topics within each based on your responses to Questionnaire 1. Please predict the degree to which each topic will be implemented into a basic design course in the year 2000. The course would include instruction and activities on the design elements and principles. These additional topics may be units within the course or integrated into other units or design projects.

Problem solving
- Brain and mind - split brain theories, whole brain education, how the mind and brain operate, motivation, effect of drugs and external environment.
- Visual thinking - vision, processing images, imaging, metaphorical thinking.
- Creativity - definitions, traits of creative people, how to be more creative, exercises for creative growth.
- Problem solving process - information processing, the design process.

Computer technology
- Instructional aid - Computer Assisted Instruction, clarify and demonstrate concepts, support lecture material.
- Unit on computer graphics - how computer graphics work, advantages, applications, systems.
- Tool for creating compositions - help explore design solution alternatives, techniques, applications, electronic colors.
- One or two systems - access to system in the design classroom or campus computer lab.
- Multiple workstations - access for each student in the design classroom.

Video
- Primary source of information - interviews with designers, units of information and techniques.
- Supplement to instruction - demonstrations, visuals.
- Tool for creating compositions (with a computer system) - video quantizing, electronic art.
- Network among schools - sharing information, techniques.
Appendix L

Questionnaire 3

Teaching Design in the Year 2000:
A Delphi Study of the Perceptions of Design Educators

Questionnaire 3

1. Name:

2. Circle the word that best predicts the degree to which each topic will be implemented in teaching Basic Design in the year 2000.

   Yes = High degree of implementation:
   Will definitely be included in teaching Basic Design in the year 2000.

   Maybe = Some implementation:
   May be included in teaching Basic Design in the year 2000.

   No = Little or no implementation:
   Will probably not be included in teaching Basic Design in the year 2000.

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<th>Topic</th>
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<th>Maybe</th>
<th>No</th>
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<tr>
<td>Problem solving</td>
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<td></td>
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<tr>
<td>Brain and mind</td>
<td>Yes</td>
<td>Maybe</td>
<td>No</td>
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<tr>
<td>Visual thinking</td>
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<td>Creativity</td>
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<tr>
<td>Problem solving process</td>
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<td>Computer technology</td>
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<tr>
<td>Network among schools</td>
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</table>

3. Please return this page in the stamped and addressed envelope by December 20.
Teaching Design in the Year 2000: A Delphi Study of the Perceptions of Design Educators

December 3, 1985
Dear Delphi Panelist,

Thank you for your response to Questionnaire 2 in the study, "Teaching Design in the Year 2000: A Delphi Study of the Perceptions of Design Educators". Enclosed is the third and final questionnaire in this study.

According to the precepts of Delphi studies, the initial question was broad and open-ended, the second was more specific, and the third asks for more specific predictions.

The most common response to Questionnaire 2 was problem solving followed by computer technology and video. Most respondents marked that a combination of all three would impact the teaching of basic design in the year 2000. Questionnaire 3 asks you to predict the degree of implementation for topics within the categories of problem solving, computer technology, and video.

Please fill out and return Questionnaire 3 in the stamped and addressed envelope by December 20.

Thank you for your thoughts, time, and participation in this study.

Have a safe, enjoyable, and restful holiday break.

Sincerely,

Jim Watson
Instructor, Fine Arts
Brookhaven College

The mail of the holidays may have delayed your response to Questionnaire 3. I do appreciate your input. Thanks!

Jim Watson
1-12-86
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Articles


Reports


Directories


Unpublished Materials


