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Toward a model of instruction for architecture design studio

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TOWARD A MODEL OF INSTRUCTION
FOR ARCHITECTURE DESIGN STUDIO

By
Garry Allen Perryman

Submitted to the faculty of the Graduate Program of the New Jersey Institute of Technology, School of Architecture in partial fulfillment of the Master of Architecture Degree 1989.
Toward a Model of Instruction
for Architecture Design Studio

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This inquiry addresses some fundamental issues raised in a debate over the effectiveness of architecture studio instruction. It argues that as currently structured the studio’s potential effectiveness is often unrealized, because of the paucity of standardized educational resources and instructor’s lack of training in educational theories of instruction. This has resulted in instructional planning that is seldom structured on educational theory or research. It is also argued that in order to maximize it’s effectiveness, beginning studio instruction must be premised upon a theory of instruction which includes specifying explicit instructional goals and objectives and that this would create a more effective learning environment.

These issues are addressed through an analysis of the body of research in architecture education and an analysis of the goals and objectives of a sample of architecture design studio handouts. Also, studio instruction is compared with other modes of instruction.
This analysis finds that although research in architecture education is growing, it has not been effectively applied in current architecture studio instruction. Also, instructor’s intentions, goals and objectives for student learning in current studio instruction, are too implicit. However, the studio mode when compared to other modes of instruction is shown to be very effective when properly guided by principles of a model of instruction. Primarily this inquiry establishes a knowledge base and outlines both a theory and model of instruction for suggesting methods toward the creation of a more effective architectural studio pedagogy.
PREFACE:

This inquiry is motivated by the desire to create a more effective instruction in architecture studio. Having taught architecture design studio over the past four years and witnessing the subjective nature of instruction and evaluation, the need was felt to inquire into effective teaching methods for architecture studio education. Teaching workshops, Instructional Theory into Practice (I.T.I.P), attended over these years hinted at a relationship between instructional planning, theories of learning and the design process in architecture. This led to an examination of the available resources to which an instructor could draw from, but revealed the lack of any such resources. This seemed to warrant further investigation.

This inquiry does not presume to create a theory nor a model of instruction in architecture, but is intended to analyze the body of research in architecture and current approaches to instruction from a sample collected from the immediate area. It was hoped that this inquiry would uncover a body of knowledge pertaining to education and instruction for architecture to aid in the development toward an approach toward a more effective instruction. Although such an aim is personal, it is hoped that this inquiry may stimulate further dialogue in architecture studio instruction toward development of a more effective architecture studio pedagogy.
For their assistance in this inquiry I wish to express my gratitude to those coordinators and/or instructors, at the schools of architecture from which the data was collected. They provided me with the information for the documentation of their own programs as well as insight into architecture education and suggestions which were to help in this inquiry. Also, I am grateful to several members of the faculty and administration at Mercer County Community College, Dr. David Levin, and Dr. Michael Shea. Special thanks to Mary Beth Calenti-Labate for her comments on the first draft. Also to the members of the thesis committee at the Graduate School of Architecture, New Jersey Institute of Technology, Michael Mosteller, Peter Papademetriou and especially for direction Dean, Sanford R. Greenfield, School of Architecture, New Jersey Institute of Technology.
TO SUSAN, GARRETT, and EMILY
for their love and understanding
TABLE OF CONTENTS

Preface and Acknowledgements

I  INTRODUCTION  1

The Studio Versus The Lecture  3
Objectives  5
Method of Inquiry  5
The Evolution of Modern Architecture Education  7
Integrated Instruction  10
Effective Instruction  12
Research in Architecture Education  14

II  A THEORY of INSTRUCTION  19

Predisposition  22
  Motivation  23
  The Instructor Student Relationship  23
  Problem Solving  25

Structure and form of Knowledge  27
  Representation  27
  Economy  28
  Effective Power  29

Sequence of Instruction  29

Evaluation  30

A Model of Instruction  33
  Identifying Objectives  35
  Structuring Objectives  36
  Determining Effective Organization  37
  Form and Pacing of Rewards  37
<table>
<thead>
<tr>
<th>III</th>
<th>ANALYSIS OF SAMPLE SCHOOLS</th>
<th>40</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Predisposition</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td>Course Outlines</td>
<td>41</td>
</tr>
<tr>
<td></td>
<td>Pre-assessment</td>
<td>52</td>
</tr>
<tr>
<td></td>
<td>Prelearning</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td>Motivation</td>
<td>57</td>
</tr>
<tr>
<td></td>
<td>Social Context</td>
<td>58</td>
</tr>
<tr>
<td></td>
<td>Summary</td>
<td>60</td>
</tr>
<tr>
<td></td>
<td>Structure and form of Knowledge</td>
<td>61</td>
</tr>
<tr>
<td></td>
<td>Representation--Enactive</td>
<td>64</td>
</tr>
<tr>
<td></td>
<td>Representation--Iconic</td>
<td>66</td>
</tr>
<tr>
<td></td>
<td>Representation--Analogic</td>
<td>67</td>
</tr>
<tr>
<td></td>
<td>Representation--Symbolic</td>
<td>67</td>
</tr>
<tr>
<td></td>
<td>Economy and Effective Power</td>
<td>72</td>
</tr>
<tr>
<td></td>
<td>Content</td>
<td>73</td>
</tr>
<tr>
<td></td>
<td>Summary</td>
<td>78</td>
</tr>
<tr>
<td></td>
<td>Sequence of Instruction</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>Models</td>
<td>80</td>
</tr>
<tr>
<td></td>
<td>Summary</td>
<td>87</td>
</tr>
<tr>
<td></td>
<td>Evaluation</td>
<td>88</td>
</tr>
<tr>
<td></td>
<td>Analysis</td>
<td>89</td>
</tr>
<tr>
<td></td>
<td>Summary</td>
<td>91</td>
</tr>
<tr>
<td></td>
<td>Related Course Work</td>
<td>92</td>
</tr>
<tr>
<td></td>
<td>Effective Studio Instruction</td>
<td>92</td>
</tr>
<tr>
<td>VI</td>
<td>CONCLUSIONS</td>
<td>96</td>
</tr>
<tr>
<td></td>
<td>Suggestions</td>
<td>98</td>
</tr>
<tr>
<td></td>
<td>Recommendations for Further Study</td>
<td>101</td>
</tr>
<tr>
<td></td>
<td>APPENDIX A</td>
<td>103</td>
</tr>
<tr>
<td></td>
<td>APPENDIX B</td>
<td>169</td>
</tr>
<tr>
<td></td>
<td>BIBLIOGRAPHY</td>
<td>180</td>
</tr>
<tr>
<td></td>
<td>PERSONS INTERVIEWED</td>
<td>185</td>
</tr>
</tbody>
</table>
INTRODUCTION

The following inquiry addresses some fundamental issues which have been raised in a debate over the effectiveness of architecture studio instruction. Although the debate raises questions for architecture education in general, it centers around which mode of instruction, the design studio versus lecture, is the most effective mode of instruction for educating architecture students. While most of the participants in this debate agree that the studio mode of instruction is most effective, they also believe that it could be improved through greater specification of goals and objectives for design and evaluation. While this inquiry affirms the studio mode of instruction as an effective means of educating architecture students and that there is a need for more explicit instructional goals and objectives, it will be argued that to maximize its effectiveness it must be based upon a theory of instruction which specifies explicit instructional goals and objectives.

These issues are addressed through an analysis of the available research in architecture education, as well as an analysis of instructors' intentions, goals and objectives for learning as they are conveyed to students in beginning design studios through course outlines and exercise handouts. Although this analysis does not take into account the instructor's actions within the classroom, it is believed by the author that the instructor's classroom behavior would
follow from instructional planning that includes explicit instructional goals and objectives.

Reference is made to a theory of instruction and learning which is utilized in the interpretation of a sample of beginning courses in architecture. The purpose of this analysis is to uncover the structure of architecture studio instruction as practiced in these schools to study the effectiveness of studio instruction. The analysis may also verify the hypothesis that instructors' intentions are too implicit.

It is also argued that to create a more effective instruction a theory must be put into practice through a model of instruction derived from that theory. The principles for a model of instruction are compared to a theory of instruction to show the relationship between theory and practice. This inquiry also addresses the question as to how effective architectural studio instruction is compared with other modes of instruction. The principles of a model of instruction are important in the formation of a general theory of instruction and should exist in any instructional setting for an effective pedagogy in beginning design studios in architecture. It is not the purpose of this inquiry to create a theory or model of instruction, but to collect a body of knowledge, and to advance some suggestions toward the creation of a more effective architectural studio pedagogy.
The Studio Versus the Lecture

The debate over whether architecture studio is an effective mode of instruction raises fundamental questions for architecture education. These questions concern the content, or body of knowledge, that is imparted in the studio and the methodology for teaching and evaluating that content (Rapoport 1984, Beckley 1984, Hurtt 1985, Ledewitz 1985, Schon 1988, Gelernter 1988). The most vocal participants in this debate, Amos Rapoport and Steven Hurtt, advocate placing emphasis on the lecture and studio modes of instruction respectively.

Rapoport is critical of the emphasis put on the architecture studio mode of instruction. He implies that studio instruction is too subjective by stating that "Design should be based on theory, not on likes and dislikes." He also observes that much time can be wasted in the studio and that individual instruction can be repetitious. Rapoport concludes that "the studio is nothing but one method of teaching (and learning) among many" and that "there is no evidence to suggest that it is effective." Therefore, Rapoport advocates reducing the emphasis on studio instruction in favor of the lecture mode of instruction in architecture (Rapoport 1984).

Steven Hurtt, refers to his colleague’s criticisms as "a characterization that is anything but an academic and objective evaluation" (Hurtt 1985). In response to Rapoport’s many criticisms of studio instruction, Hurtt answers with a list of the varied learning experiences that can be facilitated in the studio, demonstrating the studio’s potential as an effective
mode of instruction. For Hurtt the studio is where the architecture student learns by doing. He believes that the lecture mode of instruction is expository, encouraging a passive approach to learning, while the studio is exploratory, allowing the student to acquire knowledge and skills through experimentation. Hurtt maintains that both expository and exploratory modes are necessary in architecture education and both can be accommodated in studio instruction. He feels that primarily "the studio is an integrating and synthesizing area of thought." Hurtt also points out that "architecture is architecture and not something else" and that, although architecture is related to many other bodies of knowledge, it has its own body of knowledge to impart in instruction. In conclusion, Hurtt defines his ideal studio as one with "clear pedagogical objectives" that are structured to "maximize student learning" (Hurtt 1985).

Although differing from Hurtt on the effectiveness of studio instruction, Rapoport suggests similar ways to improve this form of instruction. Rapoport believes that the studio mode of instruction would benefit from "a clear definition of goals and objectives" (Rapoport 1984). Rapoport asserts:

In stating explicit objectives for design, criteria are also set for evaluating how successfully goals have been met. When this process is repeated, there is hope of developing a cumulative body of knowledge and theory" (Rapoport 1984).
This debate over the appropriate mode of instruction for architecture focused on the strengths and weakness of studio instruction. All participants in the debate agree that the studio mode could be improved through more explicit goals and objectives for instruction.

Objectives

The purpose of this inquiry is to address the effectiveness of architecture studio instruction in general and beginning studio instruction in particular. It will argue that the studio mode of instruction holds enormous potential as an effective means of educating architecture students, but that, as currently structured in many architectural programs, its potential is often unrealized. It will further argue that to maximize the effectiveness of beginning studio instruction, studio learning must be premised upon a theory of instruction which includes the specification and evaluation of instructional goals and objectives. There will be considerable emphasis placed upon the analysis of instructors’ intentions, goals and objectives for learning as they are conveyed to students in beginning design studios through course outlines and exercise handouts.

Method of Inquiry

To assess the effectiveness of current approaches to beginning studio instruction, course outlines and exercises were collected from ten schools of architecture within the Northeast region of the United States. The region contains thirty-one Association of Collegiate Schools of Architecture
member schools. The sample was drawn from schools which offer an undergraduate Bachelor of Architecture degree (5 year). Schools at extreme distances were not considered. This information was augmented by a series of interviews with participants of and analysis of papers from the 6th Annual Conference at Tulane University on The Beginning Student in Architecture 1989. This conference provided course outlines, and exercises of various programs, and papers on a variety of topics that impact beginning courses in architecture.

The studio course aims and objectives for student learning are ascertained primarily from the course outlines and exercise handouts. These are derived from the outline or exercise handout as presented to the student (Appendix A). The focus of this analysis is the instructor's intentions, as to what the student is expected to learn, not of what the student may actually have learned. Interviews with course coordinators and instructors at the selected schools were also conducted in order to clarify the meaning of the course outlines and exercise handouts. In some schools interviews were the only method for interpreting intentions because of the lack of documentation. This fact substantiates the hypothesis that instructional goals and objectives in architecture are often implicit. This documentation and analysis will describe the structure of architecture studio instruction in beginning courses as practiced in these selected schools of architecture which it is hoped are representative of instruction in most schools of architecture today.
The Evolution of Modern Architecture Education

The evolution of modern architecture studio education from the founding of the Ecole des Beaux-Arts to the Bauhaus has been well documented (Egbert 1980, Carlhian 1979, Drexler 1980, Kostof 1977, Dearstyne 1986, Wolfe 1981). However, in order to assess the effectiveness of the studio mode of instruction and to present recommendations for enhancing its effectiveness, it is useful to recap this evolution. The author will demonstrate that the effectiveness of architecture studio instruction was diminished by two historical factors: first, the marrying of the Ecole des Beaux-Arts studio methodology with the university’s predilection for the lecture format and second, by the importation of the reductive Bauhaus methodologies into basic architecture design.

Studio instruction was first established in the Royal Academy in 17th century France (later to become the Ecole des Beaux-Arts). The Ecole method of studio instruction utilized the analysis of classical elements and a common vocabulary that had been taught throughout most of modern western architectural history. This methodology became the fundamental pedagogical method of instruction in architecture. Although the Ecole introduced lecture courses into its curriculum at its inception, these classes were not well attended by students (Carlhian 1979, Chaffe 1980), and the studio (atelier) mode of instruction continually dominated.

Although many American architects were educated at the Ecole Des Beaux-Arts in the 19th century, in the United
States, up until the late 1800’s, the apprenticeship system was the dominate method of training architects. However, with the increase in new building types and the need for new technical knowledge, this apprenticeship training could no longer provide the knowledge and skills required for the practice of architecture. Consequently, major American universities began to form schools of architecture. These new schools attempted to marry the Ecole des Beaux-Arts studio methodology with the university’s predilection for the lecture format. As a result, respect for the studio mode of instruction as an academic discipline declined and the lecture mode begin to dominate (Hurtt 1985). This separation of lecture from studio divorced theory from practice in the study of architecture. This promoted a division between a studio experience, the application of knowledge, and the acquisition of knowledge in the lecture.

In the 1930’s the Bauhaus method, which had developed in Germany under Walter Gropius, was introduced at Harvard. This pedagogy, although much altered (Bowser 1983), was to promote what Klaus Herdeg has called the Decorated Diagram (Herdeg 1983). This term refers to a concentration on diagrammatic two-dimensional formalism and sensual texture. According to Herdeg this produced studio designs and modern buildings that are unattractive and dysfunctional. These buildings are as Norberg-Schulz declares (1965), devoid of a "sense of place."

Herdeg utilized studio course objectives and project programs to evaluate the implied and explicit objectives of
the curriculum. He concluded that these objectives, by emphasizing two-dimensional formalism, encouraged design decisions that shaped the buildings that are mainly extruded plan forms and textured facades. Herdeg is not the only critic of this modern architectural methodology of instruction and its resulting forms, but he was the first to explicitly relate the two (Norberg-Schulz 1965, Wolfe 1981, Dearstyne 1986, Lang 1987). This critique demonstrates that the importation of this Bauhaus methodology and its reductive language stripped the basic studio design courses in architecture of the knowledge and semiotic content. This is mostly due to the emphasis on methods which encouraged the use of the elements of point, line, plane in opposition to the Ecole’s use of historical precedent and classical language (Bowser 1983).

Although critical of the abstract exercises derived from the Bauhaus the belief here is that abstraction has been misread in its intentions for architecture education. Furthermore, it is felt this has lead to a stripping of content from what architecture is or should be and requires a more acceptable definition of basic design. The 6th Annual Conference, at Tulane University on the beginning Student in Architecture clarified a distinction between "the basic design course" and basic design for architecture. Basic design in general draws from Bauhaus artist and was created by Gropius and these artists for the purpose of breaking away from the dependence upon classicism and the Ecole des Beaux Arts
the purpose of creating none objective art as well as the breaking from the past, this instructional methodology was appropriate. But these exercises deal with abstract two and three dimensional objects with no principle direction and are more manipulation and abstraction in and for the sake of abstraction. But to teach the concept of abstraction in architecture without relevance to the subject, architecture and its relation to human use, is just abstraction for the sake of abstraction as an exercise.

Object and form making in these types of exercises create decorated diagrams and the idolization of form. Design in architecture should address the complexity of architecture through the principles of man and environment. Abstraction with reference to architecture should relate to the idea of habitation seen from eye level or an approach sequence of experience, not as most axiometric or model views. Architecture is the creation of human environments for human experience and use.

**Integrated Instruction**

The reliance on this Bauhaus methodology of instruction has presented problems for architectural education and practice because it does not acknowledge the real complexity of architecture. Architecture as a complex discipline cannot be reduced to a two dimensional design problem that denies its relation to human experience. It must integrate multiple, and at times conflicting, demands of society and users, structural and environmental technologies, and aesthetic considera-
tions. The buildings which Herdeg (1985) critiques emphasize formal aspects to the exclusion of environmental and user needs (Banham 1969). In order for these demands to be integrated, future practitioners of architecture must be educated in a manner that takes into account the varied demands of architecture by means of a sound theoretical approach to studio instruction.

Unfortunately, the modern approach to architecture studio instruction seldom achieves such a synthesis. Knowledge of architecture, its content, is typically conveyed in lecture courses with the intent that it be applied in the studio. However, evidence suggests that such application and integration does not occur and that students fail to comprehend the interdependence of human knowledge and experience, not only in individual fields, but between and among fields (Gelernter 1988, Tanner 1980).

In response to the failure to apply the knowledge that is imparted through the lecture mode within the studio context, Donald Schon (1981, 1984, 1987) and Mark Gelernter (1988) recently suggested that knowledge and application be integrated within studio context and not divided between the lecture-studio modes of instruction. Attempts have been made to integrate certain of the demands of architecture within the studio format. However, for the most part, these attempts have been limited to only one of the many demands (for example: social [Marmont and Symes 1985, Pressman and Tensseyon 1983], user needs [Robinson and Weeks 1983] technological
[Smith 1987], environmental [Watson 1984] or historical [Crowe 1986]). The integration of architecture’s body of knowledge within the studio mode can provide a more coherent and direct relating of knowledge and experience. The re-interpretation of the instructional methods of both the Ecole des Beaux-Arts and the Bauhaus can result in an educational environment more conducive to learning.

While integration of knowledge and experience will enhance the effectiveness of the studio mode, this author believes that the studio approach can achieve optimal effectiveness, only when it is guided by a theory of instruction that includes the specification of instructional objectives. Both a theory of instruction and a model for specifying instructional objectives are discussed in detail further in this paper, but first it is important to define what effective instruction is.

**Effective Instruction**

Instruction is effective when it is based on research in learning and teaching effectiveness. According to Kibler, effective instruction

1) optimizes the communication between the instructor and student,
2) addresses the student’s individual needs and capabilities,
3) emphasizes learning which is designed to achieve goals, and
4) stresses student progress. (Kibler et.al. 1974)
Also effective instruction should have predictable outcomes for student learning.

A paucity of standardized pedagogical resources, "syllabi, references, standards, and other materials to guide teachers and students" (A.E.S. 1981) has affected the effectiveness of studio instruction. In addition very few architecture instructors have been trained in theories of instruction. This lack of training has resulted in a lack of "understanding of the cognitive, affective and behavioral processes of learning to design" (A.E.S. 1981). Most instructors draw upon their own educational experiences, thus perpetuating some of the ineffectiveness and inadequacies within the studio mode of instruction. The problem is particularly acute because many instructors in architecture are adjunct or part-time faculty with little knowledge of teaching methods or teaching experience. While these instructors may be very well read and experienced as architects, knowledgeable of their subject, knowledge of one's discipline is only one aspect of effective teaching.

As James M. Cooper writes in *The Teacher as Decision Maker* (Cooper 1982), "The effective teacher is one who is able to bring about intended learning outcomes." Cooper suggests that a competent teacher should be prepared in four areas:

1) knowledge about learning and human behavior,

2) attitudes that foster learning and genuine human relationships,

3) knowledge in the subject matter to be taught,
4) technical skills of teaching that facilitate student learning (Cooper 1982).

It can be argued that the complex nature of architecture and the diversity of the body of knowledge, can contribute to the instructor’s competence. For example, courses in environmental psychology, typically required of architecture students, impart knowledge about learning and human behavior. In addition it could be shown that most architecture instructors display a positive enthusiastic attitude and have developed a command of knowledge in the subject matter. But it is within the area "of technical skills of teaching that facilitate student learning" (Cooper 1982) that instructors in beginning courses usually lack knowledge. Instructors in other fields, usually full-time educators, are more likely required to write goals and objectives for instruction and to attend workshops on teacher effectiveness.

Such activities and requirements are seldom experienced by adjunct instructors in architecture. Nonetheless, most do have goals and objectives in mind when planning their courses. They may set what they believe to be the appropriate level of the knowledge to be imparted and a method for presenting that knowledge and evaluating students. Unfortunately, this instructional planning is seldom structured or based on any educational theory or research.

**Research in Architecture Education**

It is this authors believe that research in architecture studio education has not kept pace with research in theories
of education, instruction or learning. An evaluation of the current research in architecture education should test this hypothesis. Many of the fundamental questions concerning the appropriate content and methods of instruction in architecture studio have been addressed in various studies over the past decade and the most prominent of these studies will be discussed in an effort to demonstrate that many areas of critical importance to architecture studio education have not received appropriate analysis.

The Architecture Education Study (AES 1981) conducted under the direction of the The Consortium of Eastern Schools of Architecture addressed the relationship between education and practice in architecture. Its main purpose was to update research in architecture education which had lagged during a time of profound changes in society and architectural practice. Through observation of actual student/teacher interactions in the studio, the study found that when this relationship was positive and interactive in nature, it contributed to the effectiveness of studio instruction. While the study did address the relationship of instructor to student it was too limited in its analysis of theories of learning and instruction (AES 1981).
In a 1969 study developed for the American Institute of Architects (The Handbook for Measurement and Evaluation in Design Education) the Educational Testing Service, attempted to establish a common language for evaluation in design (architecture) education. The authors stressed that "effective instructional planning begins with clear statements of educational goals" (ETS 1969). For the development of these educational goals they refer to Robert Mager's, Preparing Instructional Objectives (1962). Most importantly the authors stressed that similarities exist between instructional theory and architecture, "in purpose and process," that should interest architectural educators for creating "a more effective and efficient curriculum" (ETS 1969).

In A Survey of Studio Handouts Greenfield and Page (1976) state that the rich and complex data in studio exercise handouts are "a potent source for further analysis and interpretation" (Greenfield and Page 1976). They quantify the content of the studios, but they do not interpret the content for learning objectives. Greenfield and Page do however, caution that intentions are only part of the learning strategy and that an important aspect of instruction is the behavior of faculty in the studio. Other studies point to this incongruity between the instructor's intentions and the instructor's actions as well (AES 1981, Greenfield 1975). This author believes that this incongruity will less likely occur when studio instruction is structured by a theory of
instruction and the explicit specification of instructional goals and objectives.

Richard Rauh and David Wright (Beginning Design Courses at Schools of Architecture In Western Europe: A Documentary Study 1975) utilized Bloom’s Taxonomy to describe the cognitive objectives for beginning courses of architecture. Bloom’s taxonomy (Bloom et al. 1956) is a widely used conceptual framework for classifying and evaluating educational objectives in the cognitive domain, its major purpose being enable instructors to discern the nature and scope of appropriate instructional goals and objectives and to classify the intended that indicate that these behaviors have been learned. This taxonomy provided an effective framework for Rauh and Wright to evaluate and assess appropriate objectives in architecture studio design courses. Furthermore, the National Architectural Accrediting Board paraphrases the first three categories of Bloom’s taxonomy in constructing their criteria for evaluating architecture schools for accreditation (NAAB 1986). The use of Bloom’s Taxonomy for structuring objectives and evaluating student learning in architecture has been suggested in other studies as well (Akin 1982, ETS 1969). The taxonomies for the cognitive and affective domain are treated more fully in Appendix B.

Such research in architecture education has raised significant questions about the effectiveness of architecture studio instruction and has contributed significantly to the
growing body of research in studio education. But, much of this research has not been widely accepted or applied to studio instruction. Other than the Educational Testing Service's study (1969), few studies have applied such findings to instruction in the studio mode.
A THEORY of INSTRUCTION

A theory of instruction in architecture studio education derived from theories in learning, education, and instruction, should be general enough to allow for a wide development of approaches to actual studio instruction. A theory of instruction should prescribe rules which concern "the most effective way of achieving knowledge or skill," and it also provides "a yardstick for criticizing or evaluating any particular way of teaching or learning" (Bruner 1966).

For Jerome S. Bruner, a theory should set forth the "best means" of instruction, and how what one wishes to teach can best be learned. Bruner addresses this "best means" in Toward a Theory of Instruction (1966) by outlining four major features of any theory of instruction and learning. These features are:

1) the predisposition of the learner toward learning,
2) the structure and form of knowledge to be imparted to the learner,
3) the sequence of instruction,
4) the form and pacing of rewards.

An effective theory and model of instruction for architecture would prescribe an ideal structure for the teaching of architecture as well as the evaluation and interpretation of the present structure of architecture studio education. Such a theory will be presented here, but first it must be framed
within the overall development of theories of instruction and curriculum.

The history of educational theory and curriculum development is replete with references to the work of John Dewey especially his *Democracy of Education* (1916). Dewey’s assertion that effective learning is "learning by doing," (Dewey 1916) is particularly important for architecture education. Jerome S. Bruner (1966) derives much of his theory of learning and instruction from Dewey’s work. Bruner differs, though, from Dewey’s Social Pragmatism, which was appropriate for turn-of-the-century America, in that Bruner reflects more the thought of today and the aspirations of the creative individual.

In leading the curriculum reforms of the 1960’s and 70’s Bruner rejuvenated and validated many of Dewey’s ideas on education, especially the learners’ active participation in their own education and a hierarchy of knowledge (Tanner 1980). Similar to Dewey’s "Reflective Thinking" is Bruner’s inquiry/discovery method of learning. Bruner stresses that, through the understanding of basic principles and concepts and the students’ active engagement in an inquiry/discovery approach to problem solving, subject matter becomes more comprehensible and more transferrable. Such an engagement provides for a greater sense of connectedness between advanced knowledge and elementary knowledge (Tanner 1980).

This connectedness between advanced and elementary knowledge is related to Bruner’s ideas concerning the "casting of
the learner as the mature scholar," but this notion was highly criticized and unsubstantiated by Bruner. In fact Jean Piaget’s research (1970) pointed to significant differences between the cognitive processes of the adult and the child. This research contradicted Bruner’s hypothesis and substantiated Dewey’s belief in the uniqueness of the child learner. But what Bruner had been promoting was the idea of the learner actively engaged in learning the mature scholar’s methods of inquiry and discovery, not just passively accepting the results and information generated by the scholar’s work (Tanner 1980).

The recent work of Donald Schon, which is more immediately related to architecture education, supports Bruner’s ideas. Schon outlines his ideas in Toward a Marriage of Artistry & Applied Science In Architectural Design Studio (1988). These include:

1) teaching "what scientists do" as opposed to memorizing their findings,
2) "getting a feel for the behavior of a phenomena" as opposed to only formulating theories,
3) using "prototypes, exemplars, and precedents," (ie.. Models of Terminal Behavior), and
4) teaching thinking skills and methods of inquiry used by scientist.

Schon suggests that "these ideas could influence how science (knowledge) is taught in the studio" (1988).
Earlier in the Architecture Education Study (AES 1981), Schon demonstrated what he termed "Reflection in Action" whereby the instructor and student enter into a dialogue by building a series of arguments concerning the nature of architecture and design (Ledewitz 1985). For Schon, studio instruction and learning is "coaching and learning by doing" (Schon 1988). Schon believes that architecture exemplifies a particular kind of inquiry and design whereby the architect making representations of things to be built. He views other professions as similar to that of architecture in that they also construct representations; only they construct arguments. Hence he suggests that they too should look to the studio mode of instruction as an effective method for instruction in their respective fields.

These speculations indicate the relationship of studio instruction to Bruner's theory of instruction and to more recent theories and their common features. The main objective is the analysis of intentions in studio instruction by comparison with Bruner's features of a theory of instruction. Each of Bruner's principles is defined and then established as an issue to be addressed in the interpretation of the sample from beginning courses in architecture.

Predisposition

Predisposition, the first feature in Bruner's theory of instruction, deals with the students motivation, relationship to the instructor, and capabilities for problem solving. Factors such as the pre-assessment of the learner's prior
knowledge and skills and social-relations will not be treated extensively here, although they do influence the other features.

Motivation

Motivation refers to the instructor’s ability to convince the students of the value of learning of information, knowledge or skills and its relevance for immediate as well as future use. For the most part students are motivated by curiosity, the need or desire to know or to acquire knowledge. To capitalize on this curiosity the instructor must assign exercises that give students the opportunity to inquire and learn about "what turns them on" (Kibler et al 1974). Also students must be provided opportunities that require immediate use of knowledge and skills while being reminded of the value of the learning for the future. While motivation depends on the instructor’s actions in the classroom, motivation can be positively or negatively affected by the instructor’s intentions as well.

The Instructor Student Relationship

An effective instructor should maximize communication between himself and the student. This requires that both the student and the instructor deal with attitudes toward authority. In the Architecture Education Study (1981), Julian Beinart describes three models for the relationship between the instructor and the student relative to the body of knowledge. In the first, the instructor assumes the position of authority over both the student and the knowledge he is trying
to impart within the studio environment. This is the traditional master/apprentice relationship in most studios. Although this master-student relationship may be required at times, the student can become overly dependent on the instructor and fail to learn on his/her own. In the second model the teacher is "in a triangular relationship with the student as well as knowledge" (AES 1981). In the triangular relationship the instructor may initiate a problem and require the student to research knowledge needed to solve it, but the instructor may guide the process. In the third model "the student has independent contact with knowledge; the teacher acts as tutor" (AES 1981). Here the student must use his/her own knowledge and skills, first to recognize that a problem exists and that more information is needed, and second to initiate the process for acquiring this needed information. This is the desired relationship for the student to become an independent learner acquiring knowledge necessary to solve problems on his or her own.

The importance of a defined relationship between the instructor and the student cannot be understated in studio instruction and all three models recognize that importance. The real importance of these models is that they recognize the value of gradually working toward empowering a more independent learner through instruction. Chris Argyris, argues that the "instructor should reduce student dependency by making the process more explicit" (AES 1981). As is argued here, this
would entail the specification of explicit instructional objectives and criteria for evaluation of learning.

As Bryan Lawson writes in *How Designers Think* (Lawson 1980):

One of the major roles of design tutors is to move their students around from one part of the problem to another and the job of the student is to learn to do it for himself.

**Problem Solving**

Another aspect of the predisposition to learn, especially for an architecture student is in problem-solving. Peter Rowe comments in *Design Thinking* (1987) that while "some might maintain, design is much more than mere problem solving..." much "depends on our understanding the word problem." Rowe paraphrases the definition given by E. L. Thorndike as: "A problem can be said to exist if an organism wants something but the actions necessary to obtain it are not immediately obvious." This also concurs with Ralph Tyler who, according to Tanner, "discussed problem solving as the sensing of a difficulty or a question that cannot be answered at present" (Tanner 1980).

For Bruner problem solving concerns motivating the student to seek solutions to problems. The instructor must activate this process by establishing the problem to be solved. Then maintain the process through motivation by giving direction and appropriate knowledge of results throughout the process. Although Bruner views learning as sequential and hierarchical, he does not view problem solving
the same way. Bruner believes that a learner, when faced with a problem, projects a hypothesis which exists as prior knowledge: a schema or solution type (Bruner 1966). The learner through inquiry/discovery, overlays the pre-existing schema with a new more informed schema. Over time the learner builds a repertoire of solution types. This view of the cyclical overlaying method of problem solving derived from Bruner, Piaget, and others is becoming the prevailing theory of learning and is receiving renewed attention from theorist of architecture education (Ledewitz 1985, Gelernter 1988). The affinity of the design process to this theory of learning is perhaps evident. The Ecole des Beaux-Arts methodology of hypothesizing through the parti can be seen to conform to it also. The current models of instruction in architecture courses, however, do not acknowledge this similarity and still rely on an analysis/synthesis model, which separates the process into a linear rather then cyclical process (Ledewitz 1985).

Bruner’s inquiry/discovery problem solving process is inductive and empirical in contrast to the traditional deductive and theoretical approaches. But, as Tanner has stated (1980), rarely does a scientist use only one method of inquiry. We need both, especially in architecture education. Most importantly, learning and problem-solving in architecture education depend upon the exploration of alternatives. Moreover, when teaching architecture students the predisposition of the learner, the structure and form of knowledge, the
sequence of instruction and the nature and timing of rewards must facilitate this exploration.

**Structure and Form of Knowledge**

Any body of knowledge can be structured so as to take into account the learner’s predisposition toward learning; motivation, relationship to the instructor, and capabilities for problem solving (Bruner 1966). The structure and form of any body of knowledge are regarded in three ways which Bruner describes as: its’ mode of representation, its’ economy, and its’ effective power.

**Representation**

In his *Notes Toward a Theory of Instruction*, Bruner (1966) describes knowledge as being represented in three different and hierarchical modes: the enactive, iconic, and symbolic modes. The enactive mode, which is described as a more or less stimulus/response activity, is a set of actions appropriate for achieving a certain result. The iconic mode of representation uses models and drawings--images--to represent meaning, whereas the symbolic mode of representation uses notational forms to represent or express meaning, such as language or mathematical formulas. Donald Watson (1985) relating these forms of representation to architecture notes that Max Black in *Models and Metaphors* describes one other mode of representation as the analog which is without dimensional scale as opposed to the iconic which always refers to dimensional scale.
Although all modes of representation vary by virtue of the predisposition of the learner, some bodies of knowledge may have a particular mode of representation inherent within them as architecture and the iconic mode or mathematics and the symbolic mode. Any instruction in architecture would benefit from the inclusion of all four modes of representation. Preference would be for the most economic and powerful means at a particular time.

Economy

Another aspect of the structure and form of knowledge is economy, which is the amount of information that can be held, manipulated, or processed. Economy also varies with the mode of representation. Where architects depend mostly on the iconic mode of representation, plans, sections, elevations, etc., designers use analogic modes of representation: diagrams, parti sketches, etc., as economic means to explore various ideas and concepts.

Theories are also a form of economy. Theoretical principles can be shown to apply to a wide range of information and knowledge, thus achieving economy in expressing relationships. Economy is also related to the effective power of a body of knowledge in that, although it is independent, "a structure may be economical but powerless" (Bruner 1966). For example, the normative theoretical statement that "form follows function" is economical in that it reduces a position or approach to design to a simple
reductive statement. However, in this reductive form, it does not seem to relate to other bodies of knowledge.

**Effective Power**

The facility of a body of knowledge to connect effectively with different bodies of knowledge is defined by Bruner as its effective power. According to Bruner, appreciating the structure of knowledge and its interrelationships, the relating of one idea to another, is the goal of education. It is this structuring of conceptual inventions that bring order to disconnected observations (Bruner 1967). Bruner finds that it is rare that a powerful structuring technique is uneconomical (Bruner 1966). This can be seen in a theoretical position such as that of Vitruvius' triad: Durability, Convenience, and Beauty (Vitruvius, Morgan trans. 1960) or in Wotton's adaptation (Firmness, Commodity and Delight), where the content and the relationship of each division has never been surpassed. The structure and form of knowledge, its representation, economy, and effective power and the students' predisposition toward learning must also relate to a sequence of instruction to be effective.

**Sequence of Instruction**

According to Bruner for any instruction to be effective the instructor must lead the learner through a sequence of learning of the structure and form of a body of knowledge. This sequence is hierarchical, advancing from simple to complex. The complexity must be such that "the learner is able to grasp, transfer and transform information or knowledge
and generally increase comprehension" (Bruner 1966). Ideally, in Bruner's theory learning follows from the enactive through (analogic) iconic to the symbolic mode of representation. But, as noted above, many bodies of knowledge have inherent modes of representation: iconic in architecture, or the symbolic mode in mathematics, or even a combination of modes of representation. Also, since the sequence of instruction also depends on the predisposition of the learner and the content of instruction, the mode of representation can also vary. Ideally instruction in architecture should employ all modes of representations within a sequence of instruction that is structured to provide the learner with a sense of progress.

Evaluation

It is important that the instructor understand the nature, timing and appropriateness of both extrinsic rewards (those from the instructor or other outside sources) and intrinsic rewards (of self achievement and self actualization). Successful achievement of instruction is measured in the acquisition of knowledge, skills and attitudes. In architecture studio evaluation is more the evaluation of an end product--building design and iconic representations--and the set of behaviors in achieving these objectives.

The relationship between evaluation and instruction "can be differentiated ...only on primary purpose in that of passing judgement in achievement of a student at the end of instruction" (ETS 1969). The purpose of instruction is to lead to desired changes in the student by attempting to make
inadequacies in present behavior, knowledge or values understood in relation to desired changes. Whereas, the purpose of evaluation is to provide evidence of those changes (ETS 1969). For Bruner (1966), problem solving activities which permit individual initiative and self evaluation encourage learning. This approach tends to create an independent learner, but it depends upon a system of evaluation. It is very important that the student's efforts be responded to in a timely way and understandable way so that he or she can then re-interpret the content of instruction. Also, according to Bruner, the form of response must be communicated in the same mode as the mode of representation the student is working in. For example, if the student is diagramming a design problem, the instructor should respond to the student in a diagrammatic mode of representation as opposed to other forms. This makes for better communication and comprehension.

Too often evaluation in architecture education is subjective and the rewards in the form of grades are left to the final grade which obviates the potential effectiveness of evaluation. The desk crit in architecture studio instruction can be shown to be an effective way of communicating responses and analyse student's knowledge of results usually at a point when the student has time to reinterpret and re-evaluate his or her design. Hence it can reinforce learning. The problem in architecture studio is in the jury system of evaluation. This system of criticism and evaluation in architecture design studio instruction has been recently researched by Kathryn
Anthony in Private Reactions to Public Criticism (Anthony 1987). Primarily, Anthony suggests that through a more explicit specification of goals and objectives in design studio the evaluation of studio work would prove less subjective and more effective pedagogically. Anthony's research is important in that it points out a major problem in studio instruction, jury critiques and more especially substantiates the hypothesis that such instruction, hence evaluation, is not premised on a model or theory of instruction.

There are two systems of evaluation that will be referred to in this analysis. These are described in Objectives for Instruction and Evaluation (Kibler et al. 1974) as the norm-referenced system and the criterion-referenced system. With the norm-referenced system students are evaluated by their "relative position within a normative group." In the criterion referenced system students are evaluated as to their mastery of "specific criterion or performance standards." Each system requires different stated goals and objectives and will be shown as applied in several beginning courses in architecture (Kibler et al. 1974).

From the preceding definition of Bruner's theory of instruction, an approach to the teaching of architecture studio can be derived but, as argued here, for more effective instruction the theory should include the specification of explicit instructional objectives. Also, in order to put this theory into practice, a new model of instruction must be derived.
A Model of Instruction

Where a theory, as Bruner argues, "prescribes a set of rules to be followed," a model of instruction provides a framework for setting the theory into practice. According to Kibler a model of instruction should provide "a procedural guide for the design, implementation, evaluation, and improvement of instruction" (1974), rather than tell the instructor what, or how to teach. Providing a framework for effective instruction also makes possible the evaluation of existing instruction.

Ralph Tyler, referred to in the ETS study (1969) for his model of instruction, has, according to Tanner created, "a rationale for viewing, analyzing, and interpreting the curriculum and instructional program of an educational institution" (Tanner 1980). Tyler's rationale for instruction has four features:

1) identifying instructional objectives,
2) determining content and learning experiences required to attain these objectives,
3) determining the effective organization of learning experiences,
4) evaluating the effectiveness of these outcomes for the learner and instruction (Tanner 1980).

Though subjected to some criticism for being linear, it can also be seen as a cycling process, whereby the instructor cycles back through the process by evaluating the effects of learning at the end of instruction.
By synthesising the principles of Tyler’s rationale, and the Taxonomies for the cognitive and affective domains, with Bruner’s theory of instruction, principles for the creation of a model of instruction can be established. Through such a synthesis used to analyse beginning instruction in architecture, the author intends to create just a set of principles. In most models of instruction the selection and specification of goals and objectives is the first step in creating effective instruction. This selection of appropriate instructional objectives should be determined in light of instructional goals and expected outcomes (Tyler 1949, Kibler, et.al. 1974).

The specification of instructional goals and objectives is of value to both school administrators and instructors. In instructional objectives are specified the sequencing and administrating of courses is made easier as is their evaluation. With such principles in force, the instructor determine the most significant aspects of the subject matter to be studied as well as establish criteria for evaluation. The instructor must specify the expected type of observable behavior the student must envince in order to demonstrate mastery of the objective. He or she must determine to what extent these behaviors have been learned by observing the learner’s performance. The behaviors are expressed in the infinitive verb form. For example an observable behavior maybe specified thus: The student (at the end of instruction) should be able to write, draw, identify, analyze, among many more. There are some verbs to be avoided because the actions they refer to are
not observable, for example, to know, to understand, to explore. The instructor should also describe the conditions under which the objective will be pursued: time limit or equipment for example. In addition the instructor must make clear the criteria for evaluation (Mager 1962).

When the goals and objectives of studio courses are implicit, students are left to question the instructor’s intentions and the course’s requirements. However, when instructional objectives are stated explicitly, students, knowing what is to be learned, are focused on the content of the course and not on why a certain exercise is being attempted. Through such specifying of explicit course objectives for projects, and exercises, students are more aware of what is expected to be learned and how they will be evaluated.

Although stating instructional goals and objectives can assist in the creating a more effective theoretical approach to teaching architecture, objectives are only a part of effective teaching. The other aspects have been developed through research in teacher effectiveness. They include, in addition to teaching to objectives,

1) teacher actions, selecting objectives at appropriate levels,
2) monitoring students behavior and
3) using the principles of learning such as focus, rate and degree of learning, and retention (Hunter 1977).

Identifying Objectives
Tyler's first criterion, the identification of objectives, relates to Bruner's ideas concerning the predisposition of the learner toward learning. In structuring objectives for a course and for each exercise, the instructor informs the student of the knowledge or skills which are expected at the end of instruction. The communication of such objectives prompts a dialogue between the student and the instructor relationship; objectives also increase motivation by giving the student goals to work toward and, therefore, help in defining problems to be identified and solved. Thus these objectives certainly affect the student's motivation. The objectives, however must be attainable. The student, must be challenged, but he or she be able to see the possibility of success. Therefore, a clear understanding of what is required helps to motivate the student toward learning a body knowledge or a set of skills.

Structuring Objectives

Instructional objectives can also structure the body of knowledge in relation to what Bruner calls the structure and form of knowledge. The instructor must present the "optimal structure" of a body of knowledge so that students can simplify and manipulate information as well as derive new propositions. Such a structuring can be prompted by the use of instructional objectives. If Bruner's and Tyler's belief that knowledge must be represented in a hierarchical, economic and powerful structure, specifying instructional objectives can provide a framework for this structuring of knowledge. The
content of the course and experience of learning it can be taxonomized. These taxonomies provide a framework for creating a structure or form of knowledge based upon the principles of representation, economy, and effective power.

Determining Effective Organization

In order to determine an effective organization of learning experiences instructional objectives formalize what has taught and thus, help in determining a students level of knowledge and hence the next course in a sequence. To accomplish this efficiently one needs to establish an effective sequence for learning. All three Bruner, Tyler, and Bloom, regard acquiring knowledge as hierarchical, proceeding from lower-level information recall to higher level evaluation. Daniel Tanner suggests adding to Bloom’s taxonomy a category for problem solving as well as a higher level, one of creation. Although this hierarchical structure has been criticized in more recent studies, this sequence, especially the taxonomies, is still useful in structuring learning objectives.

Form and Pacing of Rewards

Bruner’s form and pacing of rewards are learner-specific, and related to motivation. Tyler, on the other hand, looks to appraise (evaluate) effects of learning experiences on the learner as well as the effectiveness of the structure of the teaching and learning. By establishing instructional objectives determined by the taxonomies, one also establishes objectives for evaluation. To determine instructional objec-
tives for a given levels or type of learning, the most widely used systems of classification are Bloom's Taxonomy; for the cognitive domain (1956), and Krathwhol's Taxonomy, for the affective domain (1964).

These taxonomies allow the instructor the ability to identify appropriate (content) objectives at levels appropriate for a given learner. Although criticized for being too restrictive and behavioristic, instructional objectives clearly specify to the student what is to be learned, how they are to demonstrate that it has been learned as well as how that demonstration will be evaluated. According to Bloom and Krothwhol and their colleagues there are three domains of learning: the cognitive, affective and psychomotor. The cognitive and affective domains are conceptual frameworks for defining and evaluating educational objectives. Their major purpose is to enable instructors to discern the nature and scope of instructional goals and objectives and to define intended behavior of student learning.

There are six levels of Bloom's Taxonomy within the cognitive domain. They are hierarchical from simple recall of information to more complex mental functions. The affective domain identifies behaviors and objectives which have emotional overtones, encompassing likes and dislikes, attitudes, values, and beliefs. The psychomotor domain objectives address motor skills, but little research has been done in structuring instructional objectives in this area and is only mentioned here because of the interrelationship among the
three domains. The concern here is with how these domains relate to theory of instruction and architecture education.

The taxonomy for the cognitive and the affective domains are listed in Appendix B to show the general structure of the taxonomy and provide examples of explicit instructional objects for each category. For a more detailed explanation of the Taxonomies refer to the Bibliography (Bloom et al 1956, Rauh and Wright 1975, Kibler et al 1974). The importance of these taxonomies is their power to formalize structuring instructional objectives for studio instruction as well as for the evaluation of those objectives for instruction.

It has been argued by this author that in order to maximize the effectiveness of beginning studio instruction, studio learning must be predicated upon a theory of instruction which includes the specification and evaluation of instructional goals and objectives. Also this theory provides an instrument for the analysis of instructors' intentions, goals and objectives for learning as they are conveyed to students in beginning design studios through course outlines and exercise handouts. This analysis is guided by a set of issues to be addressed that are derived from the fundamental questions raised in the debate over what effective instruction is.
ANALYSIS OF SAMPLE SCHOOLS

The following issues are addressed in the analysis of the goals and objectives, both implicit and explicit, from catalogs, course outlines, exercise handouts and interviews from the sample of beginning courses in architecture (see Appendix A). They are interpreted as they relate to Bruner’s theory of instruction as defined above. (Bruner 1966) The objective is to draw specific examples of a feature from Bruner’s theory from the data and then to interpret how the particular feature is reflected in instruction in beginning studio courses in schools of architecture as currently structured. This analysis will demonstrate the intentions in current studio instruction in comparison to an educational theory of instruction.

There are several other issues to be addressed in this inquiry as well. These are:

1) What are the general goals and objectives of the studio course and how are they stated in the course outline?

2) How does the course fit into the context of the other courses the student takes within the program and curriculum of the first academic year? and,

3) How effective is architectural studio instruction compared with other modes of instruction?
Predisposition

The first issue, the instructor's intentions toward the students predisposition toward the learning of architecture and how it is expressed in the course outline and exercise handouts concerning, motivation, student/instructor relationship and the students capabilities for problem solving. Other factors, such as, the preassessment of the learners prior knowledge and skills and social-relations, will be addressed but will be treated only briefly. These issues of predisposition are first analyzed as they are manifested in the Course outline and then in various exercises.

Course Outlines

The course outline introduces the student to the content and methods for success in a course. It defines, and creates the milieu for learning. Howard Altman, writing in the "The Teaching Professor" (1989), states that a "syllabus constitutes a written covenant between faculty member and students." He stresses that it is more then just an outline, calendar, or list of course requirements. It is the students first introduction to the course as well as an introduction into the relationship with the instructor.

Altman lists the requirements of a model course syllabus as personal information dealing with the course and the instructor. The syllabus should include a course description that parallels that in the college catalog, there seems to be an incongruity in these descriptions at most schools. (See Appendix A.) The syllabus should include "general or specific
objectives to which the instructor will be teaching and which the students are expected to achieve" (Altman 1989). These objectives should explicitly state the criteria for success in a course--these objectives may even be related to the National Architecture Accreditation Board (NAAB 1986) stated objectives for the various study areas in architecture. The syllabus should include a course calendar, course requirements, attendance, grading and other requirements for success in the course; Required texts and reading; and course grading. Finally a stipulation as to the possibility of changes should be included and any changes after that should be presented to the student written form.

The course outlines gathered in this inquiry vary from one extreme to the other. Some are well constructed much as Altman describes, others are as little as one page semester outlines, but it is the content of the outline that is most important. That is the instructors intentions, goals and objectives for student learning and how they are stated, explicitly or implicitly. Although course description are usually overly general in nature, it is believed here that this description is or should be an indication of the general goals and objectives within the curriculum.

Drexel University

Course Aims and Objectives, as stated in the Course
Outline are:

This year we will explore the basis of design in architecture: the generation of human space. Our goal together will be to expand the creative energies within you....

Teaching Methodology (also stated explicitly in the course outline).

While evaluation of work will be based on the vitality and substance of its generating ideas, the thoroughness of its development, the care and skill of its presentation, the prime objective of this course is to cultivate a personal, working, design process—a way of approaching and solving problems—for each student (Course Outline Drexel 1989).

The first line of the objectives states that "we will explore the basis of design in architecture:..." Thereby attempting, explicitly, to establish the relationship with the student, implying that learning architecture is a collective exploration. This is reinforced by the statement later that "Our goal together is...". The instructor is attempting to place the student in a relationship with knowledge in line with Beinart’s second model or maybe even the third. Given that Drexel’s program is in the evening college and the studio’s are mainly pin-up and critique secessions the student has to be less dependent on the instructor then in other programs. This is reinforced in that the primary objective is stated "to cultivate a personal, working, design process" and "an approach to solving problems." Also in stating that "You will discover that there are no absolute solutions" the instructor admits to the heuristic nature of architecture.
The outline also intends to develop "an approach to solving problems." Other intentions are to exercise the students visual and verbal communication skills implying that architects must also be able to communicate verbally as well as visually.

The course outline explicitly states the instructors intentions for the student to learn to develop an independent approach to solving problems in architecture, while developing visual, graphic and verbal skills. The individual exercises are presented in a common highly organized and clearly presented format with an introduction, assignment, objectives, considerations, and the presentation requirements. This organization informs the student of the preparedness of the instruction to follow and demonstrates to them a model of professionalism.

New Jersey Institute of Technology

The course aims and objectives are as stated in the course handout as:

Generate and build interest in architecture.
Develop broad range of knowledge through the initiation of a basic architectural language which a student can use to create an architectural composition.
develop a self motivated self learning and disciplined student.
development of craftsmanship by improving basic drafting and model making skills (NJIT 1988).

Also listed are a set pedagogical objectives:

Short problems, rapid pace.
Investigation of a wide range of subjects.
Reinforce initial stage of design process, stressing
the iterative nature of architectural design production.
Reinforce classwork with extensive hands on experience through field trips (NJIT 1987).

One of the major pedagogical aims is to "Generate and build interest in architecture." The outline states that this is accomplished "by inducing the student to choose a career in architecture through the studio experience," hence motivate the student through experience of design and problem solving. Since the student is required to submit a portfolio for entry he/she must already be quite motivated. Motivation is accomplished also by providing the student with projects they like and represent some value for them in the present and future. It is to be accomplished here through the "investigation of a wide range of subjects." and "through hands on experience an field trips" (NJIT 1988).

The relationship of the student to the instructor is established by the explicit reference of the "Studio faculty are role models" (NJIT 1988).

New York Institute of Technology

The course outline and exercises for Design Fundamentals I have been published as a book Creation In Space (Friedman 1989) by Jonathan Friedman and is the required text for the course. The text contains a variety of exercises and readings.

The course provides students with the means to investigate spatial order and invention concurrently with critical issues of design. It emphasizes direct modelling in three dimensions as the basis
and true medium for communicating architectural ideas (Friedman 1989).

This course seeks to establish an approach to architecture by providing "students with the means to investigate spatial order and invention concurrently with critical issues of design." While all aspects, the readings (pre-learning sets) and the pages entitled DOING and REFLECTING etc. provide a very well organized and conceptualized pedagogy, the stated goal that "It emphasizes direct modelling in three dimensions as the basis and true medium for communicating architectural ideas" is questionable. It is questionable from the aspect of human experience, which is not introduced in the exercises until quite late. This creates more a manipulation of form rather than a manipulation of space. It is only the lack of the human element early into the process of "space" creation that weakens its effectiveness, but only slightly. Overall, the presentation in book form of such a strong pedagogical instrument is needed in architecture education.

Penn State

Although there may be a written course outline no course outline was provided. Most instruction, assignments, evaluation criteria etc. are given verbally. Each instructor maintains their own goals and objectives as to their intentions for student learning. Although they all differ in their approach they attempt to accomplish similar goals.
These are basically:

* to break stereotypical thinking, the students dependence on their preconceptions of architecture and design.
* To teach thinking skills, through inquiring in to the nature of problems to seek their solution (interview 3/10/89).

Although the instructional objectives are not explicitly stated in a course outline, written form, the instructors are all well informed in educational theory, and have much teaching experience.

Pratt Institute

An outline, which includes the general goals and objectives is supplied by the Undergraduate Architecture: Chairperson, which is followed by most of the instructors, but the actual course outlines are written by each instructor. Below are the stated goals and objectives from one of the course outlines. Some of the objectives are written in an instructional objectives form and others are not. The list of objectives for this studio is extensive but for the most part the objectives address the pragmatic concerns of the architect. The course aims and objectives are divided into three basic areas: (see Appendix A, Pratt)

A. To teach the basic skills used in architectural design. The fundamental vocabulary of architectural form quality drafting, sketching, and modelmaking.

B. To broaden the student’s understanding of the scope of architectural concerns.

C. To convey a general understanding of architecture as a profession (Course Outline Pratt Institute 1988).
Rensselaer Polytechnic Institute

Course aims and objectives:

This is the first in a series of ten semesters of design studio. We will work with all of the major concerns which you will encounter in these subsequent studies, if perhaps in only a rudimentary way at first. The objective of this and subsequent design studio semesters is to learn to design, not only about what has been designed. That is design is a verb, before it is a noun. You will be asked to make proposals as to what you consider to be significant physical intervention in a given life situation. Thus, what ought to be done will develop together with what can be done.

During the semester we will issue elaborations of these objectives.

To learn to design, not only about what has been designed.

To make proposals as to what is considered to be significant physical intervention.

To develop what ought to be done as well as what can be done (Course Outline Rensselaer 1988).

This program attempts to integrate "all of the major concerns which...(the student)...will encounter in subsequent studies" knowledge and skills in which an architecture student needs to "learn to design." This is attempted through the exercises and the requirements of their representation. From charcoal drawings to study models, computer simulation modeling, hardline drawings and the actual construction of details or small Kiosks etc. The program probably achieves these objectives, but they are not clearly expressed. The language of the course outline and exercise handouts would be difficult for a beginning student in architecture to understand. Although the outline states: "During the semester we will issue elaborations of these objectives" none of the exercise handouts have such elaborations. Overall, the intentions for
verall, the intentions for student learning are in accord with many of the principles of the theories of learning and instruction. The strongest aspect is the philosophical position, as expressed in the course outline, that of 'Critical Inquiry' and it's definition as the method of understanding the nature and complexity of architecture.

Rhode Island School of Design

The general goals and objectives of the studio course are intended to consider:

1) Thinking in terms of relationships.
2) Similarity and difference (continuity and differentiation, physical and temporal).
3) Context: natural, built cultural.
4) Space: landscape, urban, interior.
5) Construction (at all scales).
6) Program: singular/repetitive; questions of formal determinateness of use (Catalog RISD 1988).

The students in Risd’s first architecture design course are sophomores and take basic drawing, two-dimensional and three-dimensional design courses prior to this courses. The coordinator felt that this art training was not effective and that "it seem the students threw away their charcoal pencils and picked up 4H pencils on the way to the architecture building" (interview, Risd 1989). The students are mixed, architecture, interiors and landscape and this mixture is reflected in the makeup of the faculty.
Roger Williams College

The course outline is very organized and complete, much as Altman describes, except that the course description differs drastically from the catalog description. (This is typical of this incongruity throughout the sample, see Appendix A)

Course Description:

An intensive introduction to Architectural Design focusing on:
1) abstract exercises in two and three dimensions with the objective of studying and understanding the organization and nature of architectural space;
2) analytical problems which examine built work with a focus on learning and recognizing historically important building types and spaces;
3) real building problems which integrate architectural issues such as site, context, program which involve the use of theoretical principles learned from the abstract and the analytical problems (Course Outline Roger Williams 1988).

The program is basically pragmatic though, with the abstract exercises in formal manipulation in the first semester and more concrete exercises in the second. One of the coordinators stressed the fact that he took the basic abstract exercises from his education at Cornell, compressed them into one semester and clarified the objectives for student learning so that they were more explicit.

Syracuse University

To explore the varied aspects of architectural space and the relationships of architectural elements within space To explore the process of the making of architectural space and form in an re-iterative hierarchical sequence alternating from abstract principles to more concrete principles (Course Outline 1988).

Much of the program at Syracuse is derived from Cornell, but modified over the years. The exercises are highly developed and well established "We definitely teach an established methodology of design" (interview SU 1989). The same projects
are used from year to year with little modification. The first exercise is used to pre-assess the students prior knowledge of architecture and probably expresses to the student more what they need to know. This type of exercise can be detrimental to student motivation if the evaluation is not structured properly.

Temple University

The list of knowledge and skills for this course are generally:

To develop the students ability to conceptualize design problems and their resolutions.
(and) To assist the student's development in the following areas: (see Appendix A)

SKILLS
PROCESS:
VISUAL THINKING:
CRITICAL THINKING:

The general goals and objectives of the studio course of this sample as outlined by the coordinator are extensive (see Appendix A, Temple). Most are written in a performance form but not 'instructional objective form' the difference being only a matter of verb tense, and/ observable behavior. This distinction is made more explicit by attempting to classify the objectives by the taxonomy as they are stated in the course outline.

The program at Temple is currently going through major changes and the beginning courses are being either eliminated or reevaluated in light of these intended changes. The course collected here as an introductory course in design in architecture is limited. The course does introduce the
student to the studio experience, but the only meets 4 & 1/2 hours per week. There is a single project for the entire semester. Because of this other courses The Introduction to Architecture and the drawing courses are very important in the program for the student to experience the studio mode of instruction. This approach may ease the student into the studio mode rather than shock them and therefore may be beneficial to motivation and other aspects of predisposition.

Pre-assessment

An important aspect of instruction is to take advantage of the students interests. This requires that the instructor know what these interests are as well as where they are. This is a prior condition to any instruction, especially in instruction as individual as architecture studio. To find out what and where the students interest are the student should be preassessed and not assumed to all be similar in likes and dislikes.

The beginning student in architecture graduates from the public educational institution unprepared for the study of architecture. Secondary education emphasizes verbal and written skills to the exclusion of visual and perceptual activities (ACSA 1989). If the student has been exposed to architecture the course in high school has concentrated more on the design and drafting of residential projects. Not only does this not prepare the student for the methodology and processes of design and architecture, it gives them a false perception of what architecture is. Therefore they come to
architecture education with a misconception of what they will be expected to learn. This can only be clarified in clearly stated instructional goals and objectives that are directed at the existing knowledge and skills that the student brings to the beginning course in architecture and the pre-assessment of this prior knowledge.

Although most schools of architecture establish entry requirements these requirements are not much different than other schools or colleges within the university (mathematics, physics etc.). The "Guide to Architectural Schools in North America" (ACSA 1989) which lists 102 full member schools, 12 candidate schools and 38 affiliate schools shows the entrance requirements for these schools. Of the five year B. Arch. programs most require only a high school diploma for entrance, and/or above average scores on SAT/ACT's. Of the 75, five year B. Arch. programs only 15 (20%) require a portfolio for entering (freshmen) students (ACSA 1989). Of the sample collected here five of the ten schools require a portfolio for beginning students (the requirement for a portfolio seems to be an East Coast phenomenon).

The first exercise in the beginning course in architecture is important in introducing the student to the instructor's intentions for instruction. This first exercise can be used for pre-assessing the students prior knowledge and skills as well as their existing values. Only one exercise from this sample explicitly states that it is for the purpose of pre-assessing the students prior knowledge and skills.
Example: Syracuse University, School of Architecture

Exercise 1 A Week End Retreat

The student, "as a newly successful architect", is asked to design their own Week End Retreat, as a place for work and relaxation as well as entertainment of guests and clients. The student is to use this "as an opportunity to display (their) architectural ideas and talents" (Handout, Syracuse University 1988).

This project while challenging the student to express their prior knowledge of architecture is an important pedagogical tool in assessing the inadequacies in the students existing behavior, knowledge, skills, and values in relation to desired behaviors. The important aspect in pre-assessment is that the evaluation of the inadequacies is not negatively. This can greatly affect the students motivation and, so should be handled carefully. The instruction that follows this first exercise is important also in that the intentions, for addressing the inadequacies of existing behavior, are to demonstrate methods or procedures for the improvement of and obtaining desired behaviors.

Exercise 2 Three Non Parallel Planes

In this second exercise the student is to use three non-parallel planes within a field of space to define a hierarchy of overlapping spaces. To accomplish this the following objectives are stated explicitly:

To discover the spatial relationships between basic architectural elements: plane to plane, plane and opening
To discover the possibilities of multiple spatial readings within a simple space. To understand the principles of spatial definition, closure, hierarchy, and consistency. To understand basic architectural conventions in drawing (Handout Syracuse University 1988).

These objectives assume certain aspects of the students 'product' from exercise 1 to be lacking in these areas "spatial relationships..spatial definition..etc.." addressed in exercise 2. It is through this exercise and those that follow that the students knowledge, skills and values will change to reflect the desired knowledge, skills and values intended through the instruction. The value of pre-assessment is also important as a method for self evaluation for the student, through comparison of the first exercise with that of an exercise at the end of the semester or year that is to synthesis all prior learning.

Prelearning

Another teaching concept, prelearning deals with preparing the student to master new learning. To prepare students for new learning, instructors use a device for the "warming up" and for "acquiring an appropriate 'set' for what is to follow" (Kibler 1974, Hunter 1977). This can be accomplished through the introductory remarks of the exercise that focus the student on the learning to follow. Research has shown that "a preview at the beginning of a chapter or film can increase learning efficiency" (Kibler et al 1974). Also "by providing students with the instructional objectives for a unit (of instruction) also has been found to facilitate learning" (Kibler et al 1974) An example of the use of this
concept can be found in most exercise handouts, but are more apparent as a part of the instructors actions than exercise handouts.

Penn State; Don Leon Studio, Five Exercises

Don Leon begins this particular studio by presenting an anticipatory set (Hunter 1977) of a pocket knife for the students to inquire into its nature as a "metaphor for daring" and to open the student to the process of inquiry and discovery (Leon 1989). The instructor illustrates the lesson by relating the learning from an object the Knife first as just an object to be analyzed, represented. Then the point is made as to "a Metaphor for Daring" (Leon 1989) through the actual function of the knife which is to cut. The main objectives of the project are to break stereotypical thinking, and the students dependence on their preconceptions of architecture and design. This is accomplished by showing slides of different points of view of typical objects. Other objectives which are related to the aspects of motivation, such as to capture the curiosity of the student and raise there level of critical thinking, and problem solving, to teach thinking skills, through inquiring into the nature of problems to seek their solution. The students are asked to make a free-hand drawing of a simple object, and then asked to, recalling the metaphor of the knife, redraw the same object again and again. This is related to the concept of recursive writing where through the iterative process the student comes to 'know' the object. None of these objectives are stated explicitly. The
None of these objectives are stated explicitly. The students' relationship to the instructor in this type of exercise, which although well formulated pedagogically, would predispose the student to be overly dependent on the instructor, because of the implicitness of the instruction.

Motivation

An example of motivation through group interaction is manifest in the following exercise but this exercise also contains an example of what Dewey described as "bribes of pleasure" and is very explicit in this project at Roger Williams.

Exercise 1 Comfort project

The student is to design a corrugated cardboard chair that has "design and construction merit" and that is the shape and size that is most suitable to all persons in their group of four persons.

The stated objectives are:

To study the ergometric needs of the human body in a seated position and in the act of sitting and rising;
To design a construction system using given materials and constraints that will facilitate the first objective and that will work in conjunction with a design concept.
To generate a design concept for a single usable object for the use of the people within the space and that would enhance the quality of the space.

The handout states the criteria for evaluation, but adds to this Judging criteria for the reward of dinner for the winners chosen by the faculty. This attempt to motivate the students through competition and immediate rewards. Examples of the
teacher student relationship and problem solving have already been shown in the analysis of the course outlines and should be adequate to express the general tendencies in the exercises themselves. Another aspect concerning student learning is the social context in which instruction takes place.

Social Context

In "Social Environment and the Beginning Student" in the Architectural Education Study, David Wright (Rauh and Wright 1975) delineated four aspects that affect the student in the context of studio instruction. These are:

1) the subculture or makeup of the studio population,
2) the physical setting,
3) the content, and
4) the teaching methodology.

All these affect the students' predisposition toward learning. Within the studio mode of instruction the students learn as much from each other as from the instructor and this learning is affected by the mixture of the types of students, similarity of background, age, etc. According to Wright large differences in any of these factors fragments the group. Within this study these factors are fairly consistent. The greatest change over the past decade has been the larger numbers of females in the architecture studio, as well as a smaller increase in the number of minority students. This has not adversely affected the instruction in studio.
Class size also affects learning. The average studio size in the sample is about 15-16 students per section and instructor. The largest is at Syracuse with 25 students per instructor, but there is also a teaching assistant for each section. The studio mode is very dependent on the student and the instructor entering into a dialogue, which is impossible with any large number students. The Architecture Education Study (1981) found that the relationship between the student and instructor is the most important aspect of effective instruction in architecture, but this relationship is nullified with too many students in a studio and the inability for the instructor to adequately assess and guide each student.

Students can identify with a larger group, the entering class, of which they are a part. Even this group can be too large, though. Typically a group is from 50 to 75 students. At Roger Williams College the entering class size is about 90 students each year. These 90 students are divided in half and then into sections of 15 students per instructor. The group size of 45 students which come together for reviews and lecture etc., makes for a more identifiable group.

Just as important as the student/instructor ratio and group size to effective instruction is the physical environment on the students predisposition toward learning. The unavailability of dedicated space Hot seats, and after hour access, especially in commuter schools, bonds between students and interaction among students is circumvented. Faced with all of these problems, New York Institute of Tech-
nology course in Design Fundamentals created an approach where the student builds a kit of parts at home, rather then during studio time and studios are reserved for drawing exercises and critiques. This is an approach to the content and methods of instruction that can also affect learning, but instruction is more effective that promotes interaction through sketch problems and team projects by grouping students together with common goals and objectives.

Summary

The preceding analysis of the various aspects of the students predisposition toward learning has pointed to the instructors intentions as manifest in the course outline and exercise handouts. For the most part these intentions are too implicit. As has been demonstrated, the course outlines vary in length and comprehensiveness in informing the student of the instructors intentions for learning. Because of the implicitness of most of the outlines and exercises, though, the majority of the instruction is instructor dependent, but this dependence may be preferred in the beginning courses. Although pedagogically the more explicit the objects in the beginning, the first semester or number of exercises, the instruction will appear less imperceptible. The student will perceive an ability to achieve goals and objectives when they are explicitly stated and in a form that is observable. Motivation of the student is attempted through the introduction to an exercise by a statement of the value of the exercise or the use of a quote to set the mood for the
project. Also most programs in the sample approach design in architecture as problem solving and address this, for the most part, in an analysis/synthesis methodology.

**Structure and Form of Knowledge**

There is a need in architecture to systematically organize the body of knowledge applicable to architecture as a theory of architecture which would create a coherent foundation for education. Such a theory or construct would define the structure and form of a body of knowledge as a framework for the structuring of an effective pedagogy. It will be argued here that instruction in architecture should relate to a theory of architecture and that by looking to the past, and in particular, the categorical theory of Vitruvius, a firm foundation for a more modern theory of architecture could be constructed. This is not an affirmation for "Post Modernism nor Historicism," but for the reference to the evolution of architecture, its relationship to society, technology, and history.

Through the analysis of instructors' intentions for student learning concerning the structure and form of knowledge as defined by Bruner the body of knowledge of architecture as existing in beginning courses can be found. This analysis will address the mode of representation; enactive, iconic, analogic, and symbolic; Economy, Effective Power, and the substantive content of studio instruction.

Historically the structure and form of the knowledge of architecture has been represented in all of the modes of rep-
representation defined by Bruner. Ancient architects built from the forces of climate, site and use represented through memory and the activity of building. This enactive representation of architecture, is also the construction of other built elements and is representative of itself (i.e. a Primitive hut) and not something else. As this memory became codified over time, the models that had existed in the built world, became represented, imaged, on paper and stone as icons, representations of the object to be built. Also Vitruvius indicates that Greek architects represented their ideas for building in the symbolic mode through, written detail specifications, and mathematical proportional systems.

It is this authors belief that architecture as a complex phenomenon, to integrate its multiple and at times conflicting demands, is only made economical through a coherent theory that not only defines WHAT ARCHITECTURE IS, but also defines the relationship between these multiple demands, that is its effective power. Historically the complexity of architecture, it’s body of knowledge, has been represented within a coherent theoretical construct, the treatise. Vitruvius’ "Ten books on Architecture" (Morgan Trans.1960) being the first and most important symbolic representations of the structure and form of the knowledge of architecture. This treatise codified the knowledge of theory and practice in architecture.

According to Vitruvius, the complex demands of architecture would be addressed "with due reference to durability, convenience, and beauty" (Morgan Trans. 1960) With these
Vitruvius gives us a coherent theory for the creating of architecture and gives architecture a means of Economy and an effective power. This "durability, convenience, and beauty" has been repeated and both elaborated and reduced throughout history. Although, architecture, historically; "has sold its birthright for a set of cast-off theories instead of looking to its own history" (Hillier 1973). Vitruvius' triad has withstood the process of time and change. As Robert Dripps writes:

While it is certain that there has been progress in the material world, it is less certain that this same progress has had any significant effect on the world of ideas. Ideas are concerned with values and values have remained much more constant...(Dripps 1987).

Vitruvius also defines an ideal curriculum for the education of the architect, "The architect should be equipped with the knowledge of many branches of study and varied kinds of learning" (Vitruvius trans. Morgan 1960). A re-interpretation of Vitruvius, for more modern times, can demonstrate that the actual body of knowledge that an Architect must be educated for and have a working knowledge of has not drastically changed (Erskine 1983). But, the belief here is that these, complex demands and "many branches of study" are only made comprehensible through an approach to the teaching of architecture in relation to practice. That is, as Bruner would advocate, through its ability to connect with other bodies of knowledge.
The following analysis will sight specific examples of the various modes of representation and then in general interpret the use of these various modes in studio instruction from the sample schools. The analysis of the substantive content will follow that.

Representation--Enactive

Most exercises contain some element of this mode of representation, if enactive is defined as a set of actions for the achievement of particular goals. For example the actions required to layout an iconic representation or to construct a building, poem, or story, etc. are actions towards an end product. The following exercises are specific examples of enactive modes of representation, where the end product is not a representation of something to be constructed, but is the constructed object itself.

At Rhode Island School of Design the first exercise (1 A Box) requires the student to make a box "as a point of beginning" (Exercise Handout RISD 1988) which is to hold a specific tool or set of tools, ie. triangles, etc. The stated objectives are:

1) To develop strategies and or conceptualizations to initiate and guide the development of an architectural project.
2) To explore the essential nature of the given materials and their interaction; the techniques of cutting and joining.
3) To explore the structural and plastic properties of the given wood and their relationship to flexibility, strength and shape.
4) To develop a sense of precision in the execution of the project (Exercise Handout RISD 1988).
This is clearly an object designed and built in full scale and representative of itself as a holder for a specific tool(s).

Another example is at Roger Williams, Exercise 1 Comfort project, where the student is to design a corrugated cardboard chair that has "design and construction merit" (Exercise Handout RWC 1988) and that is the shape and size that is most suitable to all persons. The objectives are:

To study the ergometric needs of the human body in a seated position and in the act of sitting and rising;
To design a construction system using given materials and constraints that will facilitate the first objective and that will work in conjunction with a design concept.
To generate a design concept for a single usable object for the use of the people within the space and that would enhance the quality of the space (Exercise Handout RWC 1988).

Exercise 3 (GLIDER)

The student is to design a glider using the materials of, balsa wood, yellow tracing paper, Thread and glue, with a maximum wing spread of 30" and must carry an egg safely to earth?

Objectives as stated in the handout:

To design a logically, precise and inventive form and structure. (NJIT Handout 1988)

These are enactive in that all are representative of what they intend on being, at full scale, although in any of the exercises the student may use analogic and or iconic modes of representation in the study and design of the object, it is the final built product here that differentiates it from the other modes. While these are examples of enactive representations, many of the abstract two and three dimensional exercises in the programs could be considered in this mode.
Representation--Iconic

Iconic representation is the predominant mode of representation in architecture. The different levels of this mode of representation in education range from presentation drawings to construction drawings. Iconic modes differ from analogical representation in the reference to scale. Included within this mode are scale models of a building and/or other object that is representative of some other object.

Most of the schools require a course in architectural graphics or graphics are taught within the studio with design (see Appendix A), many of the course outlines and exercise handouts assume that the student already possess many of the skills and the knowledge required to construct these types of drawings, i.e. plans, elevations, sections, and other presentation types.

Exercise (1) Wall/Tower/Arcade Composition

The student is to assemble three arche-types: a wall; a tower; an arcade in a composition which will create a "meaningful place".

Objectives:

To re-establish your design process
To translate a concept into a scheme.

The presentation requirements state:

1) Model of your construction at "Push-pin" scale.
2) A diagram of your idea and a one sentence description of your concept...

The first is iconic because of the requirement for the model to be constructed at "push-pin" scale. The second requirement
is an analogic diagram, although it is not specifically stated as drawn without reference to scale. Also required is a concept statement which is a symbolic representation.

Representation--Analogic

Analogic representation in architecture education is important in providing an economic means for representing complex ideas through analytical and exploratory diagrams. The following examples show how these are intended in studio instruction.

EXERCISE 4 Observation of Bridges;

The student is asked to visit a bridge (from a list provided) and to make a series of drawings that convey the strongest characteristic of that particular bridge.

Objectives:
To use drawing as a means of observing how a bridge functions.
To graphically convey an impression of structure.

Leon Studio, Design Analogs;

These projects have varied over the years but in essence they are studies of design analogs, analogies, represented in diagrams and models with no reference to scale. One year the students diagramed plays from the Penn State football playbook. Other years diagrams have been developed from music, plays, etc. Typically the analogic representation is abstracted from a symbolic representation. There were no stated objectives the project was given orally as were all instructions and critiques.

Representation--Symbolic
Few of the exercises from this sample require the symbolic representation in the form of a written narrative or mathematical model. Although few do use fictional narratives, poetry etc. as a point of departure for a design problem.

The first series of exercises at Drexel University addresses mainly the students' experience of space but with the requirement of written narratives. In the first exercise, (1) Postcard to an Architect, the student is to create a Postcard that visually describes what it is like to experience a chosen environment and write a "postcard narrative" that accomplishes the same purpose verbally. The stated objectives are:

To use visual imagery and narrative together to initiate discussion of design awareness and design vocabulary.
To learn to work quickly and expressively using simple media in a restricted graphic format (Drexel Handout 1988).

The main objective of this exercise is to draw upon the students' existing experience of space as a beginning for further experience and to train their observation abilities. In the second exercise, (2) 3-D Spatial Study, each student is asked to recall a memorable experience of a place or event of personal significance, an architectural environment that affected them. They are to build a three dimensional model of this place that communicates both the place and "more importantly" their experience. The main objective in this exercise is the continuation of the objectives of the first exercise, which is to appreciate the extent of environmental
awareness and how the environment affects the student. The stated objectives for this exercise are:

To explore some of the poetic aspects of architecture. To further heighten observation skills and develop design vocabulary. Rather than a literal representation of the place or experience, convey instead its abstract qualities; i.e. the fundamental nature of the experience that transcends the literal concrete situation (Drexel Handout 1988).

In the third exercise (3) A Spatial Monument the student is to design a spatial monument that conveys meaning relative to a person, event, or concept of personal significance. This assignment states that, "Spaces have meaning just as do poems, operas and paintings." and the architect affects the user. The stated objectives for this exercise are:

To explore the elements of path, place, boundary, and ascent. To define a position or positions within the site from which to contemplate the person, event, or concept (Drexel Handout 1988).

The exercise also requires the writing of a brief narrative. From this point in the sequence of exercises there are no longer the requirements for the writing of narratives.

One program presented at the 6th Annual Conference on the Beginning Student in Design, explicitly intends to represent an architectural idea in symbolic form. In "Placing The Senses", Clare Cardinal-Pett (1989) describes the use of fictional narrative to force, "the students to create a place experience".

The main objectives of the project are:

To force reflection on the design process,
to require a student’s reading of the unique place that he/she has invented, to re-present that place, that coherent perspective, in words and images (Clare Cardinal-Pett 1989).

All of the modes of representation are referred to in Howard Lawrence’s studio at Penn State. The students are asked to design an object that moves through space. They must be able to build the object. The project observed was a point represented by an object that when power was applied the point would rotate in space. As speed was increased the point would spin creating a circle illuminated by a strobe light. The circle was then moved up and down creating a cylinder moving vertically in space and in its extended form became a line. The students were to represent the object (point) in all the forms of representation available. Hence, the built form was enactive, the drawings and model forms analogic and iconic as well as symbolic representations in mathematical and verbal form. There were no stated objectives, the project was given orally as were all instructions and critiques.

Another example of a mixture of enactive, iconic, analogic, and a hint of symbolic representation is a series of exercises found at New York Institute of Technology. There are seven (7) studies in the text which include a series of exercises that address varied topics. These are arranged under the title of DOING they are; Architectonics, Graphics, Freehand Drawing, Document, and Prepare. The exercises are described in appendix A for further reference.

Architectonics
Under this title the student is asked to explore design using the elements, sticks and stones, which are eventually supplemented with the elements constructed under "Prepare".

Make anything you want using 12 sticks and 12 stones and to explore how centered stone masses and linear sticks can create volumes of unique form (Friedman 1989).

Graphics

Under this title the student typically constructs 2 dimensional graphic exercises. The first states,

Make anything you want using 12 pieces of paper. Tear a 6" x 12" black piece of paper into 12 pieces of any shape, and arrange them on a 12" white square field. Mount them using rubber cement on a 4" x 12" x 12" foam-core board (Friedman 1989).

This is typical for the exploration of the various issues in the two-dimensional realm (Friedman 1989).

Freehand Drawing

These exercises are typically the drawing of the spaces made in the "Architectonics" or other exercises in freehand representation. The first exercise states,

Draw the spaces made by your sticks and stones, keeping the volumes they describe in proper proportion. Be sure to make the drawings of clean lines which describe the volumes of the solid shapes of the sticks and stones, as well as the voids between them (Friedman 1989).

Document

These exercises are typically iconic representations of the "Architectonics" exercises.

In plan and section document the space you have made with your sticks and stones. Draw the objects at full scale in ink on paper (Friedman 1989).
This is the preparation of the elements to be used in the spatial (form) studies in "Architectonics".

This course has been published in a book and seeks to establish an approach to architecture by providing "students with the means to investigate spatial order and invention concurrently with critical issues of design" (Freidman 1989).

The readings (pre-learning sets) and the pages entitled DOING and REFLECTING etc. provide a very well organized and conceptualized pedagogy. The broad mixture of exercises, especially within the sequence of development still provides the architecture student with an experience in architectural graphics and design in an integrated hierarchical enactive to a well formed iconic modes of representation--and a hint of symbolic representation.

Economy and Effective Power

Architecture is represented economically through the use of analogical images and through the use of theories. Mainly through the reduction of architecture to systems, types and models, a kit of parts, etc. The effective power of the structure and form of knowledge in architecture is found in its ability to connect with other forms of knowledge. From the analysis of the sample there is some attempt to relate to other forms of knowledge through a reading or analysis of poetry, painting and sculpture, and the interpretation or accommodation of these forms in architecture.
Content

It was not unexpected to find the substantive content in beginning architecture studio instruction centered around exercises in basic design. In the courses collected here 46 percent (116/52) of the exercise handouts deal with basic design exercises. Another 20 percent (116/24) of the sample deal with space planning, and the remaining 34 percent (116/40) of the exercises deal with a variety of exercises.

Basic Design exercises are further defined as exercises that deal with usually one of the following: Formal abstract manipulation, perceptual awareness, graphics, three dimensional design "architectonics" or basic structures (Greenfield and Page 1976). In the second major category space planning; exercises that deal with human use of space as opposed to abstract problems. This would include interiors and landscapes, but exclude; structures, building envelope and other architecture parameters. The design of residential single family, multi-family, mixed multi-functional/commercial buildings are the next major category. Community buildings include public use cultural arts libraries, educational/religious, emergency/health care mixed use, and Commercial/retail buildings. Finally, there is a category which addresses the analysis of existing buildings or historic precedent in and of itself with out relating to or being a prior step to another exercise.
Basic Design:

Formal abstract manipulation exercises deal with the manipulation of abstract elements usually two dimensional, enactive, iconic and analogical in representation. These types of exercises do work into the third dimension but the difference is these elements are not related to architecture i.e. architectonic.

An example of this is type of exercises in is in the beginning design course at Penn. State, in Don Leon's five exercises and design analogs studio. (Appendix A) The instructors were adamant in their stated position that they do not teach architecture and that their objectives were to break stereotypical thinking and the students dependence on their preconceptions of architecture and design. Also they intend to teach thinking skills, through inquiring in to the nature of problems to seek their solution (interview). This type can also be found in the following exercises at:

Penn State; Howard Lawerence Studio; Pratt institute, exercise 2 Cosmogram; and Roger Williams College; exercises:

1 Composition
2 Ordering Principles-Spatial Organization
3 The Wall and The Spaces Between
4 The Path and The Place
5 The Path and The Place (cont.)
6 Exploring the Volumetric Cube.

And Syracuse University; exercises:

2 THREE NON PARALLEL PLANES
3 DESIGN EXERCISE THREE
4 DESIGN EXERCISE FOUR
7 A CUBE IN SPACE
Perceptual Awareness exercise attempt to increase the students sensitivity to self and environmental context (Jordan 1979). The first quarter at Drexel University is a epitome of this type of program content.

1 Postcard to an Architect
2 3-D Spatial Study
3 A Spatial Monument
4 Entry Experience
5 Light Study

Others at Pratt; exercise:
1 Architecture and The Imagination Project

And a series of exercises at Rensselaer;

Study 1, 2, 3, 4

Graphics: All exercises have a graphics component either free-hand or hardline drawing. There are many examples of this type though that are just for learning how to draw, especially evident in the Documentation exercises at New York Institute.

Architectonics (3 Dimensional Design): This is basically form manipulation in the third dimension and with reference to architectural elements. This type usually includes the making of a "Kit of Parts". Examples of this type at New Jersey Institute exercise; 1 ENTRY / PATH / GOAL; and at New York Institute the Architectonic exercises exhibit this type of design, but most of these exercises do not refer to human use and are more characteristic of enactive representations in formal manipulation in the third dimension.

Basic Structures types of exercises are related to architectonics, but the structural and material aspects are stressed
over the formal aspects. Drexel's second quarter exercises are especially of this type; exercises:

1 Wall/Tower/Arcade Composition
2 The Tower
3 ENCLOSURE
4 Observation of Bridges
5 Pedestrian Bridge

As is exercise 3 (GLIDER) at NJIT; exercise 1 A BOX at RISD; and exercise 1 COMFORT PROJECT at Roger Williams.

As noted above the program at New York Institute of Technology incorporates most of these Basic Design types of exercises.

Space Planning:
The following are examples of Space planning in interiors:
exercise 6 Two Reading Spaces at Drexel; exercise 3 EXHIBITION SPACE; 4 (LIVING CUBE) second semester exercises 1 A ROOM, THE BEGINNING OF ARCHITECTURE and 2 (FACADE) at NJIT. Also exercise 5 A DOCTOR'S OFFICE at RISD.

A series of exercises at Roger Williams, exercises:

2 PARTI PROJECTION-FORM FROM PATTERN
3 DESIGN OF A SMALL STUDY
5 THE DESIGN OF AN ENTRY SPACE
6 POTTER'S STUDIO

And at Syracuse, exercises:

5 AN ARCHITECTURE GALLERY, SOHO, NEW YORK
   Phase 1 Site Investigation
6 Phase 2 Design
8 THE FINAL PROJECT
1 Work Module in an 8' Cube (second semester)
3 Design of a Room

Examples of landscapes, exercises:

2 SITE WORKS at NJIT and
5 Shelter and Gate
Design Project 1 A Park Structure at RPI and exercise
2 AN ENCLOSURE IN A FIELD at RISD.

There are some exercises that deal more with the study of the way to deal with site contours as exemplified in exercises:
7 Construction on slope assignment at Drexel,
2 Topographical Investigation, at Syracuse, and

Buildings:
The following are examples of Residential building type exercises.

Single family exercise:
6 Final Project at Pratt,
3 AN ARTIST’S RETREAT at RISD,
7 House and (second semester)
7 CUBIC TRANSFORMATION-9 SQUARE HOUSE at Roger Williams,
1 A WEEK END RETREAT at Syracuse.

multi-family exercises:

Design Project 2 Residence/garden at RPI,
6 Unit Layout Assignment and
8 Final Layout Assignment at RISD, and at Roger Williams, exercise:
8 THE ROW HOUSE and
9 FINAL PROJECT

Example of multi-functional/mixed use exercise:
2 A Tap Dance Studio for Clinton Ave. at Pratt,

The following are examples of Commercial building types.

Community Buildings (public use):
exercise 6 A RECREATION CENTER, RISD

Cultural arts exercises:
3 A Place of Well-Being at Pratt,
2 Eakins Arts League at Drexel,
9 The Design of Exhibition Space at Roger Williams, and
4 Final Project at Syracuse.

Transportation type exercise:
4 A ROOM FOR WAITING, A SMALL TRAIN STATION at NJIT.
Library design exercise; at Roger Williams exercise:
10 Final Problem The Design of a Branch Library
Educational/religious exercise: at Pratt exercise:
5 Ideal School 2 parts
Commercial/retail building exercises:
1 CAMP STREET MARKETPLACE at RISD,
Study 5 at RPI, and exercise 1 Mr. Chipboard goes to Chestnut Street at Drexel
There are a series of exercises which are more analytical than design synthesis. These are exemplified by the following exercises:
4 Building Analysis I and
3 Design Research Teams 2 parts at Pratt, and exercises
4 OBSERVATION AND ANALYSIS
2 Site Analysis
3 Housing Assignment
4 Precedent Analysis
5 Site Response Assignment at RISD and exercises
8 Building Analysis and
4 FACADE ANALYSIS at Roger Williams.

Summary
The analysis of the structure and form of knowledge in architecture in the sample has shown that this is represented primarily in the enactive, analogical and iconic modes. These modes are inherent in the study and documentation of architecture as well as the processes of building. The rare examples of symbolic representation in architecture design point to a problem which does affect the effectiveness of architecture design. The architecture student typically can not or is seldom required to write a narrative, symbolic representation in architecture design courses. This form of representation
does hold promise for the future in expressing the experience of an imagined and analogic or iconic representation. The students abilities to express in narrative form the experience of an imaged space could greatly enhance the quality of design.

The effectiveness of architecture studio learning could also be enhanced through the establishment of a hierarchy of simple to complex forms of representation as Bruner suggests from enactive, (analogic) iconic to symbolic representation. Also the requirement of more effort in developing analogic representation for the economy of expressing many alternatives of a design. As was argued here, the complexity of architecture and it's connectedness within it's own body of knowledge as well as it's relationship with other bodies of knowledge could be enhanced through the reference to a theory of architecture. The theory referenced here is that of Vitruvius, which is the oldest and most reference theory through-out history.

The content of studio instruction as found in the sample is made up of primarily basic design, ie.. formal manipulation and perceptual awareness exercises, but this content in most programs becomes more concerned with the process of design through the design of buildings rather quickly.
The sequencing of instruction in the sample
First the varied models described
by Kal will be
that particular
exercises and the sequence of instruction for a semester or
longer can be determined. This method will be used here to
illustrate the sequencing of instruction in the sample
schools. First the varied models described by Kal will be
explained followed by the schools which fit that particular
model. It should be noted that some programs or sequences can
combine smaller portions of sequencing but these will be noted
as they occur.
The prevailing model expressed by David Kal in his study was
the piece by piece model, whereby exercises are broken down
into independent exercises with no or very little connection
from one exercise to the other. The other models are vari-
tions of this model. One, the synthesis model, where the
piece by piece variation synthesizes all the (piece) exercises
into a final exercise. Another variation on the piece by
piece is the overlapping of one exercise over another. Others
were the repetitive model where in a piece by piece model a
prior piece would be repeated in a later exercise. Another
approach was labeled an umbrella where there was usually a
single term project containing the varied pieces. And the
final alternative is the increase in complexity from piece to
piece reflecting the hierarchy from simple to complex. The
purpose of Kal’s article was to illustrate a model that

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final alternative is the increase in complexity from piece to
piece reflecting the hierarchy from simple to complex. The
purpose of Kal’s article was to illustrate a model that
expressed more continuity in the sequence. The Continuity Model.

1) Piece by Piece: There were no truly piece by piece models in and of themselves within a semester or quarter, which would seem to constitute a learning unit, although most all contain some element of this model.

2) Piece by Piece synthesis: This model is the prevailing sequence. Usually establishing primary elements—vocabulary or archetypical—that are each studied independently and then brought together in a final design.

DREXEL UNIVERSITY

This series of exercises deal with perceptual awareness and build to a synthesis of the students experiences of several spaces and forms, as well as the aspects of light, to the design of small interior space.

FALL STUDIO/ 1-1
EXERCISE
1  Postcard to an Architect
2  3-D Spatial Study
3  A Spatial Monument
4  Entry Experience
5  Light Study
6  Two Reading Spaces

NEW JERSEY INSTITUTE of TECHNOLOGY

The exercises address architectural elements of "Entry, Path, Goal" and continue to build upon these concepts and the knowledge of architecture. The development is hierarchical from simple concepts to more complex and pragmatic elements with each exercise building on the previous exercises.
EXERCISE
1 ENTRY / PATH / GOAL
2 SITE WORKS
3 EXHIBITION SPACE
4 (LIVING CUBE)
5 SHELTER AND GATE

NEW JERSEY INSTITUTE of TECHNOLOGY

The second semester introduces more poetic aspects in architectural projects and although still hierarchical in complexity one exercise (facade) introduces a reversal of the normal-typical--process which could motivate and challenge the student to break form the 'routine'.

FIRST YEAR / Second semester
EXERCISE
1 A ROOM, THE BEGINNING OF ARCHITECTURE
2 (FACADE)
3 (GLIDER)
4 A ROOM FOR WAITING, A SMALL TRAIN STATION

PENN STATE

These exercises explore varied aspects of formal design with several of the exercises overlapping with the synthesis of these explorations in the final design analogs project.

LEON STUDIO Five Exercises
EXERCISE ONE
EXERCISE TWO
EXERCISE THREE
EXERCISE FOUR
EXERCISE FIVE

LEON STUDIO DESIGN ANALOGS

Pratt Institute

First Year first Semester

The sequence is hierarchical, simple to complex and seems more complex then other programs collected here. While overly pragmatic some exercises do introduce some poetic aspects to the general design sequence.
EXERCISES
1 Architecture, Form, Space, and Order
2 Cosmogram
3 A Place of Well-Being at Pratt
4 Building Analysis I
5 Ideal School 2 parts
6 Final Project

PRATT INSTITUTE
First Year Second Semester

These exercises are related to the umbrella model described later, but the first two exercises are intended to build to the more final complex project.

EXERCISE
1 Architecture and The Imagination Project
2 A Tap Dance Studio for Clinton Ave.
3 Design Research Teams 2 parts
4 Final Design

ROGER WILLIAMS COLLEGE

These exercises explore ideas concerning mainly composition, figure ground etc. place, path, and with the final exercise--A Branch Library—as a synthesis of all prior exercises.

EXERCISE
1 Composition
2 Ordering Principles—Spatial Organization
3 The Wall and The Spaces Between
4 The Path and The Place
5 The Path and The Place (cont.)
6 Exploring the Volumetric Cube.
7 House
8 Building Analysis
9 The Design of Exhibition Space
0 Final Problem The Design of a Branch Library

SYRACUSE UNIVERSITY, SCHOOL of ARCHITECTURE

The first exercise here intends to preassess the beginning student (see Predisposition). The following exercises explore ideas concerning mainly three dimensional composition,
and design of interior space with the final exercise as a synthesis of all prior exercises.

EXERCISE
1 A WEEK END RETREAT
2 THREE NON PARALLEL PLANES
3 DESIGN EXERCISE THREE
4 DESIGN EXERCISE FOUR
5 AN ARCHITECTURE GALLERY, SOHO, NEW YORK
   Phase 1  Site Investigation
6 Phase 2  Design
7 A CUBE IN SPACE
8 THE FINAL PROJECT

3) Piece by Piece related: This model establishes a piece by piece approach that relates previously studied elements, not always the direct prior or following exercise within the study of a new element.

DREXEL UNIVERSITY

In the second quarter, the principle elements (archetypes) of architectonics are introduced along with materials, and structures while continuing to utilizing the basic observation skills addressed in the first quarter.

19702 WINTER STUDIO/ 1-2
EXERCISE
1 Wall/Tower/Arcade Composition
2 The Tower
3 ENCLOSURE
4 Observation of Bridges
5 Pedestrian Bridge

4) Umbrella model: The Umbrella model is typically a full semester project with a number of exercises under the umbrella which all relate to the project at hand. This model usually develops along the line of professional practice, site analysis. preliminary design, schematic design, etc..
These exercises do not express a relationship between them but contain many sub-exercises in analysis and synthesis which is typical of this sequence.

EXERCISE
1. Mr. Chipboard goes to Chestnut Street
2. Eakins Arts League

RHODE ISLAND SCHOOL OF DESIGN
Second year, second semester

This series of exercises represent a true umbrella model in that the series works within the same site through analysis and synthesis, design of several building types.

EXERCISE
1. CAMP STREET MARKETPLACE
2. Site Analysis
3. Housing Assignment
4. Precedent Analysis
5. Site Response Assignment
6. Unit Layout Assignment
7. Construction on slope assignment
8. Final Layout Assignment

5) Building block/repetition: In this model one exercise overlaps the next exercise and are usually repetitive layering development throughout the semester/quarter and usually becoming more complex.

RENSSLEAER POLYTECHNIC INSTITUTE

The exercises are structured to overlay each other and to build a repertoire of images of a known environment by first analyzing a familiar setting then reinterpreting that setting with new information and/or imagined changes. The same setting, the Greene Building which is the architecture building and a very familiar setting for students, is used in all 5
studies in the first semester. In the second semester the exercises are in two different sites one a suburban (park) landscape and the other in an urban area.

ROGER WILLIAMS COLLEGE

This series of exercises attempts to build the students experience through a number of exercises with the intention of synthesizing them in a final project but it does not separate the pieces into isolated exercises.

EXERCISE
1 COMFORT PROJECT
2 PARTI PROJECTION-FORM FROM PATTERN
3 DESIGN OF A SMALL STUDY
4 FACADE ANALYSIS
5 THE DESIGN OF AN ENTRY SPACE
6 POTTER’S STUDIO
7 CUBIC TRANSFORMATION-9 SQUARE HOUSE
8 THE ROW HOUSE
9 FINAL PROJECT

SYRACUSE UNIVERSITY, SCHOOL of ARCHITECTURE

This sequence builds the students experience through specific exercises and then synthesizes them in a final project. It does not separate the pieces into isolated exercises either.

EXERCISE
1 Work Module in an 8’ Cube
2 Topographical Investigation
3 Design of a Room
4 Final

TEMPLE UNIVERSITY
EXERCISE
1 Design intervention in the Landscape

6) Increase in complexity:
RHODE ISLAND SCHOOL OF DESIGN
Second year, first semester

The intention in this sequence is to increase the complexity of the design process from the enactive exercise to the final design.

EXERCISE
1 A Box
2 An Enclosure in a Field
3 An Artist’s Retreat
4 Observation and Analysis
5 A Doctor’s Office
6 A Recreation Center

7) Continuity model: This is Kal’s model which actually combines all of the previous models.

NEW YORK INSTITUTE OF TECHNOLOGY

This sequence provides broad mixture of exercises within it’s hierarchical development with much overlap and inter-relation among exercises.

EXERCISE
Study 1 UNITY
Study 2A DIALOG "Rough"
Study 2B DIALOG "Dressed"
Study 3 VOLUME
Study 4 TRANSFORMATION
Study 5 EXPRESSION
Study 6 TIMEPIECE
Study 7 FREE EXERCISE

Summary

For the most part the sequence of instruction in the sample is hierarchical simple to complex with some development toward more interrelation among various exercises. The piece by piece approach described by David Kal as the prevailing model or approach at the time of his study is probably impossible as there is always some relationship between exercises.
The prevailing model or approach at the time of this study is the piece by piece variation which would synthesize all the pieces into a final exercise. There are a number that do express the other models, the overlap, the repetitive, the umbrella, the increase in complexity and finally the Continuity Model. Few sequences of instruction express the Reversal/concept test model which has challenged these models. This Reversal or concept test model relates more with the recent theories in learning. This theory, sometimes referred to as the hypothesis test model is illustrated in an article by Stephen Ledewitz (JAE 1985).

**Evaluation**

Instruction leads to desired changes in the student where, evaluation provides evidence of those changes. Also, instruction attempts to make inadequacies in present behavior, knowledge or values understood in light of desired changes and evaluation provides and encourages self evaluation. Instruction informs of existing behavior, knowledge and skills and the reasons for them where evaluation reveals types of inadequate behavior knowledge and skills and their cause. For Bruner learning is encouraged by instruction through problem solving activities and permit individual initiative and evaluation. Instruction that provides for the teaching and learning of specified behavior also evoke adequacy of behavior and exercises developed for the purpose of evaluating specified behavior. To often the 'rewards' in architecture are left to the final grade which obviates the effectiveness of
learning. It is important to the learner to have knowledge of results at the appropriate time for re-interpretation. The following analysis will focus on the two types of evaluation defined previously.

Analysis

Drexel University

While evaluation of work will be based on the vitality and substance of its generating ideas, the thoroughness of its development, the care and skill of its presentation, the prime objective of this course is to cultivate a personal, working, design process - a way of approaching and solving problems - for each student.

Student work will be openly discussed so that the individual can strengthen his or her capacity to give and take criticism.

New Jersey Institute of Technology

(Criteria referenced)

Build sound working methods and habits
Develop an ability to be self 'critical'
Develop an attitude of inquiry
Understand re-iterative process

While these objectives for evaluation are very general it is the criteria as stated in the exercises that shows that this particular course is related to the criterion type of evaluation. Typically the criteria for evaluation is stated in the exercises under the title of judgement. (See Appendix A, exercises 3,4, and 5)

New York Institute of Technology

Evaluation: (Norm referenced)

Each student produces a portfolio...to document all work produced in the course. Instructors select work from the class for his or her portfolio, and is
also a means for evaluating the class and monitoring the quality of achievement our students attain.

PENN STATE

There are no stated criteria for evaluation.

Pratt Institute

All use pin-up reviews of student exercises, as well as, individual desk critiques and juries final presentations. A final aspect to the course is the assembling of a professional portfolio of the student’s work.

Rensselaer Polytechnic Institute

The evaluation is a norm referenced as stated in the handout:

Four considerations are equally important to the evaluative process.
1) We will consider your work relative to some overall assumptions of design quality.
2) We will consider your work relative to what we have observed, over a span of years, first year design students are able to do.
3) We will be interested in how you individually have developed over the period of the semester.
4) We will consider your willingness to take risks in exploring considerations which are unfamiliar to you, in order to learn.

You will not receive grades on the individual increments of the work.

The student, at mid-term discusses strengths and weakness with their course instructor with the emphasis being on which areas to give more attention to. Faculty change sections at mid semester. The student is required to keep an un-edited portfolio for review at the end of the semester. The final evaluation is through discussion of the student and portfolio by all the faculty with special attention to the views of the two section instructors.

Another factor is the evaluation of projects--knowledge of results--is scheduled during mid-term where no grades are given for individual assignments.
Rhode Island School of Design

The general and specific objectives, duration, content, end product and mode of evaluation for each project and/or exercise is given in the individual exercise handouts.

Roger Williams College

The course outline states under Grading Requirements:

Each problem has a specific objective or set of objectives which are stated on the problem handout. Also indicated are the grading criteria by which your problem solution will be evaluated. At the end of the semester, each problem will be weighted according to the amount of time spent on it during the semester.

Grading is based upon the letter system used throughout the college. A successful solution that responds well to the grading criteria of each problem will result in a grade of C. Higher grades will be assigned for those projects that demonstrate an above approach to the problem concept and development (course Outline).

Syracuse University

Not explicitly stated in outline or exercises.

Temple University

Not explicitly stated in outline or exercise.

Summary

Evaluation from the sample shows a mixture of both the criterion and norm referenced systems. Where the students work is evaluated as to a comparison with other students as to the appropriate level of expected competence which is subjective criteria. Also there is emphasis placed on the evaluation of a portfolio 'product' which has been assembled over the semester and this can also be less subjective. Evaluation of the students work by all instructors lessens dependency on one instructor in easing the authority established by the
instructor holding the grade over the student. This furthers the student teacher dialogue.

Related Course Work

The courses that a student takes in conjunction with the studio course can affect learning in the studio. These courses can represent either the split between knowledge and application or the attempt at integration. Several programs do attempt to integrate this knowledge into the studio. In particular the program at Rensselaer where the various modes of representation, enactive, analogic, and iconic are required on every project along with computer aided design, history and structures. The program at New York Institute of Technology attempts a similar integration. Most of the other programs do include some exercises that may relate to other courses (ie. history, structures). Overall there is a wish on the part of those instructors/coordinators for more integration of other coursework into the studio, but this integration is hard to realize within the present academic structure of the university.

Effective Studio Instruction

Instructors in architecture need to derive from the body of research in theories of learning, instruction and effective teaching, the knowledge needed to create a theory of instruction for architecture. The model/theory noted here is derived from such research. The following issue relates to Rapoport’s (1984) question as to how effective architectural studio instruction is when compared with other modes of instruction?
The principles of this model will be discussed in the relationship to architecture studio. This model addresses the principles of prelearning, motivation, terminal behavior, active responding, guided practice, knowledge of results, individual differences, gradual Sequence, and classroom teaching performance (Kibler et al 1974).

The principle of prelearning deals with the preassessment of the learners prior knowledge/skills and preparation of the students capabilities to master new learning. Although this can be accomplished in all modes of instruction, in architecture studio, a short design exercise/project at the beginning of the semester can reveal the level of knowledge and/or skills of the students and at what level instruction should begin. As shown in this inquiry, only one program explicitly states its objective is to preassess prior knowledge and skills. All others assume a beginning level that maybe appropriate or not.

Although, architecture students are highly motivated, they still must be provided with exercises that concern topics they like, and are relevant in the present as well as the future. Studio projects/exercises as well as the studio setting are similar to most architectural office practices and settings. This provides the student with models of terminal behavior as well, that is the experience of seeing what will be expected of them in the near and far future. Although most beginning studio projects are basic design and perceptual
awareness exercises, the exercise from this inquiry do address issues of built form reasonably early.

The desk crit in architecture studio provides for many of the other principles of any model of instruction. Active responding, the modeling of expected skill or knowledge, is demonstrated by the instructor through a graphic technique or by drawing on the students project to explain a mode of operation, etc. This activity is guided by the instructor and then practiced by the student. The studio mode of instruction provides for more individual instruction than other modes. This is reflected in the average student/instructor ratio of 15/1. Students are given immediate knowledge of results through the individual desk critique. This is found to be very responsive to the individual differences (ie. the varied knowledge and skills of the student.

When the principles of effective instruction are organized in a gradual sequence from simple to complex the learning mode is very effective. Most of the programs studied here reflect this gradual sequence. While the other modes of instruction can be effective when well structured it has been found that "the extensive use of lectures, recitation courses and some programmed instruction materials often has detrimental effects on student motivation" (Kibler et al 1974). Many of these principles of effective instruction are not provided for in the lecture mode of instruction as well. Hence it can be seen that when compared to other modes of instruction the studio mode can be shown to be very effective in achieving the
objectives of these principles. But, a note of concern must be interjected here. Effective instruction is also very dependent on the studio instructors classroom teaching performance or what Kibler describes as the instructors' "ability to select, prescribe and evaluate the effectiveness of learning." Therefore, it is crucial that the instructor of a beginning design course in architecture be knowledgeable of theories of instruction, learning and education.
CONCLUSIONS

The main objective of this inquiry was to address the fundamental issues raised in the debate over the effectiveness of architecture studio in general and beginning studio courses in particular. It was argued that the studio mode of instruction holds enormous potential as an effective means of educating architecture students, but that as currently structured in many architectural programs, its potential effectiveness was often unrealized. Also it was argued that in order to maximize the effectiveness of beginning studio instruction, studio learning must be premised upon a theory of instruction which includes greater specification and evaluation of goals and objectives.

Particular emphasis was placed upon the analysis of instructors' intentions, goals and objectives for learning as they are conveyed to students in beginning design studios through course outlines and exercise handouts. It was through this analysis and the comparison of these objectives to a theory of instruction that the hypothesis argued here could be substantiated or not.

The main purpose was not to create a theory and/or a model of instruction for architecture. It was intended that through the analysis of the body of research in architecture education, and the analysis of the current structure of architecture instruction from a selected sample that some suggestions could be advanced toward the creation of a theory and model of instruction. Primarily, the purpose is the
creation of a more effective architectural studio pedagogy.

The hypothesis that studio instruction as currently taught has not kept pace with more recent research in theories of instruction, education and learning has not been fully substantiated. There has been significant research in architecture studio education recently. Many proposals and studies which address various approaches to instruction in studio are found in *The Journal of Architecture Education*, *The Annual Conference on the Beginning Student*, *The Association of Collegiate Schools of Architecture*, among many others. It is the application of this research in the studio that still denies studio instruction its full potential. The analysis does however, substantiated the hypothesis that studio instruction suffers from a paucity of standardized educational resources, especially when compared to the available resources in other disciplines.

It is this author's belief that an effective theory and model of instruction for architecture, derived from the research in theories of learning, education, and instruction, would prescribe an ideal structure for the teaching of architecture. As demonstrated here an effective theory and model of instruction for architecture also provides a structure for the evaluation and interpretation of the present structure of architecture studio education.

The analysis of the sample of beginning studio courses in architecture by the comparison to Bruner's theory of instruction substantiates the conclusions drawn from the debate
concerning the effectiveness of the studio mode of instruction, that course outlines and studio handouts do lack explicitly stated goals and objectives for instruction and evaluation. As currently taught architecture studio instruction does not reflect a consensus as to the content nor to a method of instruction, but the differences are not that extreme.

**Suggestions**

From this investigation, concerning the architecture studio as an effective mode of instruction and the analysis of beginning design studios as compared to a theory of instruction, some suggestions can be made toward the creation of a more effective studio pedagogy. These suggestions towards the creation of a theory and model of instruction for architecture are important principles in the formation of a general theory of instruction and should exist in any instructional setting for an effective pedagogy and should exist in beginning design studios in architecture, but it is through a model that theory is brought to practice. Also suggested is the structuring of goals and objectives through the use of Bloom’s Taxonomy. The similarity in learning theory to design supports this structuring.

First, instructors in beginning courses of architecture should recognize the students prior experience and that education is a process of growth from that experience. Students should be pre-assessed for their prior knowledge and skills and not assumed to lack any prior experience. Motivate
students through projects that interest the student not just the instructor. Build a dialog with the student as Schon suggests that inquires into the very nature of architecture and its design and production.

Second, establish a theoretical approach to the knowledge (content) of architecture and teach to the integration of this knowledge in the studio. Here the reference was made to the traditional categorical theory of Vitruvius with its relationship to that developed by Norberg-schulz’ Integrated theory of architecture. Such a theory would establish the form and structure of the knowledge in architecture. A theory would also relate to the economic and effective power of the knowledge to connect with other bodies of knowledge. A theory or belief system usually exists for each instructor and the more the student is exposed to these varied theories the better they can begin to formulate their own theory.

Third, Recognize that the acquisition of knowledge is not sequential and hierarchical. Address the cyclical nature of learning by challenging the split in the analysis synthesis model of design. Establish high levels of cognitive and affective objectives with the intent for the student to develop a sense of inquiry and the building of a repertoire of intuitive hypothesis which are then tested and overlaid over time.

Finally, instructors should establish clear and explicit goals and objectives for instruction so to better evaluate student work. Establish criteria that the student can refer
to as objectives to be accomplished. Anthony's recent research with the research in education and learning theories in general demonstrate the importance of the student having knowledge of results for re-interpretation of learning. Also the evidence against the traditional jury system warrants a re-evaluation of its validity as a mode of provide a learning experience.

These suggestions are drawn from the preceding research. The knowledge gained in such research can only help in the creation of a more effective pedagogy in architecture studio instruction. To create a new architecture studio pedagogy is a difficult task, but to rely only on traditional methods, those of the Bauhaus or the Beaux-Arts, is to perpetuate inefficient and ineffective methods of instruction. These inefficient and ineffective methods of instruction do not however warrant a de-emphasis on the studio mode as Rapoport suggests. It is through the structuring of instruction in architecture studio by a theory of instruction and the explicit specifying of instructional goals and objectives a more effective pedagogy can and will result. The design, planning and structuring of instruction in architecture studio is analogous to design and planning in architecture practice and should be a challenge to the creative nature of architect/instructors.
Recommendations for Further Study

The main objective of this inquiry addressed the fundamental issues raised in the debate over the effectiveness of architecture studio through the analysis of instructor's intentions for student learning. This excluded the actual instructor's actions in the classroom. These actions are just as important to instruction as are intentions. The emphasis on intentions and their relationship to a theory of instruction was deliberate, because effective classroom actions should be preceded by instructional planning based on theory. The theory of instruction described by Bruner is seen as appropriate for this analysis for both, intentions for instruction and a theory speak to idealized conditions for learning and instruction. Therefore, further study needs to be directed toward classroom actions and effective teaching skills. A model of instruction as outlined in this inquiry needs to be constructed and observed as it is applied in the classroom. Such an observation and analysis would substantiate the effectiveness of such an approach over current practice.

The Annual Conference on the beginning student in architecture, now in its 6th year, provides a forum for the relating of teaching practices and basic design projects. Many instructors benefit by attending such forums. A more specific discussion concerning the relationship of instructional theory and architecture studio instruction could be suggested as a theme and could act as an exchange of instructional goals and objective. Also, instructor's in architec-
ture studio would benefit from the incorporation of a workshop directed to effective instructional methods more specific to studio instruction.

The practice of Architecture, over the past century, has undergone tremendous changes, but the education of future practitioners has not kept pace with these changes. The practitioner/adjunct instructors are one of the strongest ingredients in the education of architecture students. These instructors as well as full time instructors would greatly benefit through the planning of instruction based on the knowledge of theories in education, learning and instruction. It is only through a combination of practical experience and a knowledge of the theories of learning, instruction and education and their application in the studio that an effective instruction in architecture studio will come about.
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<td>OF TECHNOLOGY</td>
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The following course outlines and exercises have been collected for the analysis by comparison to a theory of instruction. The name of each institution, coordinator, specific course title and level are all listed. Most courses are the first and second semesters of the students first year in architecture. The course description, as printed in the school’s catalog, is also provided as is the relationship of this first design course in the context of other courses, graphics or lecture taken by the student in the first academic year. This is important in the effect that these courses have on the content and methods in the studio courses. Texts either required and/or referenced are also noted. These texts are an indication of the content or a portion of the knowledge that is being referenced or taught. It is not that these texts are the entire or the only significant knowledge imparted in the design studio, but that they are more significant in there being explicitly required or referenced.

Also listed are the similar pedagogical approaches that Richard Rauh and David Wright (1975) found to exist in the teaching of beginning courses in architecture. These are stated briefly, the tools approach, the design parameters approach, the architect as actor approach, the design procedure approach, the formal manipulation approach.

The tools approach is basically giving the student the "tools" that they will need to represent architecture.
These are typically the graphics courses at most of the schools. The design parameters approach, draws upon the idea that a building performs many different functions, such as, User needs, functional zoning, contextual fit, relationship to site, and other issues of external criteria.

The architect as actor approach, is for the most part role playing, is more the approach in Introduction to Architecture courses. The design procedure approach, typically presents a project as it would be approached through the project processes an architect would go through. Somewhat related to the Architect as actor, (role playing) approach. From project programming through schematic design to a final presentation of the proposed building design. Rarely, in beginning design courses is the process taken past design development into working drawings. The formal manipulation approach is possibly the most popular approach for beginning design courses. This is the manipulation of formal aspects such as geometry.
DREXEL UNIVERSITY

Joseph Scanlon (interviewed 2/23/89)

Drexel's program is in the evening college, each year, Fall, Winter and Spring quarter, is approximately equivalent to one semester in other programs. The first year, suggested courses a student would take along with the studio is a professional elective either, Architecture, Man, and Society. (19204/5/6)(3 credits/quarter) or Basic Graphics (19404/5/6)(3 credits/quarter) depending on the students abilities or prior skills in architectural graphics.

The Studio course 19700,19701,19702, STUDIO 1-1, 1-2, 1-3; (3 credits/quarter)

CATALOG DESCRIPTION:

19700 STUDIO 1-1 (pre-or co-requisite: 19404 or equivalent) Basic design using three dimensional abstract and applied projects to investigate design principles. Exercises heighten observation and graphic skills while establishing an architectural vocabulary.

19701 STUDIO 1-2 Continuation of 19700. Architectural problems will emphasize the nature of function, structure and material, and their impact on the design process and therefore the solutions of the problems.

19702 STUDIO 1-3 Continuation of 19701. Simple architectural problems will investigate the relationship interrelationships of scale, context and building elements, the nature of materials structure, and their impact on the process of creating architecture (Drexel 1988).

COURSE AIMS and OBJECTIVES: (As stated in the Course Outline)

This year we will explore the basis of design in architecture: the generation of human space. Our goal together will be to expand the creative energies within you. Through a series of investigations, we will probe the fundamental considerations of design and exercise the your ability to communicate visually and verbally.
Emphasis is placed on the process of design, which materializes in a series of product/solutions. You will discover that there are no absolute solutions (Course Outline).

CLASSIFICATION OF PEDAGOGICAL APPROACH: Design Process

TEXTS: Each instructor chooses their own text, but the most often referenced texts are;
Frank, Ching; "Form Space and Order"
Frank, Ching; "Architectural Graphics"
Rasmussen, Experiencing Architecture;
Bloomer and Moore; "Body Memory and Architecture".

The course enrolls from 75 to 90 students per year with 5-6 instructors, one per section of 15 or 16 students per section per quarter. The course meets one night per week for three hours, this is mostly a pin-up and critique session. The critiques are open, not one on one instructor to student although that does happen occasionally (Scanlon). The teaching methodology is explicit in the course outline which follows.

TEACHING METHODOLOGY:

While evaluation of work will be based on the vitality and substance of its generating ideas, the thoroughness of its development, the care and skill of its presentation, the prime objective of this course is to cultivate a personal, working, design process - a way of approaching and solving problems - for each student.

Student work will be openly discussed so that the individual can strengthen his or her capacity to give and take criticism. Design projects will be assigned on a weekly basis. Attendance in class is essential as work not presented on the scheduled evening will not be properly reviewed.

Presentation in class will include models, sketches,
and drawings as appropriate. The student is expected to maintain a notebook of ideas, questions, and sketches. (Course Outline)

The Fall quarter focuses on the discovery and implementation of basic elements of form. The winter and summer focus on the synthesis of the elements of form in increasingly complex architectural problems. The course outline is for all three quarters. The individual exercises are presented in a common format with an introduction, assignment, objectives, considerations, and the presentation requirements. Highly organized and clearly presented.

FALL STUDIO/ 1-1

EXERCISE 1 Postcard to an Architect 1 Week

The student is to create a Postcard that visually describes what it is like to experience a chosen environment (from a list provided) and write a "postcard narrative" that accomplishes the same purpose verbally.

Objectives: (as stated)
To use visual imagery and narrative together to initiate discussion of design awareness and design vocabulary.
To learn to work quickly and expressively using simple media in a restricted graphic format.

The stated objectives are not in performance or observable behavioral form.

The intro states:

Each of you has an extensive familiarity with the built environment; you’ve lived in it all your life. A major part of design education is the training of your vision so that you become conscious of what before was seen but went unnoticed. You will learn to read what before was either undecipherable or invisible (Drexel Handout 1988).
The project does address several objectives indicated in the considerations part of the exercise like:

To explore your ability to communicate visually and verbally
To heighten your powers of observation

The main objective of this exercise seems to be to draw upon the students existing experience and observation abilities.

**EXERCISE 2  3-D Spatial Study  1 Week**

Each student is asked to recall a memorable experience of a place or event of personal significance. It is to be an architectural environment that affected them. They are to build a three dimensional model of this place that communicates both the place and "more importantly" their experience. The main objective in this project is the continuation of the first one which is to appreciate the extent of environmental awareness and how the environment affects the student.

Objectives:

To explore some of the poetic aspects of architecture.
To further heighten observation skills and develop design vocabulary.
Rather than a literal representation of the place or experience, convey instead its abstract qualities; i.e. the fundamental nature of the experience that transcends the literal concrete situation.

**EXERCISE 3 A Spatial Monument  2 Weeks**

The student is to design a spatial monument that conveys meaning relative to a person, event, or concept of personal significance. (This is a spatial as opposed to a sculptural monument) This assignment makes reference that:
"Spaces have meaning just as do poems, operas and paintings."

and the architect affects the user.

Objectives:
To explore the elements of path, place, boundary, and ascent. To define a position or positions within the site from which to contemplate the person, event, or concept.

The exercise also requires the writing of a brief narrative.

EXERCISE 4 Entry Experience 2 Weeks

Design a sequence of spaces within a 12"x18"x12" H volume to illustrate the qualities of, a sense of anticipation, an arduous experience, or an apprehensive feeling. "A means of transition from one space to another."

Objectives:
To explore the elements of approach, entry, arrival and transition. To create a sequence of spaces using the vocabulary of walls and columns.

EXERCISE 5 Light Study 2 Weeks

Each student is asked to produce two "light boxes" made of white opaque board 9"x9"x12" H as illustrated. One box is to show an example of indirect light the other an example of direct light.

Objectives:
To study the affect of openings, apparent size shape, and proportion and feeling of space. To investigate how to manipulate light quality.

EXERCISE 6 Two Reading Spaces 3 Weeks

The student is to design two separate adjacent spaces within a given volume - one for the studying of large maps and charts and the other for the reading mystery novels.

Objectives:
To bring together all the related principles previously discussed in a final design.

This exercise attempts to synthesize the learning experience to this point.

19702 WINTER STUDIO/1-2

EXERCISE 1 Wall/Tower/Arcade Composition 1 week

The student is to assemble three archetypes: a wall; a tower; an arcade in a composition which will create a "meaningful place".

Objectives:
To re-establish your design process
To translate a concept into a scheme.

EXERCISE 2 The Tower 2 weeks

The student is to design a 55 foot high fire watch tower, which should take into account the qualities of the experience that a fire watcher looks forward to each day- the experience of climbing through the trees and occupying the platform perch at the top.

Objectives:
Design a free standing, singular object in space.
Design for a simple function
Design using simple structure and materials as prime generators of design.

EXERCISE 3 ENCLOSURE 3 weeks

(incomplete information on project which dealt with the concept of enclosure and walls of masonry materials.)

EXERCISE 4 Observation of Bridges 1 week

The student is asked to visit a bridge (from a list provided) and to make a series of drawings that convey the
strongest characteristic of that particular bridge.

Objectives:
To use drawing as a means of observing how a bridge functions.
To graphically convey an impression of structure.

EXERCISE 5 Pedestrian Bridge 3 weeks

The student is asked to design a pedestrian bridge connecting two covered platform areas at a suburban railway station.

Objectives:
To design a free standing structure which serves as a transition/connection between two spaces.
To explore materials and structure as generators of design.

SPRING STUDIO/19702 1-3
EXERCISE 1 Mr. Chipboard goes to Chestnut Street 4 weeks

This is the design of a theater entrance facade (after a horrifying gas main explosion) The function (program and entry sequence) will not change. Basically this is a facade design requiring an analysis of the existing context. The implicit value content seems to assert that an image of 'theater' is important and of less importance is the neighborhood character which the design will show the way for revitalization. Also, the requirement that the area be analyzed and represented at both night and day reflecting more the times it would be used. Objectives: No explicitly stated objectives.

EXERCISE 2 Eakins Arts League 5 weeks

This project asks the student to consider the design of a community "Arts League" building. The project requires and is structured to typical practice, from site analysis to design
development.

Objectives: Not explicitly stated

REMARKS

The course outline explicitly states the position of instruction to follow. Each exercise in the first quarter is structured toward creating and improving the students observation abilities. The final exercise synthesizes all the prior skills and abilities. The second quarter, the principle elements (arche-types) of architectonics are introduced along with materials, and structures while continuing to utilizing the basic observation skills addressed in the first quarter. The third quarter, as noted is from a prior year but address the issues previously covered.

In conclusion the course intent, both explicit and implicit, is to introduce architecture as a process of creating human experience through the use of materials, structure, light, as well as arche-types. The sequence of this development for learning is through the layering of personal experience of the environment (prior experience) and developing new and more informed experiences. The exercises are always in reference to human experience of space, form, and architecture. In that the main course objective is defined as "the basis of design in architecture: (as) the generation of human space." it would follow that these exercises would lead to the intended goals and objectives.
NEW JERSEY INSTITUTE of TECHNOLOGY, School of Architecture

David Elwell (interviewed 3/9/89)

FIRST YEAR /First semester

Along with the design course students take ARCH 154 Introduction Architectural Graphics 3 cr.; and ARCH 103 Introduction to People and Their Environment

ARCH 163 Introduction to Design I

CATALOG DESCRIPTION:

Introduction to an array of basic principles and elements of design. Emphasis on design methods, sensitivity to context, manipulation of form and space, and representation skills, function, and communications skills. General design fundamentals presented in lecture hour (NJIT 1988).

There is no required text, but there are required or suggested readings for specific exercises.

The course aims and objectives are as stated in the course handout as:

Generate and build interest in architecture.
Develop broad range of knowledge through the initiation of a basic architectural language which a student can use to create an architectural composition.
develop a self motivated self learning and discipline student.
development of craftsmanship by improving basic drafting and model making skills (NJIT 1988).

CLASSIFICATION OF PEDAGOGICAL APPROACH: Design Process

There are approximately 100 students with 6 to 7 instructors 15-16 students to an instructor. The instructors are typically young architects just beginning their practice. The 4 credit studio meets Mondays and Thursdays with an hour lecture once a week which is topical and delivered by one of the studio faculty.
Also listed are a set pedagogical objectives:
Short problems, rapid pace.
Investigation of a wide range of subjects.
Reinforce initial stage of design process, stressing the iterative nature of architectural design production.
Reinforce classwork with extensive hands on experience through field trips (NJIT 1987).

Entry into the program requires a portfolio

**EXERCISE 1 ENTRY / PATH / GOAL 2 Weeks**

The student is asked to design a "work" which contains the arche-typical elements of entry, path and goal. They are given a kit of parts and a set of rules for composing these elements. The parts;
- one wall 1' thick x 8' h x 100' long;
- four round columns 1'dia. x 8' high.;
- one base 2' t. x 500 sf. of area;
- one 6' h scale figure.
- all elements are white or monocromatic.

Objectives: (as states in handout)

The aim of this exercise is to test your ability to provide a logical basis for design making. The desire is not to see how original you can be. But to promote an appreciation for and development of an architectural grammar.
To develop ideas using sketch models as well as good craftsmanship.

**EXERCISE 2 SITE WORKS 2 Weeks**

The student is to design a "site works" on a steep rural site for a sculpture garden and work space for the sculptor, as well as used for relaxation and contemplation.

Objectives:

- To design with contours and natural materials.
- To create Architectonic spaces.
- To design and produce spatial organization by manipulating contours, earth forms and plant materials.
EXERCISE 3 EXHIBITION SPACE 2 Weeks

The student is to design a sequence of spaces in a long, narrow, vertical space between two existing walls. The purpose of the space is to exhibit three distinct works of art. This is a continuation of the idea of exercise 1. The path is to be continuous and to think and design in section and plan. Issues addressed are earth/plane, sky/plane, spatial hierarchy, expansion/compression, procession/obstruction, solid/void, symmetry/asymmetry and spatial layering. The site is 9’w x 81’l x 36’ high. and includes a set of rules as to the relationship to the existing walls and ground plane.

Objectives:

To develop the ability to organize circulation and a sequence of spaces.

EXERCISE 4 (LIVING CUBE) 2 Weeks

The design is for a residential/work/storage module to be placed within a loft space. The student must design the 9’x 9’x 9’ module to accommodate to different functions; sleeping, studying, dining, seating (living) and or clothes storage. The module is assumed to be constructed of 2x4’s, plywood, mouldings hardware and fastenings as necessary for assembly by non technical persons.

Objectives:

Develop awareness of scale and spatial sub-division within an open plan.
To develop an understanding of simple wood construction.
To design for specific functional activities.
EXERCISE 5 SHELTER AND GATE  2 Weeks

The student is asked to design and locate a gate to a cemetery and a bus shelter structure containing seating or standing room of 60-70 sf. The gate and shelter are to replace the existing gate structure which has recently burnt down. The project is to integrate yet separate the two diverse functions, and to synthesis the issues addressed in the previous projects.

Objectives:

To compose the design using a vocabulary of basic architectural elements.
To compose architectural form appropriate to activity and/or meaning.
To compose enclosure and orientation within a space.
To address movement and the effect of transition from one space to another.
To use landscape and plant materials as elements in creating architectural form.

FIRST YEAR / Second semester

ARCH 164 Introduction to Design II

CATALOG DESCRIPTION:
Prerequisite: Arch 163. A continuation of Arch 163 (NJIT 1987-89).

COURSE AIMS and OBJECTIVES:

To continue to develop and build interest in architecture. To further develop the range of knowledge through the use of basic architectural language to create architectural compositions. To continue the development of craftsmanship in basic drafting and model building skills (NJIT 1988).

This is a continuation of Arch. 163, The projects are longer and more complex.
EXERCISE 1 A ROOM, THE BEGINNING OF ARCHITECTURE 4 Weeks

To design a practice room (600 sf/ 9000 cu. ft.) for the performing arts. This must accommodate musicians or dancers or players.

Objectives:

Develop an architectural character suited to the situation described.
To explore the basic means of creating architecture through establishing a module, proportion or the control of light.
To develop a sensorial appreciation of materials.
To promote associative meanings and cultural precedents.
To explore the possibilities of design using form, space and materials to create architectural character.
To demonstrate lighting principles and the taking of view.

EXERCISE 2 (FACADE) 2 Weeks

This is the design of a plan and section of spaces for a given "facade" which is actually a small limestone sculpture titled "Oculus" by Gonzalo Franseca. The student must also invent the program, uses of the spaces as well as the context for the facade, plan and section.

Objectives:

(there are no explicit objectives for this exercise)

EXERCISE 3 (GLIDER) 1 Week

The student is to design a glider using the materials of, balsa wood, yellow tracing paper, Thread and glue, with a maximum wing spread of 30" and must carry an egg safely to earth?
Objectives:
To design a logically, precise and inventive form and structure. (hopefully that will fly)

EXERCISE 4 A ROOM FOR WAITING, A SMALL TRAIN STATION

4 Weeks

The design of a train station from the given program with the need to fulfill a larger purpose of representing the community to the outside world and must be a focus of civic pride.

Objectives:
To design with a simple program
To create a sense of place and civic pride (representational meanings)

REMARKS:

One of the major pedagogical aims is to "Generate and build interest in architecture." This is accomplished by motivating the student with projects they like and represent some value for the student in the present and future. It is accomplished here through the "investigation of a wide range of subjects." and "through hands on experience an field trips" (NJIT 1988). The exercises address architectural elements immediately with reference of human experience of "Entry, Path, Goal" and continue to build upon these concepts and the knowledge of architecture. The first exercise does not assume a high level of prior knowledge of the of "grammar" of architecture. The intentions are to develop the ideas through "sketch models" or enactive representation as is the final "Crafted model". The affective objectives of the exercise, to promote an appreciation, is also very low level learning task. The development is hierarchical from simple concepts to more
complex and pragmatic elements with each exercise building on the previous exercises. The second semester introduces more poetic aspects in architectural projects and although still hierarchical in complexity one exercise (façade) introduces a reversal of the normal--typical--process which could motivate and challenge the student to break form the 'routine'. Most of the exercise assignments are clear in their intentions for student learning and the evaluation of that learning.
NEW YORK INSTITUTE OF TECHNOLOGY

Jonathan Friedman (Interviewed 4/17/89)

First Year Fall semester

With the design course Fundamentals I/II the student takes
ARCH 6149/55 Building Construction I/II and ARCH 6180 Survey
History of Architecture I/II.

Arch 6031 Design Fundamentals I

CATALOG DESCRIPTION: (NA)

TEXTS: The course outline and exercises for Design
Fundamentals I has been published as a book "Creation In
Space" (Friedman 1989) by Jonathan Friedman and is the
required text for the course. The text contains a variety of
exercises as well as readings.

COURSE AIMS and OBJECTIVES:

The course provides students with the means to
investigate spatial order and invention concurrently
with critical issues of design. It emphasizes
direct modelling in three dimensions as the basis
and true medium for communicating architectural
ideas (Friedman 1989).

CLASSIFICATION OF PEDAGOGICAL APPROACH: Formal Manipulation

Enrollment: 350 per semester six different scheduled time
slots open admissions
Professors: mostly adjunct
Schedule:

The exercises are arranged under the title of DOING they are
Architectonics, Graphics, Freehand Drawing, Document, and
Prepare.

The exercises are not described below in full detail (as
written) just the essential objectives of each.
EXERCISE Study 1  UNITY

Architectonics
Make anything you want using 12 sticks and Explore how centered stone masses and linear sticks can create volumes of unique form.

Graphics
Make anything you want using 12 pieces of paper. Tear a 6" x 12" black piece of paper into 12 pieces of any shape, and arrange them on a 12" white square field. Mount them using rubber cement on a 1/4" x 12" x 12" foam-core board. Explore above issues in this two-dimensional realm.

Freehand Drawing
Draw the spaces made by your sticks and stones, keeping the volumes they describe in proper proportion. Be sure to make the drawings of clean lines which describe the volumes of the solid shapes of the sticks and stones, as well as the voids between them.

Document
In plan and section document the space you have made with your sticks and stones. Draw the objects at full scale in ink on paper.

Prepare (for an upcoming series of studies)
4- 1" cubes
4- 1/4" x 1/4" x 3" rods
1-8" x 8" square base
1 sturdy container

EXERCISE Study 2A DIALOG "Rough"

Architectonics
The student is asked to create two spaces in DIALOG that responds to an 8" square base with their "sticks and stones".

Graphics
Organize an 18" square field to create a DIALOG of form and space. Use black and/or white only. Only tear the paper. Do not cut it. Explore the properties of the square field in a visually vivid way.

Freehand Drawing
The student is to make two half-hour studies of their tool box they placed in the sun.

Document
The student is to in plan and section, document the space created in Architectonics.

Prepare
12- 1" cubes
EXERCISE Study 2B DIALOG "Dressed"

Architectonics
Using Rods and CUBES, create a series of spaces which explore the dialog between solid and void. Develop a clear and well proportioned parti using the given elements....

Graphics
Cut squares of various sizes from black and white construction paper and arrange them on an 18" square field to explore the properties of the square in a visually vivid way.

Freehand Drawing
Make two half-hour studies of a prepared still life arrangement of three boxes and three cylinders. One in line and one in tone.

Document
Hardline on ink on paper at 1:1 scale, plan, section, elevation and axonometric of Rods and CUBES study above.

Prepare
A new set of rods and cubes if necessary...

EXERCISE Study 3 VOLUME

Architectonics
Using your 12 RODS and 12 CUBES define a 3"x 3"x 3" cube so that a solid/void ambiguity results. Use rubber cement to assemble the elements, which must form one contiguous mass.

Graphics
Using a doublesquare graphics template (provided) with tracing paper find a 3" square to use as a prototype for a tile. Make a set of 36 identical tiles and arrange them in an 18" field to create a figure ground ambiguity.

Freehand Drawing
On newsprint make two half-hour studies of negative space. First draw negative space and then the negative space in line only.

Document
A full set of architectural presentation drawings depicting your study of VOLUME.

Prepare
More of the KIT of PARTS

EXERCISE Study 4 TRANSFORMATION

Architectonics
Transform a 4" cube into an extended space exhibiting a range of solid/void relationships. Use all parts of the RODS and CUBES.

Graphics
Transform a two dimensional black and white field into a
visual space (2D and 3D) of hierarchically arranged layers, transparencies, figure/ground ambiguity, and depth.

Freehand Drawing
Set up a group of bottles. in your news print sketchpad, draw their volumes, capturing their roundness and profiles. Be sure to accurately depict the spaces between them. Draw the transparencies you see.

Document
A full set of architectural presentation drawings depicting the Architectonics above.

Prepare
More of the KIT of PARTS

EXERCISE Study 5 EXPRESSION

Architectonics
Using all the STICKS and STONES elements, create EXPRESSIVE SPACE. Make a form expressive in both solid and void as well as the play between them.

Graphics
Make a 12" square field of the letters of your name so that the resulting two-dimensional form reads first, before the name, and also a figure/ground ambiguity.

Advanced Project
Design a record cover that communicates the meaning and feeling of the particular music you choose.

Freehand Drawing
In your newsprint sketch pad, make at least four one hour studies of the human figure in a building or a room.

Document
Document your expressive space with a full set of architectural drawings.

Prepare
More of the KIT of PARTS

EXERCISE Study 6 TIMEPIECE

Architectonics
Make a place that measures the changes of time. Create a set ordered architectural spaces in which people may observe, celebrate, and appreciate the cycles of time revealed by changes in the weather, night and day, seasons, and memory. Express your feelings about the meaning and mystery of time through the plastic order of mass and void in light which you create.

Use full STICKS and STONES architectonic "kit of parts".

EXERCISE Study 7 FREE EXERCISE

This last study is the design Using the "kit of Parts" to design a tower or a wall etc..

Evaluation: Each student produces a portfolio...to document all work produced in the course. Instructors select work from the class for his or her portfolio, and is also a means for evaluating the class and monitoring the quality of achievement our students attain.

REMARKS

This course is unique in that it has been published in a book and seeks to establish an approach to architecture by providing "students with the means to investigate spatial order and invention concurrently with critical issues of design." While all aspects, the readings (pre-learning sets) and the pages entitled DOING and REFLECTING etc. provide a very well organized and conceptualized pedagogy the stated goal that "It emphasizes direct modelling in three dimensions as the basis and true medium for communicating architectural ideas" (Friedman 1989). is questionable. It is questionable from the aspect of human experience, which is not introduced in the exercises until quite late. This creates more a manipulation of form rather than a manipulation of space. The broad mixture of exercises, especially within the sequence of development still provides the architecture student with an experience in architectural graphics and design in an integrated hierarchical enactive to a well formed iconic modes of representation--and a hint of symbolic representation. Overall, the presentation in book form of such a strong pedagogical instrument is needed in architecture education.
PENNSYLVANIA STATE UNIVERSITY, COLLEGE OF ART AND
ARCHITECTURE

Don Leon, coordinator; Richard Alden, and Howard Lawrence,
(Interviewed 3/10/89)

With the design and graphics ARCH 120 A,B/130 A,B. the
student takes ARCH 110/111 Design Intro. to Arch. and Planning
Theory I/II and ARCH 161/165 Struc. Sys./Matl.
120 A,B, and 130 A,B. VISUAL COMMUNICATION and DESIGN and
RESEARCH I.

CATALOG DESCRIPTION:

Abstract, symbolic, and representation of systems of
communication. Development of visual and graphic
skills and techniques. (Concurrent: 130A,B,C.)
Multidimensional design and perceptual development.
Formulation of abstracted concepts and logical
visual models (Penn 1988).

TEXTS: none, various referenced or required readings.

COURSE AIMS and OBJECTIVES:

Each instructor maintains their own goals and objectives
as to their intentions for student learning. Although they
all differ in their approach they attempt to accomplish
similar goals. These are basically:

to break stereotypical thinking, the students
dependence on their preconceptions of architecture
and design.
To teach thinking skills, through inquiring in to
the nature of problems to seek their solution
(interview).

CLASSIFICATION OF PEDAGOGICAL APPROACH: Process and inquiry

There are 70 - 80 students and four (4) instructors (16-
18) students per section. The course meets every day in
afternoons 2:30-5pm and integrates graphics with the design studio. Students rotate between instructors through-out the academic year, therefore, they are exposed to that particular instructors content and method of instruction. There is no set sequence or hierarchy that a student must follow. What follows is an example of a rotation (approx. 8-10 weeks) and should not be interpreted as a set sequence.

**LEON STUDIO Five Exercises.**

Don Leon begins this particular studio with an "anticipatory set" of a pocket knife for the student to inquire into its nature as a "metaphor for daring" this is to open the student to the process of inquiry and discovery. The instructor illustrates the lesson by relating the learning from an object "the Knife as a Metaphor for Daring" (Leon 1989).

**Objective:**

to capture the curiosity of the student and raise there level of critical thinking.

**EXERCISE ONE 1 week**

Students are asked to make a free-hand drawing of a simple object, and then asked to, recalling the metaphor of the knife, redraw the same object again and again. This is related to the concept of recursive writing whereby through the iterative process the student comes to 'know' the object.

Objectives: (none stated)

**EXERCISE TWO 1 week**

"asks students to empty their pockets...placing five
found objects on a table surface defined as the site."

The student is to compose these found objects "carefully" which then is critically studied with the concepts of territory, hierarchy, and direction. Reference is made to each objects "existence will".

Objectives: (none stated)

**EXERCISE THREE 1 week**  
This exercise is a continuation of the last exercise and is to "carry their (students) work to the highest level of craft."

Objectives: (none stated)

**EXERCISE FOUR 1 week**  
In this exercise the student is asked to make a free-hand drawing of a "Mind Machine (cognitive construct) that is based on no pre-image and serves no recognizable function" (Leon 1988).

Objectives: There were no stated objectives the project was given orally as were all instructions and critiques.

**EXERCISE FIVE 1 week**  
"is the study of site derived from the hypothesis that architecture involves an experience of secret readings super imposed upon banal seemingly accidental relationships of form and function" (Leon 1988).

Objectives: There were no stated objectives the project was given orally as were all instructions and critiques.

**LEON STUDIO 5 weeks**  
These projects have varied over the years but in essence they are studies of design analogs. One year the students diagramed plays from the Penn State football playbook. Other
years diagrams have been developed from music, plays, etc. Typically the analogic representation is abstracted from a symbolic representation. 

Objectives: There were no stated objectives the project was given orally as were all instructions and critiques. 

HOWARD LAWRENCE STUDIO 8/10 weeks

The students are asked to design an object that moves through space. They must be able to build the object. The project observed was a point represented by an object that when power was applied the point would rotate in space. As speed was increased the point would spin creating a circle illuminated by a strobe light. The circle was then moved up and down creating a cylinder moving vertically in space and in its extended form became a line. The students were to represent the object (point) in all the forms of representation available. Hence, the built form was enactive, the drawings and model forms iconic as well as symbolic representations in mathematical and verbal form. 

Objectives: There were no stated objectives the project was given orally as were all instructions and critiques. There was an observation of another project which seemed to fail in every form of representation. 

RICHARD ALDEN STUDIO 8/10 weeks

This studio has developed over the past 18 years. The students are given a site which Alden has designed and calls the "dish", because of their characteristic round dish shape. These "sites" vary with each rotation and many have been
developed through the years. They are flowers, radial lines, 'milk drop', etc. the idea being they are not your typical grid or suburban--house in middle--lot types. They are usually developed to the site boundaries--tight sites. This project probably appeals to the beginning student in that it is what they want to do typically--design houses--but accomplishes the intended goals of the instructor to break stereo typical thinking.

Objectives: There were no stated objectives the project was given orally as were all instructions and critiques.

REMARKS

Most of the remarks concerning these particular studios have been made above. The information was obtained through observations and interviews which was not the intentions of this inquiry. The instructors here are all very experienced and knowledgeable in educational and learning theory. The studio exercises are well formulated but the implicitness of the instruction would predispose the student to be overly dependent on the instructor,--although the instructors here would disagree with this observation.
PRATT INSTITUTE

Donald Cromely (interviewed 2/25/89)

First year; Fall semester

With the design course 101/102 the student takes ARCH 107/108 Hist. Art/Arch. and ARCH 113 Media & Com. I/II.

101 Basic Design I

CATALOG DESCRIPTION:

The design sequence uses an intuitive and intellectual learning process to synthesize the student's experiences in all other courses and to transform these experiences into design. The process explores relationships between humanity and self, society and environment and the functional, formal and technological dimensions of architecture (Pratt 1988).

ARCH 101 provides a conceptual framework for the student beginning the architecture curriculum through an exploration of fundamental design principles (Pratt 1988).

TEXTS: Though many texts are referenced by each instructor, the studio documented here requires Frank Ching's "Architecture; Form, Space and Order."

COURSE AIMS and OBJECTIVES:

To teach the basic skills used in architectural design. The fundamental vocabulary of architectural form (Ching) quality drafting, sketching, and modelmaking.
Ability to interpret programmatic requirements and site conditions to design a project for a specific site and client.
The appropriate use of structure and materials in design.
To broaden the student’s understanding of the scope of architectural concerns.
Architecture as a language for the communication of social and cultural issues
Architectural history as a resource of precedents and
prototypes.
Architecture as a means of self expression
The role of architecture in the various social and environmental systems it serves
To convey a general understanding of architecture as a profession
What architects do and what their responsibilities are
what basic steps they follow in bringing a project from conception into realization
What criteria they use to evaluate buildings
General guidelines of professional behavior.

CLASSIFICATION OF PEDAGOGICAL APPROACH: Design process and Parameters

The enrollment in the studio courses runs about 120-135 students in 8-9 sections 15-16 students/ section and instructor. Each instructor provides their own course outline from a general outline handed down by the coordinator. The studios meet Mondays and Thursdays from 2-6 pm., 8 hours per week total.

Generally the instructors demonstrate through slide lectures the various aspects and topics of design, and solicit group discussion. All use pin-up reviews of student exercises, as well as, individual desk crits and juried final presentations.

The following exercises are a typical cross section of exercises taken from the studio handouts of Mimi Lobell, which is actually the most complete and structured of the course outlines that were made available, though it is generally representative of the content and method of others.

EXERCISE 1 Architecture, Form, Space, and Order 5 days

Students are given an introduction to the Ching text
and are asked to draw of a "favorite building" in the New York area. A building of "high architectural quality".

Objectives:
Principles of Architectural form and spatial organization.
Developing a vocabulary of historical prototypes
Practice in freehand drawing and building analysis

EXERCISE 2 Cosmogram 3 days

The student in this exercise is asked to Translate a "peak" experience into a symbolic diagram?

Objectives:
create a two dimensional design
self-expression in spatial terms
translation of concept into form
Graphic presentation using color

EXERCISE 3 A Place of Well-Being at Pratt 2 weeks

The design of a peaceful sanctuary for up to 30 people on the Pratt campus.

Objectives:
Working from a program
Site selection and mapping, using an urban site
Consideration of user needs
Determining symbolic intentions of a project
Three dimensional design: manipulating point, line, and plane.
Translating concept into form
Graphic skills: presentation to scale of architectural drawings in pencil
Learning to pace a project for the limited time available.

EXERCISE 4 Building Analysis I 1 week Analysis of the form, structure, and spatial order of an historical and contemporary work of architecture.

Objectives:
Recognition of the formal and organizational principles of important prototypes
Determining a building’s structure
Graphic skills: presentation of analytical drawings in ink on strathmore board.

EXERCISE 5 Ideal School  2 parts a.1 week b. 3 weeks

Development of a master plan for an ideal boarding school or small college.

Objectives:
Developing a program
Learning how spatial relationships reflect social relationships, the meaning of an institution, and the philosophy or attitudes of the designer
Designing for a large-scale site, community, and program.
Selecting an appropriate parti
Distinguishing between a master plan and an architectural design
Learning to use contour lines and other topographical notations
Developing and presenting a master site plan and model

EXERCISE 6 Final Project 5 weeks

Design of a major project such as a country house.

Objectives:
Working from a program for a hypothetical site and client
Organizing hierarchies of space
Selecting a prototype and parti
Making appropriate use of structure, materials, light, etc.
Developing the design to show realistic wall thickness, room layouts, bathrooms, stairs, etc.
Graphic skills: complete ink presentation with models
Presentation before guest jurors.

First year Spring semester

102 Basic Design 2

CATALOG DESCRIPTION: (see above)

ARCH 102 translates this conceptual framework into small-scale architectural projects in a variety of
contexts (Pratt 1988).

COURSE AIMS and OBJECTIVES:

To continue the student’s overall progress, begun in the first semester (ARCH 1), in learning the basic skills of design.
To sensitize the student to the artistic, subjective, and poetic potentials of architectural design and drawing, through the exploration of the parallels between architecture and literature, drama, and mythology.
To build the basic skills needed to complete the design of a relatively complex, multi-story building in an urban neighborhood.
To assemble site maps and information
To work within a team
To select and write a program for the project
To study the history of the neighborhood
To search prototypes for the selected building type.
To design the chosen building type
To assemble a professional portfolio of their work.

The following exercises are a typical cross section of exercises taken from two instructors.

EXERCISE 1 Arch. and The Imagination Project 3 weeks

The student selects a passage from literature, drama, or mythology and designs an architectural evocation or setting for the passage.

Objectives:
To experience in design of a work of architecture that primarily expresses ideas rather than functions
Into generate a design from another art form
Exploration of subjective, symbolic, emotional, and poetic possibilities in design
To practice drawing in pencil and working in color

EXERCISE 2 A Tap Dance Studio for Clinton Ave. 3 weeks

The design of a building which will contain a dance studio and attending facilities, the dance instructor’s apartment, and rooms for visiting artist and other boarders.
The instructor is an aging Movie star famous for staircase tap
EXERCISE 3  Design Research Teams  2 parts 5-6 weeks

The students as a class select the major design project for the rest of the semester, usually a medium sized building in an urban site. Part a. is the research in small teams of the site neighborhood history, program, and prototypes for the project.

Objectives:

a. Experience working in teams
   Learning how to get information on land use, social history, codes and zoning, etc.
   Becoming familiar with organizations, library resources, individuals, and publications that are valuable sources of information.
   Learning to prepare a detailed program for a project
   Learning to evaluate a site
   Presenting information and data in a clear and useful way.

b. The Project: Design of the chosen building type.
   Practice in the design process, including selecting prototypes and doing parti studies, schematic design, design development, and final presentation.
   Coordinating program, space, and structure in a moderately complex building (20,000 to 35,000 SF 2 - 3 stories high)
   Mastering the principles of spatial hierarchy and reflecting them in the design of an appropriate structural system
   Applying the principles of passive climate control
   Designing a building that fits well in an urban context and appropriately accommodates the functional, individual, social, cultural, and spiritual levels of human life.
   Designing public outdoor spaces in conjunction with an urban building
   Preparing a presentation for a jury.

A final aspect to the course is the assembling of a professional portfolio of the student’s work.
   Learning about the different types of portfolios and their uses.
   Acquiring the ongoing habit of retrieving work in a portfolio
   Learning to assemble a portfolio, including getting stats or photographs, selecting the best work, designing the desired "image" etc.
REMARKS

The program is so varied in that each instructor writes their own goals and objectives that this sample is only representative of probably the best. The objectives from the outline as well as each exercise are extensive. Most are written in a performance form but not ‘instructional objective form’ the difference being only a matter of verb tense, and/observable behavior.

This particular studio section uses Ching’s Architecture, Form, Space, and Order as a primary text--exemplar--but also includes an extensive noted bibliography as do most of the other sections. The sequence is hierarchical, simple to complex and seems more complex then other programs gathered here. While overly pragmatic some exercises do introduce some poetic aspects to the general design sequence.
RHODE ISLAND SCHOOL OF DESIGN

Tim Culvalhouse (interviewed 3/24/89)

Second year, first semester

RISD's program begins with a first year foundation courses, students do not enter architecture until second year.

With Design Principles 2101/2102 the student takes Drawing for Architectural Studies I (3cr) and Principles of Architectural Technology I (3cr) and History of Architecture I (3cr).

2101 DESIGN PRINCIPLES

CATALOG DESCRIPTION: none. The following objectives were stated as goals for the entire program and are from the catalog (RISD 1989, pg. 32).

Drawing, The ability to collect, analyze, develop, and communicate ideas on paper; Thinking, knowledge of the history of buildings, their designers, and of contemporary issues, and the development of critical awareness and discernment; Design, the ability to produce architecture through both reflection and invention; Building, the technical implementation of one's design; and Cooperation; the ability to argue, transact, manage, and act legally and ethically in society, and to understand one's place in it.

There are no required texts but there are assigned readings which relate to the exercise.

COURSE AIMS and OBJECTIVES:

The design course "2101 DESIGN PRINCIPLES" is taken with "Drawing for Architectural Studies I" (3cr.), a basic architectural graphics course; "Principles of Architectural Technology I" (3cr.), Materials and methods; and "History of Architecture I" (3cr).
CLASSIFICATION OF PEDAGOGICAL APPROACH: Formal manipulation

The course enrolls approximately 100 students per semester and there are 8 Professors plus teaching assistants and meets Tuesday and Thursday mornings (10-11:30) for lecture and afternoons (1-5:30) for studio. (12 hrs/wk) Most projects are scheduled to be turned in the night before reviews. There are individual group pinups as well as guest critics for final project reviews.

EXERCISE 1 A BOX 1 week

To make a box "as a point of beginning" which is to hold a specific tool or set of tools, ie. triangles, etc..

Objectives:
1) To develop strategies and or conceptualizations to initiate and guide the development of an architectural project.
2) To explore the essential nature of the given materials and their interaction; the techniques of cutting and joining.
3) To explore the structural and plastic properties of the given wood and their relationship to flexibility, strength and shape.
4) To develop a sense of precision in the execution of the project.

EXERCISE 2 AN ENCLOSURE IN A FIELD 1 week

Given an 80’ x 120’ field, a four sided envelope 24’x24’x16’ high x 12" thick; a 32’x32’x3’ high base and a cylindrical column 8” dia. x 12’ high; the student must manipulate these materials within a set of rules.

Objectives:
To the objectives of project 1 add the following:
1) To examine and recognize the formal qualities of the object, and to articulate the nature of the relationships between the object and it’s base, and the object and its field.
2) To explore the relationship of interior and
exterior space, and how these are demarcated.
3) To explore such perceptual notions as horizon,
boundary, threshold, continuity, scale, etc. through
an imagined human presence.
4) To investigate conditions of passage, approach,
axis, directionality and arrival and to acknowledge
the relationship between sequence and narrative.
5) To acquire or develop technical skills fundamental
to the production of architecture.

EXERCISE 3 AN ARTIST’S RETREAT 2 weeks

Objectives:

1) To articulate a connection or transition
virtual or symbolic) between the two different
levels of the site.
2) To discover the formal qualities of the
building section and the interrelationship of
spatial volumes.
3) To explore and interpret spatial qualities of
the landscape and their role in siting and
developing the building.
4) To explore and interpret formal elements of the
landscape and their potential for transformation.
5) To encounter the architectural conventions in
the design of a stair and section.

EXERCISE 4 OBSERVATION AND ANALYSIS

The student is assigned to visit a significant work of
architecture.

Objectives:
To understand the roles of analysis and speculation
in the critical process,
To employ both verbal and drawn studies in support
of an analysis and speculation of a given (built)
work.

EXERCISE 5 A DOCTOR’S OFFICE 2 Weeks

The design of an office for a physical therapist: with
patients who are rehabilitating and are in varied stages of
such, therefore the designer must accommodate these varied
capabilities in the design of the office.

Objectives:
To address function and accessibility in architecture.

**EXERCISE 6 A RECREATION CENTER 3 Weeks**

The student must design a recreation center in an urban environment addressing contextual issues along with a more complex functional program.

Second year, second semester

**2102 ARCHITECTURAL DESIGN**

**CATALOG DESCRIPTION:** see above

**COURSE AIMS and OBJECTIVES:**
continue the objectives from the first semester and stress the following:
1) Thinking in terms of relationships.
2) Similarity and difference (continuity and differentiation, physical and temporal).
3) Context: natural, built cultural.
4) Space: landscape, urban, interior.
5) Construction (at all scales).
6) Program: singular/repetitive; questions of formal determinateness of use.

**CLASSIFICATION OF PEDAGOGICAL APPROACH:** Process/Parameters

**EXERCISE 1 CAMP STREET MARKETPLACE 3 Weeks**

The student is asked to design a Marketplace as "to stimulate the cultural and physical identity of a strongly rooted community of a modestly scaled public building: the Marketplace." The project becomes the focus of a continual analysis and synthesis of various elements for the entire semester.

Objectives:
To explore the essential nature of materials and their interaction.

**EXERCISE 2 Site Analysis 1 1/2 Weeks**

The students are to analyze the site surrounding the last
project including their design of the The Marketplace in the analysis.

Objectives:
To understand the roles of analysis and speculation in the critical process,
To employ both verbal and drawn studies in support of an analysis and speculation of a given (built) work.

EXERCISE 3 Housing Assignment 1 1/2 Weeks
The student is asked to research housing types.

Objectives:
To the objectives of project 1 add the following:
1) To examine and recognize the formal qualities of the object, and to articulate the nature of the relationships between the object and its base, and the object and its field.
2) To explore the relationship of interior and exterior space, and how these are demarcated.
3) To explore such perceptual notions as horizon, boundary, threshold, continuity, scale, etc. through an imagined human presence.
4) To investigate conditions of passage, approach, axis, directionality and arrival and to acknowledge the relationship between sequence and narrative.
5) To acquire or develop technical skills fundamental to the production of architecture.
(These objectives relate to the following exercises)
EXERCISE 4 Precedent Analysis 1 Week
The analysis of historic housing types.

EXERCISE 5 Site Response Assignment 1 Week
The analysis of a particular site for contextual fit.

EXERCISE 6 Unit Layout Assignment 1 Week
Design of a typical housing unit within a complex.

EXERCISE 7 Construction on slope assignment 1 Week
The study of slope and its impact on design in plan and section.
EXERCISE 8 Final Layout Assignment 3 Weeks

Final design of the housing units and complex within the context of neighborhood and community.

REMARKS

Risd’s program is unique in that the students in the first architecture design course are sophomores and take basic drawing, two-dimensional and three-dimensional design courses prior to this courses. The coordinator felt that this art training was not effective and that the students threw away their charcoal pencils and picked up 4H pencils on the way to the architecture building. The students are also mixed, architecture, interiors and landscape and this mixture is reflected in the makeup of the faculty.

The sequence of ideas developed throughout the course are presented hierarchically from simple enactive psychomotor skills--project one the Box--to more complex design and representation in iconic form with a crafted 3-dimensional model and plan, elevations, sections and a perspective views.

The general and specific objectives, duration, content, end product and mode of evaluation for each project and/or exercise is given in the individual exercise handouts. The sequence of instruction in the second semester is introduced as a multitude of exercises within the same site. These allows the for the design of one new element--The Market--to be evaluated for its part of the now existing context allowing the student to evaluate the impact of their
intervention in the context. Generally the sequence and
development of instruction builds form an introduction to
basic ideas and concepts to the application to their impact in
the environment.
RENSSELAER POLYTECHNIC INSTITUTE

Francis Bronet (Interviewed 3/30/89)

FIRST YEAR First semester.

Rensselaer's program in the first year is "integrated" 10221 & 10222 Architectural Design 1a & 1b and 10211/10203 Intro. to Arch. Theory & Design in context. Also integrated with the studio are computers and structures/materials. The school is now attempting to integrate the second year studios.

10221 Architectural Design 1a

CATALOG DESCRIPTION:
(NONE)

TEXTS: (referenced or required)

COURSE AIMS and OBJECTIVES:

This is the first in a series of ten semesters of design studio. We will work with all of the major concerns which you will encounter in these subsequent studies, if perhaps in only a rudimentary way at first.

The objective of this and subsequent design studio semesters is to learn to design, not only about what has been designed. That is design is a verb, before it is a noun. You will be asked to make proposals as to what you consider to be significant physical intervention in a given life situation. Thus, what ought to be done will develop together with what can be done.

During the semester we will issue elaborations of these objectives.

CLASSIFICATION OF PEDAGOGICAL APPROACH: Integrated Process

Enrollment: 50-55/5 (75/6)

Schedule: The course meets Monday, Wednesday and Fridays; Wednesdays the studio is divided up into smaller sections for drawing--graphics--and computers.
EXERCISE Study 1 3 days

The student is asked to make a "plan" of the spaces south of the Greene Building (the architecture Building) on one or more 18"x 24" sheets of newsprint with charcoal.

Objectives:
Stated as considerations of the inclusiveness of study, the extents of study area and the building up of the drawing through density.

EXERCISE Study 2 3 days

The student is to do study 1 again, but assume some major changes have replaced what is there now...ie.. Now there is a 40' high dense forest.

Objectives:
The intent is to sense overall play of spaces which are formed by differences in intensity of resistance to movement on the ground.

EXERCISE Study 3 2 Weeks

The student is to assume a 20'x 20'x 20' whitewashed concrete cube 12" thick slab thickness is setting in a dense woods, as shown in plan and section. The intent is to study "different senses " of the quality of daylight on and around the object and landscape and how much the student can manipulate both.

EXERCISE Study 4 3 Weeks

The student is asked to set aside all interpretations (all listed) of the south side of Greene Hall (arch. bldg.) and to propose physical changes which would provoke the student to want to be there as well as want to return. (ie.. an inviting environment) The proposal is limited to changes
in earth (topography), landscape materials (trees/shrubs etc.)
and elements. Also assume existing area is replaced—as in
study #2—as a 40’ high evergreen forest.

**EXERCISE Study 5  4 weeks**

This study is to synthesize all prior studies in the
design of a bookstore and coffee shop addition to the Greene
Building.

Objectives:
To synthesize all prior knowledge and skills.

First year Second semester

10222 Architectural Design 1b

**CATALOG DESCRIPTION:**

(NONE) Prerequisite 10221 for 10222.

**COURSE AIMS and OBJECTIVES:**
Continuation of Design 1a

**EXERCISE Design Shelter**

The student is asked to design a shelter in a park, on a
specific site and using specified materials and other
criteria. This is accomplished in 4 exploratory studies all
in model form.

Objectives:
To marry site, simple program, and materials in a
usable shelter.

**EXERCISE Design Study 2**

The student is to design a townhouse, with a more complex
program and site. There are very specific requirements for
the project in function, materials and fit to site.
Objectives:
To increase the understanding of design issues through more complex issues.

REMARKS
The exercises are structured to overlay each other and to build a repertoire of images of a known environment by first analyzing a familiar setting then reinterpreting that setting with new information and/or imagined changes. The same setting, the Greene Building which is the architecture building and a very familiar setting for students, is used in all 5 studies in the first semester. In the second semester the exercises are in two different sites one a suburban (park) landscape and the other in an urban area.

This program attempts to integrate "all of the major concerns which ..(the student) will encounter in ..subsequent studies" knowledge and skills in which an architecture student needs to "learn to design." this is accomplished through the exercises and the requirements of their representation. From charcoal drawings to study models, computer simulation modeling, hardline drawings and the actual construction of details or small Kiosks etc. The program probably does achieve these objectives, but they are not clearly expressed. The language of the exercise handouts is at times difficult to understand. Also, although the outline states: "During the semester we will issue elaborations of these objectives." ; none of the exercise handouts have such elaborations. Another factor is the evaluation of projects--knowledge of results--is scheduled during mid-term where no
grades are given for individual assignments.

Overall, the intentions for student learning are in accord with many of the principles of the theories of learning and instruction. The strongest aspect is the philosophical position of the school itself that of 'Critical Inquiry' and it's definition as the method of understanding the nature and complexity of architecture.
ROGER WILLIAMS COLLEGE

Andrew Cohn (interviewed 3/23/89)

First Year, First Semester

Along with ARCH 103/104 Architectural Design 1 A/B the student takes ARCH 101 Architecture Graphics and ARCH 201 Computer Applications and ARCH 223/224 History of Architecture

ARCHITECTURE 103, ARCHITECTURAL DESIGN 1A

CATALOG DESCRIPTION:
The objective of this course is to introduce the beginning architecture student to the primary determinants that affect an architect's decision-making process. The studio hours are in a lecture/information-giving and problem solving format. The determinants of this first semester are Materials, Color, Form and Space. Students work individually and in groups to investigate the determinants, to make presentations to the class and apply their knowledge in the solutions of small architectural projects. Emphasis is placed upon the procedure by which an architect goes through design and decision-making (Roger Williams College 1988).

(required and/or referenced)
Ching, Francis D. K. Architecture: Form, Space, and Order.

COURSE AIMS and OBJECTIVES:
An intensive introduction to Architectural Design focusing on:
1) abstract exercises in two and three dimensions with the objective of studying and understanding the organization and nature of architectural space;
2) analytical problems which examine built work with a focus on learning and recognizing historically important building types and spaces;
3) real building problems which integrate architectural issues such as site, context, program which involve the use of theoretical principles learned from the abstract and the analytical problems.

CLASSIFICATION OF PEDAGOGICAL APPROACH: Formal Manipulation Design Process
Enrollment: 90/6
Professors: Team taught
Schedule: Tuesday/Wednesday/Friday 2-6pm.

All the following exercises are stated in the same format; Problem number, title, objectives, procedure, presentation requirements, reading (mostly from Ching, Architecture, Form Space, and Order.), schedule (assigned and due dates), and grading criteria.

EXERCISE 1 Composition 5 days

Under the heading procedure the student is asked to use as many of the forms, triangle, square and circle "in any size and in any combination as necessary to present your ideas prepare two compositions:" one symmetrical the other asymmetrical. The forms are cut bristol board glued to a black cardboard base.

Objectives:
To introduce Architectonic elements as components of composition.
To understand issues of symmetrical and asymmetrical compositions.
To establish an "architectonic" frame of mind with which we shall approach all work this semester.

Grading Criteria:
2. Exploration in the solution of the design issues expressed in the readings and in class discussion.
3. Understanding by the student of his/her own design concept.

EXERCISE 2 Ordering Principles-Spatial Organization 1 week

The student is to use the forms from #1 is "to design three compositions, each based on a plan type: centralized..linear...and grid organization."

Objectives:
To understand fundamental organization principles and plan types.
To explore design characteristics which can be studied in plan.

Grading Criteria:
(Add to #1)
4) Understanding the plan types.

EXERCISE 3 The Wall and The Spaces Between 1 Week:
Using strathmore board the student is to hierarchically order a number of spaces "3 larger..and 6 smaller"

Objectives:
To explore the space-defining properties of a given structural system (parallel bearing walls).
To examine the effects of a governing proportional system on a compositional field.
To develop skill in defining and ordering space.

Grading Criteria:
(same as #1)

EXERCISE 4 The Path and The Place 4 days
The student is to describe in words and sketches a familiar walk, (sensory walk)

Objectives:
To introduce problem #5 by describing paths and places already known and experienced.

Grading Criteria:
1. Design and composition.
2. Technical excellence

EXERCISE 5 The Path and The Place (cont.) 1 Week
Provided with a site, list of elements and rules the student is to design and create a path and a place.

Objectives:
To study the configuration of path, the form and structure of the circulation space and building approach.
To study the sense of arrival and the space of the destination.
Grading Criteria:
(not stated)

EXERCISE 6 Exploring the Volumetric Cube. 1 week

This exercise is the construction of "three hierarchically arranged and interrelated volumes."

Objectives:
To explore means of expressing hierarchically-arranged volumes.
To study interrelationships of volumetric spaces.
To study means of defining and forming volumes of space.

Grading Criteria:
(not stated)

EXERCISE 7 House 1 week

Design of a house on a given site and program and to a list of issues.

Objectives:
To integrate the theoretical principles introduced in prior problems 1-6 (organizational issues, plan types, hierarchy, proportion, spatial definition, etc.) with "real" architectural issues such as site, program and structure; to make abstract concepts serve a useful purpose.
To introduce "housing" as a building type.

Grading Criteria:
Demonstration of understanding of the state objectives.
Technical excellence.

EXERCISE 8 Building Analysis 3 days
(Not available)

EXERCISE 9 The Design of Exhibition Space 2 weeks

The student is to design an exhibit space for three new sculpture collections in a landscape.

Objectives:
To study issues in the design of an exhibit space.
To Understand issues of site such as view, light,
terrain and vegetation.
To continue the study of structure as a form-generator and organizer of space.
To continue the exploration of path and destination relationships.

EXERCISE 10 Final The Design of a Branch Library 4 wks

The student is to design a branch library for an urban site.

Objectives:
To emphasize the relationship of a specific program to the architectural expression of a culturally significant building type.
To focus on development of abstract concept to architectural expression.
To continue exploration of structural elements and systems.

First Year, Second Semester

ARCHITECTURE 104, ARCHITECTURAL DESIGN 1B

CATALOG DESCRIPTION: (prerequisite: Architecture 103)
This semester is intended to study the determinants: Organizations and Structural Assemblies/Spatial Relationships and Spatial Organizations. A series of in-class and homework assigned exercises will lead the student to an understanding of these determinants and to the development of skills in handling these determinants in the solution to architectural problems. Material is introduced in a systematic fashion to allow the students to develop skills of increasing complexity. The semester's exercises will lead to a to a final project of two week duration in which the student will be expected to apply the material of the semester to achieve a solution. The process of design is emphasized throughout the development of the design solution (Roger Williams College 1988).

COURSE AIMS and OBJECTIVES:

EXERCISE 1 COMFORT PROJECT 4 days

Design of a corrugated cardboard chair that has design and construction merit and that is the shape and size that is most suitable to all persons.
Objectives:
To study the ergometric needs of the human body in a seated position and in the act of sitting and rising;
To design a construction system using given materials and constraints that will facilitate the first objective and that will work in conjunction with a design concept.
To generate a design concept for a single usable object for the use of the people within the space and that would enhance the quality of the space.

EXERCISE 2  PARTI PROJECTION-FORM FROM PATTERN 1 week

The student is given one of four patterns which have no scale, no explicit architectural meaning, and no historic or stylistic precedents. They are to be interpreted as parti sketches, and as such may be symbolic of design intentions, and may be representative of a plan, section, or elevation, or all of the above for a room that the student is asked to design. The room is a contemplative space for the student. It is to contain all of the architectural ingredients to facilitate the ability to concentrate, meditate and get in touch with the spiritual force within the student.

Objectives:
To emphasize and analyze a parti (concept) as a generator of space;
To focus upon the qualities that comprise an architectural space: shape, volume, proportion; light; ornamentation and other enhancing elements.
To project a three-dimensional room from a two-dimensional sketch; creating space generate an elevation, catch light, and focus human spirit.

EXERCISE 3  DESIGN OF A SMALL STUDY 1 week

The student is asked to convert an existing corner in a townhouse into a study which will house the owner's collection of books and display some "favorite works of art". This space
will be where the family spends a significant amount of time and also provide a space for small parties.  

Objectives:  
To address issues of human scale and comfort.  
To introduce concepts of the use of the use of materials and craftsmanship.  
To focus on the idea of the room in architecture as realized through a specific function and setting.  

EXERCISE 4 FACADE ANALYSIS 5 days  

The student is asked to draw the main facade elevation of an assigned "architecturally significant" building and analyze the facade according to Parti; Proportion & Geometry; Pattern; Symbol & Imagery; Material & Structure; and Color & Texture.  

Objectives:  
To analyze those architectural conditions and elements that comprise the facade or face of a building.  

EXERCISE 5 THE DESIGN OF AN ENTRY SPACE 5 Days  

The student is to design the entry for a proposed building of three stories and integrate this in a conceptualized facade.  

Objectives:  
To study means of articulating entry  
To design an entry volume that expresses transition from outside to inside.  
To study the scale relationship between the building and entry.  
To understand issues from previous (facade) study.  

EXERCISE 6 POTTER'S STUDIO 2 weeks  

The design of a working studio for a potter with specified furnishings and requirements.  

Objectives:  
To focus on the process to date.  
To emphasize site design and the integration of building and site.
To continue the study of issues in prior studies such as: Parti as generator of space; Human scale and comfort; Materials and craftsmanship; Entry and transition from outside to inside.

**EXERCISE 7 CUBIC TRANSFORMATION—9 SQUARE HOUSE 1 week**

The project is for the design of a custom house for a mathematician and his wife an astronomer. The house is to be designed within a 3 dimensional nine square cube, 10’ sq. and must be expressed.

Objectives:
- To study structure and geometry as generators of form.
- To create a program from expressed needs.

**EXERCISE 8 THE ROW HOUSE 8 days**

The student is to design a 700 sf. third floor apartment above retail space on a corner lot with a facade design of "architectural character and distinctiveness.

Objectives:
- To continue the study of housing types begun in prior exercise.
- To deal with realistic, although hypothetical, housing situation: apartments over retail space.
- To consider elevation design as a means of architectural expression.
- To consider elevation as a means of expression of interior spaces and volumetric configuration.

**EXERCISE 9 FINAL PROJECT**

This project is the design for mixed use with emphasis on building placement and massing, urban plaza(s), paths and site access, planting and other elements deemed appropriate.

Objectives:
- To emphasize issues related to the city as a living environment.
- To continue the study of issues to date including: The process of design including the development and transformation of meaningful concepts; The design
possibilities of housing as explored in previous projects; The "Room" in architecture both as an interior space but also expressed as outdoor "Rooms" in plazas courtyards and entries; Entry and elevation explorations as introduced in previous problems.

REMARKS

The exercises explore ideas concerning mainly composition, figure ground etc. place, path, and with the final exercise--A Branch Library--as a synthesis of all prior exercises. In the second semester there is a split here in the studios, one group 3 sections works on a commercial/residential development as a semester long project with multiple exercises addressing varied issues. The exercises illustrated here of the second group of 3 studios, continues some of the abstract exercises, but finally addresses basically the same final project as the other. The differing approaches are more an ideological split between the coordinators. One taking a more pragmatic view of the approach, whereas the other takes a more abstract view. The program is basically pragmatic though, with the abstract exercises in formal manipulation in the first semester and more concrete exercises in the second. One of the coordinators stressed the fact that he took the basic abstract exercises from his education at Cornell, compressed them into one semester and clarified the objectives for student learning so that they were more explicit.
SYRACUSE UNIVERSITY, SCHOOL of ARCHITECTURE

Cheryl O’ Neill (interviewed 3/29/89)

FIRST YEAR, First semester
ARC 107/108 Basic Arch. Design and ARC 103/104 Drawing ARC
133/134 Intro. to the Hist of Arch.

ARC 107 Basic Architectural Design

CATALOG DESCRIPTION:
Architectural principles through analysis, abstract exercises, and building-design problems. Use of graphic conventions and the role of drawing to convey architectural ideas (SU 1989).

TEXTS: (referenced or required)

COURSE AIMS and OBJECTIVES:
To explore the varied aspects of architectural space and the relationships of architectural elements within space.
To explore the process of the making of architectural space and form in an re-iterative hierarchical sequence alternating from abstract principles to more concrete principles.

CLASSIFICATION OF PEDAGOGICAL APPROACH:

Enrollment: 110-125 students 20-25 per section with one instructor and one teaching assistant.
Schedule: Meets Monday, Wednesday and Friday 2-6 pm with 1 hour lectures on wed.

Typical studio format

EXERCISE 1 A WEEK END RETREAT 3 days

The student, "as a newly successful architect", is asked to design their own Week End Retreat, as a place for work and relaxation as well as entertainment of guests and clients. The student is to " as an opportunity to display" their " architectural ideas and talents".
Objectives:
To express prior knowledge of architecture

EXERCISE 2 THREE NON PARALLEL PLANES 2 weeks

The student is to use three non-parallel planes within a field of space to define a hierarchy of overlapping spaces.

Objectives:
To discover the spatial relationships between basic architectural elements: plane to plane, plane and opening
To discover the possibilities of multiple spatial readings within a simple space.
To understand the principles of spatial definition, closure, hierarchy, and consistency.
To understand basic architectural conventions in drawing.

EXERCISE 3 DESIGN EXERCISE THREE 1 week

The student, within a field of space defined by a base plane and grid of columns is to define a number of overlapping spaces.

Objectives:
To discover the spatial relationships between three basic architectural elements: plane to plane, plane to opening, and plane and column.
To investigate the spatial implications of the column grid.
To understand the principles of spatial definition, closure, hierarchy, and consistency.
To understand the basic architectural conventions in drawing.

EXERCISE 4 DESIGN EXERCISE FOUR 3 days

Similar to the previous problem given a field of space defined by a base plane and grid of columns and parallel set of beams the student is to define a number of overlapping spaces.

Objectives:
(in addition to those of the previous exercise)
To investigate the implications of a directional spatial system.

EXERCISE 5 AN ARCHITECTURE GALLERY, SOHO, NEW YORK:

Phase 1 Site Investigation 5 days

The student is to design an architectural gallery that contains certain paintings, furniture, models, and sketch books etc. from prominent architects. These are to be incorporated into an existing SOHO loft with its existing columnar grid. The project is in the two phases.

Objectives: (not explicitly stated)

EXERCISE 6 Phase 2 Design 2 1/2 weeks

(see above Ex. 5)

Objectives: (not explicitly stated)

EXERCISE 7 A CUBE IN SPACE 2 1/2 weeks

The student is to make a composition of three non-parallel planes within a 3" x 3" cube.

Objectives:
To continue the study of the fundamental principles of spatial definition and articulation.

EXERCISE 8 THE FINAL PROJECT 4 1/2 weeks

There are five different programs, one per section for this project all are about 500-600 square feet and for very specific needs, ie. a Photographer’s Studio etc..

Objectives: (not explicitly stated)
The main intent of this exercise is synthesis of the prior exercises.
FIRST YEAR, Second semester

ARC/NAS 108 Basic Architectural Design
CATALOG DESCRIPTION:
Continuation of basic design principles. Design problems dealing with program, context, and construction.

COURSE AIMS and OBJECTIVES:
(Not explicitly stated)

EXERCISE 1 Work Module in an 8’ Cube 3 weeks
4 Phases
The student is to design a work space within an 8’ Cube for one of 5 different clients. (one per section) There are programmatic criteria as to function and a set of rules for the development of the cube.
Objectives:
To explore the use of space
To explore human scale
To explore the qualities of space
To explore ergonometrics
To explore the concept of additive elements
To explore the concept of subtractive elements
To analyze space as depicted in a work of art

EXERCISE 2 Topographical Investigation 3 days
The assignment is for the regrading of a sloping hillside to include five given elements; a 32’ dia. flat semicircle, a 20’x 80’ flat terrace, four columns defining a 16’ cube of space, a 20’x10’x 10’h volume of space and 400 sf plane either vertical or horizontal.
Objectives:
To understand the architectural implications of topography; the form and space making possibilities inherent in the manipulation of the ground surface. a room of high architectural quality;

EXERCISE 3 Design of a Room 2 1/2 weeks
Phase one: The student is asked to analyze a room of high architectural quality from a given list.
Phase two: The student is to design a reception room, as a major public space, it is a place to be and a place to be seen. It is a part of a primary spatial sequence.

Objectives:
- To use precedent
- To analyze discrete space
- To analyze the quality of space
- To study volumetric section
- To study the use of space

EXERCISE 4 Final 6 1/2 weeks
Various Programs on a Slot Site

The students are given various programs for a building to fit within a "Slot Site". The programs are for Study or literary societies and address the following

Objectives:
- To explore Urban issues such as an impacted building, street vs. garden, Facade (context)
- To use a complex program
- To address honorific and normative sequence
- To address section

REMARKS

Much of the program at Syracuse is derived from Cornell, but modified over the years. The exercises are highly developed and well established. "We definitely teach a method of design." (interview) The same projects are used from year to year with little modification. The first exercise is used to pre-assess the students prior knowledge of architecture and probably expresses to the student more what they need to know. This type of exercise can be detrimental to student motivation if the evaluation is not structured properly.

The other exercises deal with basic and fundamental principles of the manipulation of space, form and varied
elements, becoming more concrete architecturally related toward the end of the first semester. One aspect of the course is the use of multiple functional programs within the same general design problem. This helps to multiply the number of different programs and building types the student is exposed to. Although, the main intention of architecture design courses is the teaching how to design rather than what or specific building types. The final semester builds exercises up to the synthesis of a final design in a slot site.

Overall the course intends to establish an approach to problem solving through a common well tried methodology, while it may work for some, here it is assumed to work for all.
TEMPLE UNIVERSITY, COLLEGE of ENGINEERING, COMPUTER SCIENCES and ARCHITECTURE

Norman F. Krecke, Howard Brunner and David Cronrath (interviewed 3/22/89).

FIRST YEAR second semester

0030. Design Fundamentals after 0010 Drawing and 0001 Intro to Architecture

0030. Design Fundamentals

CATALOG DESCRIPTION:
Meaning and principles in the field of architecture. The evolution of human values through historical and contemporary architecture. The development of creative values in architecture and its supporting profession. Techniques of drawing, analysis of line, form, proportion, color and texture (Temple 1989).

TEXTS: (referenced or required)

COURSE AIMS and OBJECTIVES:
To develop the students ability to conceptualize design problems and their resolutions.
To assist the student's development in the following areas:
SKILLS: To build confidence in basic design so the student can fully develop and express his or her ideas.
skills such as Library research, perspective drawing, drafting (plans, sections, elevations), model construction (conceptual and study), diagraming, color utilization, and sketching.
PROCESS: To explore and reflect upon the process of design. To explore ways to formulate a clear intent, to generate alternative resolutions, and to select a preferred option.
VISUAL THINKING: To develop the ability to think visually by expressing their ideas using form (2-dimensional and 3-dimensional)
CRITICAL THINKING: develop the ability to critique design resolutions and express these thoughts to others and to oneself.

CLASSIFICATION OF PEDAGOGICAL APPROACH:
Enrollment:
Professors:
Schedule:
EXERCISE: Design intervention in the Landscape 15 weeks

The students are given the same site (all sections) but each instructor addresses the particular site as well as project which is to "intervene into the landscape". (the particular site this semester was Fairmont park) The individual projects range from a theater to an additional element, i.e., a concession stand, at the Water Works. Although there were varied programs the coordinator developed the particular Objectives and/or issues to be addressed. (specific objectives for the projects are not written and handed to students by the instructors)

Objectives:
The specific objectives outlined by the coordinator are:
To develop an understanding of the activities and uses to which architectural solutions are to serve.
To investigate and determine appropriate size for particular activities, the particular activities to be accommodated, and the elaboration and augmenting of an activity description
To develop an understanding of the emotional and psychological qualities of architecture. In particular the sense of security and privacy available through architectural form and space.
To develop an understanding of the context within which a design is developed. In particular, techniques for an analysis of the site forces, and the appropriate responses to this analysis.
To develop an understanding of the methods and materials used for construction, and how this knowledge can be used in the service of making meaningful, lasting architectural solutions. In particular an initial explorations into bearing wall and gridded frame constructions.
To develop an understanding of the natural and artificial environmental control systems and methods, and how this knowledge can be used in the service of making comfortable architectural solutions.
To develop an understanding of the historical continuum within which architectural solutions are
related to and exist within. In particular, an investigation and analysis of similar building types done by other architects.
To understand the sources for clear and comprehensive architectural concepts. In particular, develop the ability to hierarchically arrange problems and seek resolution using formal expressions.
To understand the cultural, spiritual and symbolic aspects of a rich and vital architecture. In particular, develop an understanding of the ways in which a place can be made and enriched through an elaboration and articulation of form.

REMARKS

The program at Temple is currently going through major changes and the beginning courses are being either eliminated or re-evaluated in light of these intended changes. The course collected here as an introductory course in design in architecture is limited. The course does introduce the student to the studio experience, but the course only meets 4 & 1/2 hours per week, and there is a single project for the entire semester. Because of this other courses The introduction to Architecture and the drawing courses are very important in the program for the student to experience the studio mode of instruction. This approach tough may ease the student into the studio mode rather than shock them and therefore may be beneficial to motivation and other aspects of predisposition.
The goals and objectives of the drawing courses are important here as stated in interview: The objectives of Visual literacy are to see and recognize visual order, texture, color pattern, symbols, excellent craftsmanship, and the ability to read, write and draw visual images. Also; the ability to use
imagery to perceive objects in space, to use and to comprehend graphic languages such as maps, blueprints, diagrams, drawings models and three dimensional illusion.
APPENDIX B

The Taxonomy the Cognitive and Affective Domains

The NAAB has established objectives perspective on architecture education. Content and performance variables. These achievement orientated performance criteria are stated as awareness, understanding, and ability. Awareness is the recall of knowledge (information) understanding is comprehension and abilities are the skills in application. The NAAB divides content into four major areas context, design, technology and practice.

The Cognitive Domain

There are six levels of Bloom’s Taxonomy within the cognitive domain which are hierarchical from simple, recall of information to more complex mental functions. These levels are knowledge, comprehension, application, analysis, synthesis, and evaluation.

The first level of the Taxonomy, knowledge, requires the recognition or recall of information. It is in this area that Bloom has been criticized most for his definition of knowledge as the mere recall of information. Knowledge is the recall, comprehension and application of information. Therefore comprising the first three categories of the taxonomy and so the first category should be titled information, not knowledge. (Tanner etc.) Despite this criticism the taxonomy in the cognitive domain has been proven as effective tool for the evaluation and classification of educational objectives.
The following structure is adapted from Bloom’s Taxonomy (1956), Rauh and Wright (1975), Kibler et. al. (1974) and The NAAB (1986).

The list is Bloom’s categories with the infinitives suggested by Kibler et. al. with examples from Rauh and Wright and the NAAB.

1.00 INFORMATION (knowledge)

1.10 The recall of Specific Information.

1.11 The recall of Terminology
   (specific symbols, verbal and nonverbal).
   To define, distinguish, acquire, recall recognize.
   Vocabulary, terms, terminology, meanings, definitions, referents or elements.

Example: To define technical terms by giving their attributes, properties, or relations.

Example: Familiarity with the signs and symbols used in architectural diagrams and their common range of meanings.

1.12 Recall of specific Facts
   (dates, events, persons, places, etc.)
   To recall, recognize, acquire, identify;
   facts, conventions, properties, examples, phenomena

Example: The recall of the architect’s name and the date of construction for a particular building.

Example: The recall the usual sizes and dimensions of household furnishings.

1.20 Knowledge of the ways of organizing, studying, judging, and criticizing. This includes the methods of inquiry, the chronological sequences, and the standards of judgment within architecture as well as the patterns of organization through which the field of architecture is itself determined and internally organizable.

1.21 Knowledge of Conventions, forms and usages.
   To recall, recognize, acquire, identify;

Example: To be conscious of correct forms and practices of
architectural drafting.

Example: Familiarity with the modular dimensioning conventions used throughout the American construction industry.

1.22 Knowledge of the processes, and sequences. To recall, recognize, acquire, identify;

Example: Understanding the sequence of steps involved in the assembly of components in pre-cast concrete construction.

Example: Knowledge of the cyclical routine of living activities that occur in an indoor dwelling environment on a daily basis.

14. be aware of major current building and urban design project types and how they are evolving, their spatial and geometric components and forms, their programmatic components, and their technical systems;

1.23 Recall of Classifications and Categories. To recall, recognize, acquire, identify;

Example: To understand the distinction between "served" and "servant" spaces in an architectural scheme.

Example: Becoming familiar with the various generic types of structural systems.

1.24 Knowledge of Criteria. To recall, recognize, acquire, identify;

Example: Familiarity with criteria by which a design for an elementary school classroom might be evaluated.

Example: Knowledge of criteria for the evaluation of a multi-family housing site in terms of maintenance, service, and sanitation.

1.25 Knowledge of the methods of inquiry and procedures. To recall, recognize, acquire, identify;

Example: Knowledge of the critical path method for construction organization and management.
Example: Knowledge of the procedure for the calculating riser/tread ratios in the design of stairs.

1. be aware of methods of historical inquiry, including systematic observation, comparative analysis, and the use of documents and sources;

1.30 Knowledge of the major theories and generalizations.

1.31 Knowledge of particular abstractions which summarize observations of phenomena.
To recall, recognize, acquire, identify;

Example: Knowledge of the principle of functional independence of structure and wall systems as exhibited in Le Corbusier's maison Dom-ino.

Example: Knowledge of major generalizations about the behavior of people in public places.

1.32 Knowledge of principles and their interrelations.
To recall, recognize, acquire, identify;

Example: Knowledge of linguistics theories of perception and architectural form.

Example: Knowledge of the relatively complete formulation of principles and organization of practices of cathedral building in 12th century France.

Example: 13. be aware of significant theories of design and relevant design methods

The second level, comprehension, requires the demonstration of understanding by organizing or arranging information. Comprehension builds upon information by demonstrating an understanding of information.

2.10 TRANSLATION
Translation of an original design or communication by paraphrasing or rendering from one language or form of communication to another.

Example: The ability to construct an accurate scaled model from plans, sections, and elevation drawings.
Example: Skill in translating written program data into graphs, charts, tables, etc.

(2.20) INTERPRETATION
The explanation or summary of a design or communication.

Example: The ability to grasp the overall idea of an urban design proposal and describe it to others.

Example: The ability to interpret a client's list of needs and requirements.

2.30 EXTRAPOLATION
Determine implications, consequences, and/or effects.

Example: The ability to predict the consequences of a high density, high-rise architectural proposal will have on local utilities, services, parking, traffic flow, etc.

Example: Ability to anticipate the design consequences that the choice of a construction system will have on the other architectural systems of a building.

Application requires students to use a rule or process to solve a problem. The application of information that is recalled and demonstrates understanding. In architecture this is related to the canon or rules of formulation in classic architecture or in the drawing of a perspective or other form of representation.

3.00 APPLICATION
The use of abstractions in the form of general ideas, rules or procedures, or generalized methods. The abstractions may also be technical principles, ideas, and theories which must be remembered and applied.

To apply, generalize, relate, develop, organize

Example: Ability to construct a perspective drawing using the proper rules of descriptive geometry.

Example: Ability to design a building entrance in accordance with the ideas of "defensible space."
Analysis requires the use of three types of cognitive processes. Either the identification of motives, reasons and/or causes for specific occurrences; or the consideration of information in order to reach a conclusion, an inference or generalization based on the information; or to analyze a conclusion, an inference, or generalization based on evidence.

4.00 ANALYSIS

The breakdown of a design, building or communication into its constituent elements or parts such that the relative hierarchy of ideas is made clear and/or the relations between the ideas expressed are made explicit.

4.10 ANALYSIS OF ELEMENTS

Identification of the elements included in a design, building or communication.

Example: The ability to distinguish the elements of structure from the elements of enclosure in a building.

Example: Ability to identify the formally operative elements in the facade of a renaissance palazzo.

4.20 ANALYSIS OF RELATIONSHIPS

The connections and interactions between elements and parts of a design, building, or communication.

Example: Skill in comprehending the interrelationships among the various architectural sub-systems and elements in a building.

Example: Ability to distinguish between consistent relationships, intentionally contradictory relationships, and inconsistent relationships among elements in a design.
4.30 ANALYSIS OF ORGANIZATION PRINCIPLES

The organization, systematic arrangement, and structure which hold the design, building or communication together.

Example: The ability to recognize the formal principle which governs the placement and disposition of the major architectural elements and systems within a building.

Example: The ability to infer the architect's purpose, intellectual perspective, or design philosophy as exhibited in examples of his work.

Synthesis requires original and creative thinking to produce original communications, to make predictions or to solve problems. Bloom uses the metaphor of the house (AES 1977)

5.00 SYNTHESIS

The putting together of elements and parts so as to form an organized whole not clearly there before.

5.10 PRODUCTION OF A UNIQUE DESIGN OR COMMUNICATION

The development of a reasonably complete design.

Example: Ability to develop a building design as an elaborate, historically didactic, formal architectural concept.

Example: Ability to design a system of circulation spaces that is understandable as an orchestrated series of spatial transformation.

5.20 PRODUCTION OF A PROPOSED SET OF OPERATIONS

The development of a plan of work or the proposal of a plan of operations. The plan should satisfy requirements of the task which may be given to the student or which he may develop for himself.
Example: The ability to devise a simple structural kit of parts along with a strategy and sequence for assembly of the components.

Example: Ability to plan for phased development of a proposed commercial/residential redevelopment scheme.

The last level of the Taxonomy, evaluation, like synthesis requires a higher order of mental processing. Evaluation is the judging of the quality of an idea, solution to a problem or an aesthetic work.

6.00 EVALUATION

Judgments about the value of designs and methods for given purposes both quantitative and qualitative.

6.10 JUDGMENTS IN TERMS OF INTERNAL EVIDENCE

Evaluation of the accuracy of a design, building or communication by internal criteria.

Example: The ability to determine if a proposed architectural solution meets all specified program requirements.

Example: The ability to indicate logical inconsistencies and flaws in the formal arrangement of the various building systems that comprise an architectural design.

6.20 JUDGMENTS IN TERMS OF EXTERNAL CRITERIA

Evaluation of a design or building with reference to selected or remembered criteria.

Example: Ability to determine if the means employed and the approach taken to the solution of a design problem represents the most appropriate one when other alternatives are considered.
Example: Judging by external standards, the ability to compare a design proposal with some exemplary standard or model, especially with another work of recognized excellence.

AFFECTIVE DOMAIN

The affective domain contains behaviors and objectives which have some emotional overtone. It encompasses likes and dislikes, attitudes, values and beliefs. The following is an abstract of the taxonomy of educational objectives for the affective domain. (Krathwohl et al. 1964) Modified for use in Evaluating Exercises in Architectural design. (Perryman 1989)

1.0 RECEIVING (ATTENDING)

The first level in the affective domain is concerned that the learner is willing to receive or attend.

"This is clearly the first and crucial step if the learner is to be properly oriented to learn what the teacher intends that he will. To indicate that this is the bottom rung of the ladder, however, is not at all to imply that the teacher is starting de novo. Because of previous experience (formal and informal), the student brings to each situation a point of view or set which may facilitate or hinder his recognition of the phenomena to which the teacher is trying to sensitize him." (Krathwohl et al. 1964)

The category of receiving has been divided into three subcategories to indicate different levels of attending to phenomena.

1.1 AWARENESS

Awareness is merely being conscious of something a situation, phenomenon, object, stage of affairs.
Example: Develops awareness of aesthetic factors in dress, furnishings, architecture, city design and art.

Example: Develops some consciousness of color, form arrangement, and design in objects and structures around him and in descriptive or symbolic representations of people, things, and situations.

1.2 WILLINGNESS TO RECEIVE
The behavior of being willing to tolerate a given stimulus, not to avoid it.

Example: Increase in sensitivity to human needs and social patterns.

1.3 CONTROLLED OR SELECTED ATTENTION
Controlled or selected attention of a stimulus which is perceived as clearly marked off from adjacent impressions. The learner controls the attention so that the favored stimulus is selected and attended to despite competing and distracting stimuli.

2.0 RESPONDING
This level is the responding to a phenomenon, not just (1.2) Willing to attend, but is actively attending. "As a first stage in a "learning by doing" process the student is committing himself in some small measure to the phenomena involved.

2.1 ACQUIESCENCE IN RESPONDING
Compliance or reaction to a suggestion, the student makes the response, but he has not fully accepted the necessity for doing so.

Example: Willingness to comply with building codes and regulations.

2.2 WILLINGNESS TO RESPOND
The learner is committed to responding, not just because of a fear of punishment, but "on his own" or voluntarily consent from one's own choice.

Example: Acquaints himself with significant current issues in architecture through voluntary reading and discussions.

2.3 SATISFACTION IN RESPONSE
Beyond the Willingness to respond level, the consent,
is that the behavior is accompanied by a feeling of satisfaction in responding.

"The location of this category in the hierarchy has given us a great deal of difficulty." see (Krathwohl et. al 1964)

3.0 VALUING

3.1 Acceptance of Value
   Ascribing of worth to a phenomenon, behavior or object. Belief in phenomenon, behavior or object.

Example: Continuing desire to develop ability to draw more professionally.

3.2 Preference for a Value
   Willing to be identified with a certain value or belief.

3.3 Commitment
   Highly committed to a value or belief.

4.0 ORGANIZATION

4.1 Conceptualization of a value
   Ability to see how a value relates to those already held.

4.2 Organization of a Value System

5.0 Characterization by Value or Value Complex

5.1 Generalized Set

5.2 Characterization

The reason for the presentation of these categories is to express the structure and value of these taxonomies for the structuring of instructional objectives. The hierarchical arrangement of both of the taxonomies should be taken as an organizing apparatus and not as a strict organization of learning.
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SCHOOLS of ARCHITECTURE Persons Interviewed:

<table>
<thead>
<tr>
<th>Name</th>
<th>University/ College</th>
<th>Position</th>
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<tbody>
<tr>
<td>Joseph Scanlon</td>
<td>Drexel University</td>
<td>Coordinator/ Assistant Professor</td>
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<tr>
<td>Jonathan Friedman</td>
<td>New York Institute of Technology</td>
<td>Coordinator/ Associate Professor</td>
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<tr>
<td>David Elwell</td>
<td>New Jersey Institute of Technology</td>
<td>Coordinator/ Associate Professor</td>
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<tr>
<td>Don Leon</td>
<td>Pennsylvania State University</td>
<td>Coordinator/ Associate Professor</td>
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<tr>
<td>Howard Lawrence</td>
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<td>Assistant Professor</td>
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<td>Richard Alden</td>
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<tr>
<td>Donald Cromely</td>
<td>Pratt Institute</td>
<td>Coordinator/ Associate Professor</td>
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<tr>
<td>Francis Bronet</td>
<td>Rensselaer Polytechnic Institute</td>
<td>Coordinator/ Assistant Professor</td>
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<tr>
<td>Tim Culvalhouse</td>
<td>Rhode Island School of Design</td>
<td>Coordinator/ Assistant Professor</td>
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<td>Andrew Cohn</td>
<td>Roger Williams College</td>
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<tr>
<td>Cheryl O’Neill</td>
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<td>David Cronrath</td>
<td>Temple University</td>
<td>Coordinator/ Assistant Professor</td>
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<td>Norman Krecke</td>
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<td>Associate Professor</td>
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<td>Howard Brunner</td>
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