

AN ANALYTIC PHILOSOPHY OF DESIGN AND DESIGN EDUCATION: MAJOR
PARADIGMS AND IMPLICATIONS FOR ART & DESIGN EDUCATION

by

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ABSTRACT

This study is based on the premise that both the theoretical and practical work of curriculum development requires the support of generally understood and agreed concepts and terminology. The use of the term 'design' within the fields of design methodology, art & design education, and the design professions is analyzed for the purpose of distinguishing and correlating the various domains of attached meanings. This 'Analytic Philosophy' seeks to clarify to what extent the term 'design' is reliable when applied to the task of determining the purpose and content of design-related activities within art curricula.

Two major paradigms related to the notions of design as a 'problem-solving-process' and as a 'basic human capacity' are isolated and offered as dominant orientations towards design methodology and design curriculum development. Assumptions, beliefs, claims, and counter-claims seen to undergird these paradigms are mapped and analyzed along with the design-related content of Canadian provincial secondary art curriculum guides.

It is shown that the term 'design' commonly finds different meanings within different contexts and that agreement

regarding the meaning of the term is difficult to establish both within and across the various design and art & design education domains. It is also evident that many of the claims which work to support the theoretical frameworks of the paradigms cannot be substantiated. It is concluded that the notion of 'design', as a result, remains conceptually and contextually vague and ambiguous.

It is further concluded that while such conceptual confusion might be of little consequence to the practical activities of the design professions, it can serve to complicate and inhibit communications and work particularly related to design education issues and curriculum development. Therefore the term 'design' is seen as unreliable when applied to the task of determining the purpose and content of design-related activities within art curricula.

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I. INTRODUCTION

A. A PERSONAL PERSPECTIVE

Twenty-five years of experience as a design student, design practitioner, and design instructor has led this author to one basic conclusion - in dealing with design and design education-related issues, concepts, and language, many designers, design and art education theorists, and classroom teachers appear confused about both the basic nature of design and the meanings of associated terminologies.

Having dealt with a wide range of design and design education issues across various disciplines including architecture, commercial and industrial design, stage and display design, film production, and design studies at the secondary and post-secondary levels, I have come to recognize that communications about design theory, activities, and programs are often complicated or seriously impaired by the vague and ambiguous nature of the basic term 'design'. At this time I find little reason to argue with Ken Bayne's (1976) contention that how one defines design depends on what one wants to accomplish. Those who work in architecture or commercial design, for example, might be guided by a tacit, general agreement regarding the nature and function of the design process, or they might work in

accordance with recognized methodologies which might be only appropriate to their particular discipline. For artists, craftsmen, and designers in other fields, the issue of being guided by understood and agreed definitions and concepts of design may be of little consequence - the having or not having of which would not influence their work in any significant way. For art and design educators however, the issue might encompass somewhat different concerns and implications.

Design education theorists such as Ken Baynes and Bruce Archer (1976) have drawn attention to what they perceive to be significant problems related to both the vagueness of the concept of design and confusion over the meanings of important terms. The existing diversity of notions and assumptions which can be found across design-related disciplines leads, they maintain, to circumstances in which the term design can carry significantly different meanings, imply different goals and objectives, and influence and govern design procedures or curriculum development in different ways within different domains. My own professional experience tends to support these views. When an architect refers to 'good design' or 'design criteria' he/she might be alluding to qualities and requirements quite different in nature and intent from those pinpointed by a fine arts

instructor when critiquing the 'design characteristics' of a painting or drawing. For a commercial or industrial designer the act or process of designing might involve methods, prescriptions, priorities, procedures, and problem-solving techniques dissimilar to those dealt with, or considered important, by a design student in a fine arts program. And art educators, either from one institution or district to another or within the same faculty might hold disparate or, as is sometimes the case, quite contradictory notions of what the aim, purpose, and content of design-related studies or activities should be. These ideas can cover a spectrum from vocational/industrial training courses such as drafting and commercial design through to crafts, architectural studies, computer graphics, and/or aspects of the study of traditional fine arts subjects.

In teaching both commercial design programs at technical institutions and design courses in college fine arts programs I have utilized different references, set different goals and objectives, focused on different value systems, engaged the students in different types of activities, and adopted different instructional approaches, even though both types of programs are considered 'design' studies. In numerous faculty and curriculum meetings it has been evident that different, and sometimes quite contradictory notions

about design and design education have been brought to play in discussions and negotiations.

Even in the United Kingdom, which boasts a long history of design education development and reform (Piper, 1975; MacDonald, 1984; Adams, 1984; Baynes, 1984; Allison, 1982) there remains a lack of consensus over the central issues of defining design and determining the best ways of fitting design studies into both the general and fine arts curriculum. While attending a design education conference in Rugby in 1987 I was interested to see some of the workshops bogged-down in attempts to find agreement over definitions of design and design education from which the work of the conference could move forward. In spite of continuing disagreement over some of the basic issues and concepts the British system does, however, offer its art educators a general model for design education theory, research, and curriculum implementation that is unequalled in other educational systems. In the U.K. it is possible, for example, for educators to gain a degree in design education and there are continuing efforts to articulate design studies approaches from elementary through to post-secondary levels. Recently the British government, for the first time in history, implemented a comprehensive policy for education culminating in the General Certificate of Secondary

Education, which provides national, standardized curriculums for Art & Design, and Craft, Design, and Technology courses. In addition in-service teacher-training programs such as the *Design Dimension Project* provide ongoing opportunities for British art teachers to keep abreast of developments in design education theory and practices and agencies such as The Design Council and The School Curriculum Development Committee, with its Arts in the Schools Project, work constantly at promoting design studies in the schools, funding research and study programs, and publishing support materials.

Canadian art educators are not involved in nor do they have access to similar programs or support systems. Courses in design education - comprehensive courses which would introduce art educators to general design and design education theory and practices - are not offered at any Canadian Universities (Bergland, n.d.) and where courses labelled 'Design' might be found, they appear to be tied to the study of particular crafts or applied arts.

Since the disbanding of the National Design Council and Design Canada in the late 1970s Canadian educators have been left without any agency which might support and guide the development of design education curricula or undertake

research programs from which educators might benefit. Some provincial art curriculums do contain design studies components or prescribe what they consider design-related activities but these can be significantly different in regards to purpose and content and there appears, at the time of this writing, to be little interest on the part of educators towards analyzing the place and role of design studies within Canadian schools. In a March, 1987 issue of *University Affairs*, Bargh and Lehman outlined a case for establishing a legitimate place for design faculties within Canadian universities but little else in the way of communications or proposals regarding this issue can be found.

As an art educator with a background of experience in various design fields I agree with Ken Baynes that the study of design should be viewed as an important dimension of the curriculum - that design experiences, whether they be tied to architecture, fine arts, applied arts, theatre and film, computer graphics, home economics, or interdisciplinary studies involving the social and hard sciences, can provide students with unique and valuable ways of learning about their environment and the means of manipulating it in positive ways. I support the contention that confusion over the nature of design-related concepts and basic terminology

can make more difficult work concerned with fitting design activities or programs into existing art curriculums and that there is a real need for further clarification of the issues especially if curriculum developers and classroom teachers are to feel confident about any work they might do in this regard.

As is the case with defining creativity it may not be possible to easily establish consensual, operational definitions of design and design education. It is especially difficult to posit such definitions within the process of developing and implementing design studies activities within formal school curricula. I would therefore argue that the first step towards finding general agreement regarding the purpose and content of design studies curricula is the analysis and testing of the assumptions, beliefs, and value-systems which underpin attitudes and positions adopted in relation to design and design education. This step will help educators gain an understanding of how particular concepts and sub-concepts have developed and may influence the field. It will also help determine how related terminology or language works in support of those concepts and test, to whatever extent possible, the validity and reliability of associated claims and assumptions.

It is my intention to present within this thesis both a case which verifies the need for the analysis and clarification of design and design education concepts and terminology, and to apply programs of conceptual and content analysis to components of the conceptual system which are seen as relevant to the focus of the study. In doing so the author remains respectful of Karl Popper's (1965) dictum:

It is only in searching for refutations that science can hope to learn and advance. It is only in considering how various theories stand up to tests that it can distinguish between better and worse theories and so find a criterion of progress.

(p.22).

B. BACKGROUND TO THE STUDY

The Seminar for Research in Art Education at Penn State University (1966) offered an opportunity for stock-taking. ...There was concurrence that within the domain of art education researchers might concern themselves with questions regarding intent or purpose, clarification of meanings and concepts peculiar to what we do in art education, as well as the inter-relations of these concerns.

I. Johnson, et al, (1979).

Education systems are collective, open-ended enterprises built on and supported by a wide range of complicated, interconnected, and constantly changing contexts and concepts (Geahigan, 1976; Unruh & Unruh, 1984). Knowledge does not remain static and because an education system tends to respond to and reflect shifts in a society's values and perceived needs, the professional educator must operate within a transitional framework of concepts, theories, and contextual factors (Tanner & Tanner, 1984).

Many of the basic concepts which undergird such frameworks are initiated out of particular philosophical assumptions and beliefs about the value and function of formal education

systems (Hills, 1982). The extent to which curricula adequately and/or appropriately reflect those notions can be seen to depend, in some measure, on the degree to which the related basic concepts are both defined with precision and clarity and understood and used with confidence. These fundamental concepts are basic to any intelligent thought or discourse about education and even the most primary theoretical and practical work requires the support of concepts which are generally understood and reliable (Soltis, 1978; Smith & Ennis, 1961). An adequately defined concept can be seen as an essential tool for the professional educator, providing basic orientation to the form and function of the system (Brodbeck, 1973).

Educational discourse cuts across a variety of contexts in which different sorts of issues may be at stake, though identical terms may reappear throughout (Scheffler, 1960) and the work of evaluating, developing, and implementing curricula can be complicated by the highly abstract and ambiguous nature of some of the concepts which are used to help determine educational theory and practice (Hills, 1982). Lack of agreement or confusion over the meaning of terms and definitions which are intended to clarify and represent a concept can serve to seriously hinder the tasks of justifying and prescribing the form and function of a

field of study, an area of research, or a course of action (Smith & Ennis, 1961; Geahigan, 1976). Reliance on and use of ambiguous terminology and ill-considered definitions can confuse communications between curriculum theorists and precipitate theoretical exchanges which can often be at cross-purposes (MacDonald, 1971). Conceptual errors, exacerbated by the misunderstanding and misuse of related terms and definitions, can be seen to impair the theoretical and practical work of an educational system. A theory which is conceptually inadequate - one which can be interpreted in many different ways or is difficult to comprehend - can serve to narrow and limit communication within the field (Geahigan, 1976).

Dobbs (1971) points out that all disciplines within education continue to struggle with language problems related to definitions and descriptions. Frankena (1966) maintains that there are reasonable grounds for seeing many of the terms and definitions used in educational language as ill-considered and improperly utilized. Smith & Ennis (1961) concur, seeing many of the terms and definitions used in educational discourse as either inadequate to the role assigned them or improperly used as tools in work associated with curriculum theorizing, evaluation, and development. Ornstein (1977) contends that communications about

educational matters have become increasingly confused and obscure particularly in relation to educators making statements about knowledge, schooling, and education. Hirst & Peters (1970), while emphasizing the need for educators to develop the ability to be discriminating and precise in the use of words for the purpose of understanding a concept, also see a major stumbling block in the diversity of meanings which can be attached to terms within different educational contexts or domains. Individuals may differ widely in what they believe a term to mean or may incorrectly assume there exists a consensus regarding its meaning and function. DiBlasio (1978) categorizes such terms as 'loaded' and maintains that they can carry a wide variety of belief claims or suppressed premises of belief.

Professionals across the general field of education rely to a great extent on the 'special' or 'technical' language of education to facilitate and describe their work within the context of administration, curriculum work, and classroom practices. Particular special languages have evolved in service of distinct subject areas as well as for the general system of education and such languages, with their embedded terminologies, serve not only to direct and redirect the procedures of the system but also to commit its practitioners to certain strategies and methods:

... we find that some educational words have power - the power to redirect the procedures and purposes of educators. But words ... do not possess power in themselves. To attain their power, the total framework of the ideas these words represent must be fully understood by those who use them. Without such an understanding, many educational words become empty slogans; or, even worse, they provide the licence for doing anything under the protective blanket of their impressive names. In this way, educational abuses and failures can arise in what seems to be a reasonable and workable educational plan. But if the word is only as good as the idea behind it, we as educators should ask ourselves more frequently just what this or that educational term means. To what assumptions, values, theories, and strategies for teaching do these words commit us (Soltis, 1978, p.90)?

How well a complex enterprise such as a formal education system functions - how well it establishes and clarifies its basic philosophies, values, and concepts and transposes them into effective form and action - can be determined by both the degree of precision with which essential ideas and information are transmitted throughout and by the ability of

those who depend on and work with such data to understand and translate it into effective practice (Soltis, 1978). Without the support of both general and specific special languages built on clear and agreed terms and definitions, the confirmation and promotion of essential and foundational concepts and beliefs is a problem. If the languages of education are to play a viable role in supporting its practical and theoretical work, and if educators are to have confidence in the utility of those languages, continual attention should be paid to the tasks of clarifying the meanings of basic terms and establishing and maintaining precision and confidence in their use (Hills, 1982; Brodbeck, 1973; Hirst & Peters, 1970).

C. THE LANGUAGE OF ART EDUCATION

The field of Art Education has its own distinct history of changing contexts, shifting values, and mutable concepts (Effland, 1984; Feldman, 1980; McFee, 1966, Hamblen, 1984; Keel, 1965). Over the span of the last century Art Education has developed its own special language to help describe and support its work. This language also has its inherent and unique problems related to the clarification of basic concepts and the utilization of definitions and terminology within the language of the field. Concerns exist regarding the utility of the language used to describe the basic concepts and formulae which undergird, or are assumed to undergird, Art Education theory and curricula. Some theorists believe there are important questions to be asked regarding both the clarity and precision of the language and the role it is able to play within the workings and communications of the field. Eisner (1968), for example, states:

We do not have in our professional discourse, the degree of specificity that we need in order to communicate with precision. ...We need a language that will illuminate and define operationally those key qualities that we are interested in studying.(p.53)

Agreement on the meaning of common terminology is fundamental to the success of a support language but according to Dobbs (1971) there is, in the field of education, a lack of agreement as to the meaning of many commonly used words and phrases. Under close scrutiny, claims Dobbs, many of the most common terms used in Art Education discourse can be found to be so overlaid with multiple meanings that their utility to the field is seriously compromised. Because of the lack of general referents and common agreements art educators tend to spend considerable time working to overcome the resulting confusion.

Both the lexicon of special terms and definitions which populate the language of art education and the lack of agreement regarding their meaning and usage have been cited as contributing to conceptual and definitional problems not only within the field itself but in relation to communications across disciplines as well. Practitioners in various educational fields may find it difficult to communicate across specialties or within their own field due to a variance in interpretations and understandings of basic terms and concepts (Ornstein, 1977). Scheffler (1960) warns that definitions from the field of science, for example, cannot often be fitted into the stipulative, descriptive, or

programmatic definitions of education without the risk of serious distortion and DiBlasio (1978) sees problems for art educators not only in dealing with in-house confusion over beliefs and knowledge claims embodied within art education language but in dealing as well with the language of other fields with whose belief claims they must also relate. Art educators, in the course of inter-disciplinary communication, might encounter terms which have a number of customary meanings in diverse fields and may become confused in trying to relate those terms to art education while dealing with their use in such areas as psychology, sociology, or philosophy (Dobbs, 1971). In addition, communications between art educators and the general public might also be made difficult and confused by the sometimes exclusive nature of both art educational and general educational languages (Hobbs, 1973).

For art educators the task of finding general agreement regarding concepts of design and design studies/education remains a problem particularly in relation to the ways in which the terms have been or may be used within the language of the field and in regards to the planning and implementation of design studies components of school art programs. While the term 'design' is commonly used throughout art education discourse and within art curriculum

descriptions, there remains, within the field, considerable confusion about what the term means or describes and how reliable it is as a working term within art education communications. While it might be argued that within certain disciplines or fields of study such as architecture, engineering, and commercial/industrial design there might be little if any confusion about or argument over the meaning of the term or how to formalize its processes and study, it appears that within the field of education consensual conceptualizations of design and/or design studies/education have yet to be satisfactorily settled into the work of establishing agreed rationales, goals, and objectives for design as part of art curricula. A lack of consensus appears to exist across educational systems and this is perceived as a problem issue even within those systems which boast an extensive background of design education research and development.

Baynes and Archer (1976), working out of the Design research Unit of the Royal College of Art, argue that the conceptual ambiguity of 'design' presents a major problem for art educators attempting to keep pace with changing values, needs, and methods within general and art education. In a recent editorial in *Canadian review of Art Education*, Webb (1987) drew attention to the problems educators have in

trying to communicate about design and design education across systems and cultures:

Talking recently with an English art educator about design, I became more aware than usual that we do not speak the same language. I do not mean this just in the "cheerio chum" versus "catch you later" sense. The point is that the present connotations of particular terms emerge from a history of use, and the effects can be subtle indeed. ... Although language may provide for subtlety, that subtlety may be layered to the point where larger complexes of meaning are affected, and shared understanding is threatened. ... The point is that, although words are identical, the connotations of the terms design and design education in the United Kingdom are at variance with those with which Canadian art teachers have commerce. (p.1)

Webb's statement draws attention to the fact that there is concern within the field regarding the analysis of held concepts of design and design education and the ways in which those concepts, definitions, and terminologies might influence art and design curriculum development.

Philosophical orientations towards, and concepts about

educational content and strategies can become embedded within the terminology of the languages educators use (Smith & Ennis, 1961). Such terminology can carry individual and/or collective predilections about what is to be done and why it is to be done. Decisions influenced by changing values and conditions can be embodied in the ongoing revision of the definitions of relevant terms (Scheffler, 1960). A professional educator's confidence in the value and utility of the language can be tied directly to his or her belief that the language's essential terms and phrases are generally used to talk about, and describe, the same things (Smith & Ennis, p.10). An important basis for choosing a particular concept and definition for educational purposes should be a consideration of those consequences which result from their adoption and use.

D. RATIONALE FOR THE STUDY

Philosophical research is systematic inquiry into questions of meaning and value related to knowledge in and about visual arts. Systematic inquiry implies a logical system of asking a question or defining an issue or in general delineating a conceptual area to be investigated. (Cardinale, 1979, p.3)

To maximize the utility of the languages of education and help in supporting its capacity for contributing positively to the practical and theoretical processes of the field it is important to scrutinize their structure and usage for the purposes of determining where clarity and meaning might be lacking (Ornstein, 1977). In order to move beyond the constraints imposed by predilections for thinking or framing problems in certain ways, the way we use essential terms and expressions in educational discourse should be critically examined (Smith & Ennis, Preface).

If ambiguous language and terminology serves to cause particular problems within curriculum theorizing and planning - if there are instances where individuals or groups differ in their understanding of terms and concepts and if the process of determining the form and content of a program of study is complicated and/or influenced in any way

because of a lack of agreement - then an analysis of how basic terms and definitions have and do function within that process can be seen as warranted.

E. PURPOSE OF THE STUDY

This study is based on acceptance of the following premises:

1. The study of design, in some way, is an educational concern of art curricula.
2. Vague and ambiguous terms and concepts are insufficient for determining the aims, purposes, and content of a curriculum.

This study centers around exploring and mapping the conceptual and logical terrain of the fields of design theory, design methodology, and design education theory and curriculum development, with a particular concern for examining the ways in which the basic concept of 'design' has or has not been defined or described.

The purpose of this study is to test the following hypotheses:

1. The concept of 'design' is vague and ambiguous; it lacks any definition that finds consensus within or across the fields of design theory and methodology or art & design education.
2. The basic term 'design' is unreliable when applied to discourse relating to design and/or design education or to the work of determining the aim, purpose, and content

of design-related activities within art curricula.

3. The ways in which design-related studies and activities are (or are not) described or prescribed within Canadian provincial art curriculum documents reflects a general lack of agreement regarding the basic concept of design and the ways in which the study of design could be accounted for within art curriculums.

The intention of this study is to undertake the following program of analysis as a means of drawing conclusions regarding the hypotheses:

1. Identify the major paradigms or conceptual orientations that have informed the development and adoption of contemporary concepts of design and design education.
2. Outline the conceptual constructs of such paradigms by isolating and analyzing underlying claims, assumptions, and premises.
3. Determine if such claims and related arguments have a basis in fact or are unsubstantiated.
4. Examine the field of design education theory and curriculum development for statements, theories, or claims concerned with the relationship between the definition of design and the development and implementation of design studies programs in schools.
5. Undertake a limited content analysis of available Canadian provincial art curriculum guides with attention

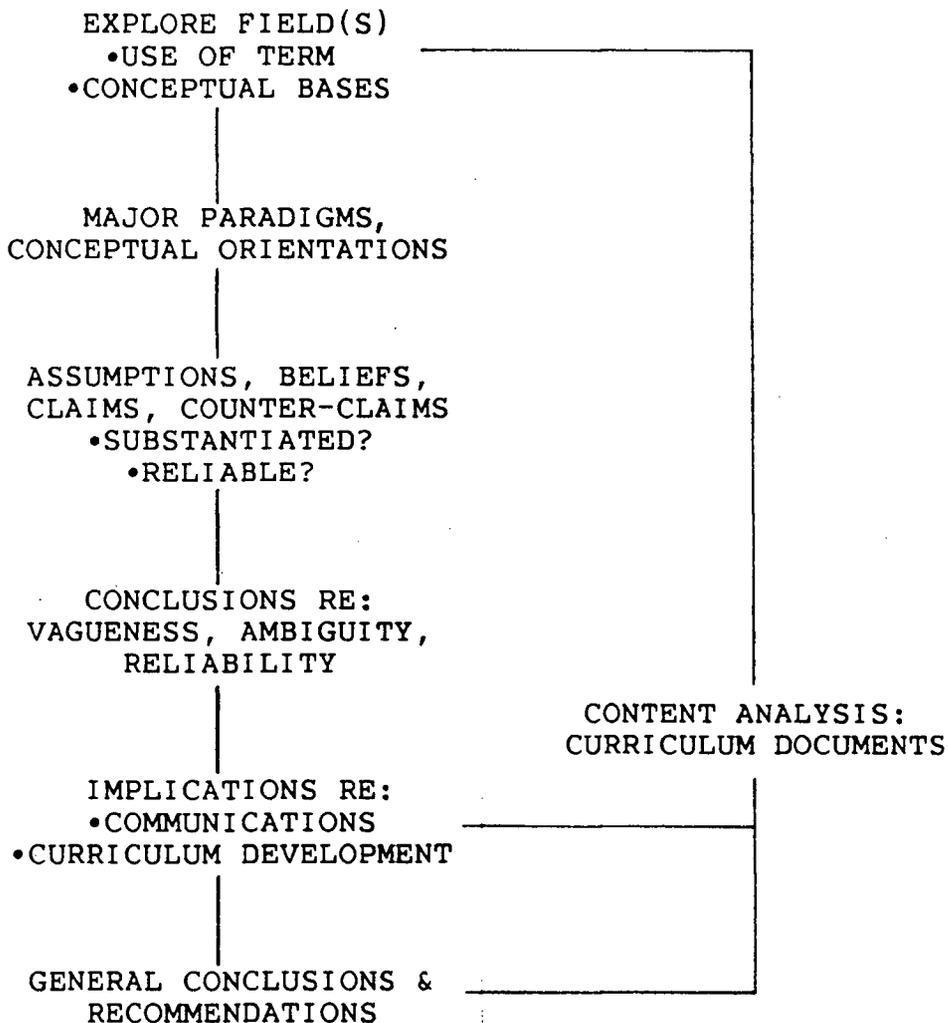
to definitions of design, rationales for design activities, and stated goals and objectives for design-related activities. Compare with selected curriculum models from other educational systems.

6. Using a model adapted from Soltis's (1980) delineation of 'Analytic Strategies' determine which of the following categories best describes the 'Analytic Situation' which exists in relation to the conceptualization of 'design' within the concerned fields:
 - a. *Generic Type* - Undisputed model case(s) of the concept of 'design' are readily available, but generic features shared by model species are not clearly spelled out.
 - b. *Differential Type* - The concept of 'design' seems to have more than one meaning and their identities and the basis for differentiating between them aren't clear.
 - c. *Conditions Type* - Undisputed model cases don't seem to be readily available and standard instances of the concept of 'design' can easily be made by changing a context condition. (p.90 - 120).
7. On the basis of the determination of the 'Analytic Situation' consider implications for the development and implementation of design studies and activities within art curricula.

art curricula.

8. Make recommendations for further study and research related to the conceptualization of 'design' and the related development of design studies programs and education curricula.

The following diagram charts the analysis procedure:



This study will, in part, take the form of a 'Reported Definition' and will seek to both analyze and clarify core concepts, terminology, and definitions. It will serve to further clarify the relationship between the use of language and the holding of presumptions or presuppositions related to the meaning of terms and concepts and the development and articulation of rationales, goals, and objectives for design-related activities within art & design curricula.

It is not the intention of this study to offer or posit any new Operational, Stipulative, or Criteria-Attachment definitions of 'design' or 'design education' even though one or more of these might emerge as a consequence of the analytic procedures.

It is also recognized that the sampling of curriculum statements is limited due to time constraints and availability of the documents and does not, therefore, represent a view of design education approaches beyond those available documents referenced. Because of the chance of revision or replacement during the time of this study the documents referenced might not represent present positions on design studies on the part of certain school systems or institutions.

Any conclusions drawn from data or communications included in this study do not necessarily apply to situations or conditions which might exist beyond the sources of the data.

F. DESIGN OF THE STUDY

This study will undertake an Analytic Philosophy of a particular aspect of the field of education - one that is seen as closely interrelated to and influenced by attitudes, values, and practices outside the field of education. This study recognizes the essential interactive nature of the relationship between design, design methodology, and art & design education and sees the theoretical and practical concerns of all these fields as constituting the essential domain of study for this thesis.

In clarifying the concept of Analytic Philosophy Green (1971) offers the following statement:

... it is primarily concerned with the clarification of concepts and their relations. Consequently, questions of philosophy tend always to be framed in terms of concepts to be analyzed and patterns of thinking to be clarified. ... The analysis of a concept is the description of its use. It is describing when the concept applies, when it does not, how its subtle nuances incline us to think one way or another when we use it, the delicate differences of meaning it receives in different contexts, and how the likenesses and differences

between those contexts lead us to one or another use of the concept. ... One way to study a concept is to examine how it is related to others, which concepts are connected to it, and which ones are not. ...

Hence the principle: A concept is the locus of inferences permitted by the various uses of a term (p. 10 - 11).

Park (1963) sees Analytic Philosophy, particularly as it applies to education, as a means "... to unsnarl the logical and linguistic tangles in pedagogical knowledge" (p. 7 - 8). He further argues that all educational objectives appear to be value judgements of some kind and that it is important to isolate and analyze the explicit and implicit presuppositions which might underlie particular philosophies or points-of-view.

Phenix (1975) also points out that education is grounded in the search for meaning and suggests that the primary goal of any philosophy of education or curriculum is to distinguish and correlate the various domains of meaning. Green (1971) argues that we should analyze a concept by studying the meanings of its related terms and that this is best accomplished by looking at the ways in which the term (concept) is used (p. 11).

And finally, Jaeger (1988) suggests a process of examining examples and contrasts as a means of clarifying notions and concepts - an analysis and comparison of paradigmatic examples which illustrate the typical uses of a term and which are assumed to illustrate what a term means or when it should or should not be applied.

G. DATA SOURCES

In regards to the collection and analysis of statements, communications, and data, this study is concerned with drawing material from those contexts in which concepts, sub-concepts, and definitions of design and design education are found and considered appropriate to its focus and intent. For this investigation the following sources will be explored for relevant material:

1. Publications related to design and design education theory, history, and practice.
2. Research and working papers related to design studies curriculum development.
3. Curriculum statements, guidelines, and communications from Canadian, British, and Australian sources.
4. Professional journals, consultative documents, and position papers related to design, design education, the history of design, and art & design curriculum theory and development.

H. DEFINITIONS OF TERMS

CONCEPT - Abstraction from observed phenomena: A term that states the commonalities among those observed objects or events and distinguishes them from other objects or events.

CONCEPTUAL CONSTRUCT - Concepts combined into meaningful patterns: A complex abstraction which is not directly observable.

CRITERIA-ATTACHMENT DEFINITION - Attaching criteria to a term. The criteria do not give the meaning of a term but they tell how a term should be applied in the view of the person giving this kind of definition. Definition is judged on the basis of the justification for attaching the criteria to the concept expressed by the use of the term. Since their acceptance often implicitly embodies value judgements, these criteria can be justified or unjustified.

OPERATIONAL DEFINITION - A definition which equates a concept with the results of certain measurements. Makes it possible to pin down the meaning of any term in a way that will eliminate vagueness.

RELIABLE TERM - A term which carries the same meaning in

every usage or circumstance. Such a term can be depended on and used with a high degree of confidence.

REPORTED DEFINITION - Reporting a meaning: attempting to give an accurate representation of the usage of a term for some individual or, more commonly, for some group, subculture, or language community. Since usage changes over time, so do Reported Definitions. They can be correct or incorrect.

STIPULATIVE DEFINITION - Stipulating that a particular word shall express some concept. The meaning of a term for a given situation or set of situations. The criterion is generally convenience.

II. DESIGN CONCEPTUALIZED

A. HISTORICAL OVERVIEW

In English the term 'design' can carry many meanings while most European languages do not have a single equivalent word. The term, as defined by architects, artists, educators, engineers, or craftspeople can encompass a wide variety of notions regarding methodologies, activities, and/or products. It can be used as a noun to describe an object like a plan, drawing, or representation, or as a verb to describe a way of thinking or particular way of doing things. Baynes (1976) has suggested that how one defines design depends on what one wants to accomplish and that definitions which have meaning and utility for one particular field or discipline might not be meaningful or useful for another.

Concepts of design can range from broad philosophical notions to prescriptions for particular methodologies. Papanek (1970), for example, views design in terms of an unfolding, ever changing philosophy - a way of looking at the world in general and learning how to change it. Baynes (1976) sees design as involving all the creative work that goes into the making of a material culture while Mason

(1979) perceives design as a close intermingling of economics, aesthetics, and craftsmanship. Yoemans (1984) talks of design in terms of a particular function of perception while Munari (1972) defines it simply as communication. Roberts (1982) maintains that design is a generally misused shorthand term which describes the efforts of all the traditional art subjects.

Such a diversity of conceptualizations and definitions adds to ongoing confusion regarding the proper application of the term within general and special languages. Brendendieck, in an address delivered at the International Design Conference in Aspen in 1977, drew attention to the ambiguity of both the root term and the supporting sub-terms on which a definition should be built and compared the situation to the way in which language is developed and used within the field of science:

Over a period of centuries, science has built up theory and method and a constantly evolving terminology to keep pace with its stages of development. There is a never ending adjustment among "fact", theory, and terminology, one of the main characteristics of progress in any field. In the area of designing, however, we find a very different mental climate. Typical discussions

usually abound in such vague and nebulous terms as "rhythm", "balance", "proportion", and "harmony", with the recent addition of references to "function", "requirements", "analysis", etc. Compared to the characteristically more precise definitions of science, which make agreement between individuals possible, such terminology offers a harsh contrast. It is readily seen that the ambiguity of such words leaves them open to any and every interpretation, and that agreement between persons employing these terms becomes next to impossible. There seems to have been little effort to define terms or to come to agreement regarding conscious or unconscious assumptions. But until such an effort is made, progress will remain slow in the field. For progress depends on communication among the practitioners, and communication, to a large extent, depends on agreement as to the meaning of basic terms. (p. 73-78)

Within art education discourse and communications the term design can be found to describe and prescribe a variety of different and sometimes conflicting concepts of either whole programs of study or specific processes or activities within art, technology, home economics, industrial arts, media,

graphics, and even computer studies curricula. Yet while the term finds considerable use within the field of art education, the wide variety of meanings and notions found attached to it and the lack of general agreement about those meanings poses particular problems to the work of establishing what the form and function of design studies/activities might or should be within the general framework of established and/or developing art curricula. Agreed definitions of 'design' and sub-concepts such as 'a design', 'design awareness', 'design capacity', 'design process', 'design method', 'applied design', 'design studies', and 'design education', which might function as foundational concepts for curriculum development, remain illusive. Baynes (1976) sees this conceptual/definitional confusion as an obstacle to the task of keeping art curricula at pace with changing social values, conditions, and needs:

At the philosophical level there is an area of great confusion about terminology, but this only conceals an even greater area of difficulty about understanding the nature of design and its relations with art, home economics, handicraft, technology, and other school subject areas. (p.21)

In regards to placing a concept of design within an

educational context the British Design Council (1987), which has a long history of involvement with design education issues, has also drawn attention to the problem of finding agreed definitions of design and related sub-concepts which would have utility for curriculum development:

The term design undoubtedly gives rise to problems of definition. While those who are professionally engaged in design may have a clear idea of its meaning (and even amongst them, there will be differences of emphasis and interpretation), to the world at large there is no such consensus. Some see it as concerned with decoration and ornamentation, and may, in the school context, associate it with particular aspects of art. Others think of it in terms of crafts, such as pottery, or work with textiles, while others, thinking of the growth of craft, design and technology (CDT) as a subject in secondary schools, think of design as to do with construction or technology. Others still think of it as problem-solving and associate it with science.

(p.3.2)

In an 1980 report, *Design Education at Secondary Level*, the Council again focused on the the conceptual/definitional issue which it believes should be taken into account when

attempting to establish a consensual definition of the term design for educational purposes:

... 'design' can embrace the activities and products of the architect, the craftsman, the decorator and the artist. It can describe the work of the textile designer, the silversmith, and the creator of stage or television settings. One can 'design' a machine, a system, a publication, an electrical circuit or an experiment (p.4)

In the process of outlining the problem he believes education faces in adapting existing subject traditions to a growing recognition of design activity as a viable medium for education, Baynes (1976) has argued that the major difficulties facing teachers in art and design education is confusion about the central concept of design itself:

A definition of design that would be useful to a designer might not help an historian and might possibly outrage a philosopher. ... For the teacher ... the problem is even more acute. He is likely to come into contact not only with his own conception of what design is, but also with the separate conceptions of each of the children he teaches. These, in turn, will have come from family background, popular mythology, and the mass media.

The situation is not helped by the existence of conflicting views within the design professions and between various groups of educationalists. ... The part of me that is a designer seeks a narrow and operational definition; the part of me that is historian seeks for a definition that will reflect the way in which the word has actually been used in the past; and the part of me that is involved in teaching looks for something which will be broad enough to fit the aspirations of liberal education. (p.23)

Programs of study which constitute what are generally considered to be the traditional subject areas within established art curriculums do not appear to suffer from the same kind or degree of conceptual/definitional confusion. If there remains any confusion or lack of agreement regarding the basic concepts of disciplines and/or fields of study such as drawing, painting, printmaking, sculpting, potting, weaving, or photography, the issues do not appear to be as complex or as controversial as is the case with design and its related sub-concepts. In many ways the problems educators confront when trying to work with or find agreed definitions and concepts for design and design related activities are not unlike those associated with finding

meaningful or appropriate ways to account for aesthetics or creativity within an educational context. Many art curriculums describe and/or prescribe some kind of design related goal or activity whether it be a foundational exploration of the elements and principles of design within a general program of art studies, or as a particular subject area such as commercial or applied design. In some subject areas or programs of study the term design might not even be attached to activities which might usually be thought of as design related and in other cases courses which deal primarily with particular applied art or craft subject matter are given the general label of 'Design'. Design programs of some kind or another are considered an important aspect of formal visual art training within foundational studies programs in art schools and colleges around the world and educational systems such as those in Great Britain and Australia have shown considerable concern for the articulation of design activities through all levels of primary, secondary, and post-secondary education (Design Council, 1976, 1977, 1978, 1985, 1987; Education Department of Southern Australia, 1978, 1984; Department of Education, Queensland, 1984, 1985).

In order to clarify the evolution of design education concepts and to better understand the ways in which design

curriculum may have been planned and implemented, it would be useful to focus on the general historical context in which these developments have taken and are taking place. Within this broad context it is apparent that one issue which has had a significant impact on the development and implementation of design studies/education is that to which Baynes has pointed - the problem of defining the basic concept of design itself.

The generally held contemporary notion of design, which appears to be very broad and amorphous, owes its genesis to the ideological, social, and industrial changes which were brought about by the Industrial Revolution. Until the emergence of mass production techniques the process of 'designing' and making goods and artifacts adhered to a long tradition of highly individualized 'craft' skills and methods which tended to service personal or strictly local or regional demands. Against the background of increasing scientific enquiry and industrial development which characterized the 19th century, traditional systems of apprenticeship and skills training had to adapt to the demands of a more egalitarian society. The traditional activities of the narrowly focused craftsman were eventually pushed aside and made irrelevant by the emerging expertise of someone called a 'designer' - a professional who

understood both the promise and the capabilities of the new mass-production and distribution techniques and changing needs and expectations of societies in transition. With the inexorable shift of patronage from a few to the many the concept of craftsmanship was reformed into a new concept of 'design specialism'. In response to the workings of 19th century science and industry and the demands of the new economic and social environment which was being forged as a result of those efforts, contemporary concepts of design and the role of the designer were born.

Through the Victorian era a number of influential artists and designers, most notably those who followed the lead of prominent designer William Morris, remained preoccupied with and committed to the preservation of traditional approaches to ornamentation and surface elaboration. The 'Arts and Crafts' movement of this period represented the belief that industrialization was an aesthetic curse which was destroying human purpose and culture and its advocates remained adamantly opposed to any degree of reconciliation between art and industry. They promoted a return to pre-19th century craft practices and valued highly the individualized, highly-skilled production of goods and artwork.

By the beginning of the twentieth century the claim that mass production was rather a basis for the evolution of a new, more affluent and challenging culture than a threat to the existence of culture had been more or less accepted by industrialized societies. The Art Nouveau movement, which spanned the turn of the century, represented both a breaking away from the dominance of historical forms and motifs and a repudiation of the imitativeness of Victorian design. By the 1920s concepts of design as a marriage between theories of art and the practices of industry provided the basis on which the rationale and goals for the Bauhaus school in Germany were formulated. The Bauhaus philosophy proposed a break from any connection with the past and the establishment of what was assumed would be a value-free and culture-free approach to learning - an orientation which would be independent of social and cultural preconceptions. A fundamental goal of the Bauhaus was to help designers learn how to work with the machine and the ultimate test of the designer's expertise was his/he ability to adapt the process of design to the potential and demands of mass-production. The concept of foundational studies - knowing, understanding, and applying the elements and principles of design - was born in the Bauhaus program and remains an influential force in the planning of art programs at all levels of art & design education around the world.

Essential to the Bauhaus concept is an emphasis on finding solutions to functional problems stated within the parameters of a prescribed design 'program'. It is assumed that design work conducted within such parameters will yield a value and culture-free solution which will satisfy stated, predetermined functional requirements. The tradition of 'systematic' design, embodied within what has been termed the contemporary 'design methods movement', owes its genesis to the Bauhaus philosophy and curriculum concept (Maser, 1987; Skerl, 1987).

By the 1950s notions about design moved closer towards that of a 'scientific' and totally objective process. The teachings of the Hochschule fur Gestaltung at Ulm underscored a growing acceptance on the part of artists, designers, and architects of the belief that the process of design could be rationally determined - that the process could be clearly and explicitly stated and precisely controlled (Rowe, 1987). These assumptions, which have so greatly influenced design theory, practice, and education over the last thirty years have come to be rigorously questioned and tested through the 1960s and '70s, particularly by theorists and educators working or interested in the emerging field of 'Design Methodology' (Cross, 1984). Many of these concerned parties believe

'systems' approaches to design and design studies tend to deny what they consider to be the 'subjective', essential aspect of design activity.

Out of this broad historical perspective two major design paradigms or conceptual orientations can be isolated and considered as dominant factors in the formulation of assumptions, beliefs, theories, and methodologies related to the practice of design and the evolution of design education approaches over the past forty years. The first paradigm or conceptual orientation tends to define design in terms of utilitarian, functional activities which are undertaken by trained, specialist designers applying refined skills through predetermined and systematic methodologies. In particular this concept pinpoints the 'problem-solving-process' as the fulcrum around which the design process turns. The second (and historically the most embryonic) concept proposes design be conceptualized in relation to a perception of 'design capacity' or 'design capability' as a fundamental human capacity that is as basic to human development as numeracy and literacy. This capacity, it is held, is defined in terms of a perceived human predisposition towards shaping the environment to satisfy needs related to survival, comfort, and personal and cultural expression. How these conceptual orientations have

developed, have been embraced by the design and design education fields, and how they have or might continue to inform the development of art and design curricula is the concern of the following analysis.

B. DESIGN AS PROBLEM-SOLVING

Over the last one hundred years two particular themes have informed theory related to the conceptualization of design as a problem-solving-process: the associationistic/mechanistic orientation of the late 19th century which related problem-solving behaviours directly to what were considered irreducible lawlike relationships that governed all mental processes; and the behavioural-nonmentalistic point-of-view which rejected the notion of governing inner mental processes and saw human behaviour explainable only in terms of empirically measureable factors.

Under the doctrine of associationism it was held that the sole mechanism of learning lay in the association of impressions that were repeatedly presented, in combination, to the senses. Mental images, sensations, and feelings, were seen as necessary and critical aspects of the process of learning. Creativity was perceived as a largely random event and creative problem-solving as a series of associations producing new attachments which lead to new insights about the problem (Rowe, 1987; Cross, 1984).

The behaviourist position, which evolved on the heels of the Gestalt notion of holistic organizing principles (Rowe,

p.44) attempted to observe human behaviour by empirical methods and in turn correlate environmental factors or stimuli with what were believed to be consistent and quantifiable patterns of human response and behaviour. This view of problem-solving served as a bridge to the development of stage-process models which, it was believed, would serve to adequately describe man's interactions with his environment and could therefore be used in helping to establish guiding principles for the process of designing.

The notion of design as a reducible problem-solving-process - a process which can be reduced to a series of stages of systemized behaviours or activities and which affords the designer more control over and precision in the pursuit of successful solutions to understood design problems - has found a wide degree of acceptance within the fields of design and art & design curriculum development over the past 50 years. Many problem-solving models referred to by designers and art & design educators are anchored to an assumption that the whole process of design can be clearly delineated and explicitly stated, and that methodological parameters can be easily determined and prescribed. It is further assumed that the formal structuring of the design process will provide means for adequately dealing with the growing complexity and shifting emphasis and focus of design

problems related to contemporary life (Rowe, p.51-74).

The specific aims of 'stage-process design' are to reduce the degree of design error, re-design, and delay, and to make possible more imaginative, advanced, and successful design. In general, it is assumed that such a Cartesian view of designing - where it is important to break a problem down into fragments and solve each of these separately before attempting some grand synthesis - would make the process efficient and reliable. A process which is conceptualized as a structured movement from a set of givens to the reaching of pre-set goals promises the kind of accessibility and potential for operationalization which makes it particularly attractive to designers and educators.

Seeing design in terms of formal systems of data analysis, needs assessment, problem definition, and agreed precriptive methods is an orientation which owes much of its conceptualization to behaviourist psychology.

Behaviourist-based rigid-state models of problem-solving behaviour have greatly influenced the development of models of problem-solving approaches to design activity. In the late 1950s and early 1960s design and design education theorists, following the lead of behaviourist theory which postulates that human behaviour can only be adequately

explained in terms of observable, measureable, and replicable patterns of behaviour, attempted to define and describe the creative problem-solving process through the mapping of the logical structure of cognitive activities which were assumed to be taking place. Theorists working in the fields of architecture, engineering, urban design, applied arts, commercial design, and art and design education developed stage-process models of design which formalized the procedures and activities associated with, and deemed necessary to, the activity of design. This concept of 'design-as-problem-solving-process' became common to many professions and disciplines. Rittel (1984) has labelled this 'systems-approach' to design, with its heavy reliance on exhaustive data collection, data analysis, and solution synthesis, as the "1st Generation Design Method" (p.317-328).

This basic 'analysis-synthesis' orientation towards design methodology found wide agreement and acceptance in the 1960s and served to inform much of the design and design education-related research of that period. Many variants of the basic Analysis-Synthesis-Evaluation model were posited into theory and research including elaborations of the basic stage and stage-sequence concepts (Archer, 1984). Theorists such as Jones, Asimow, Archer, Luckman, Alexander, Maver,

Maldonado, and Gugelot developed various forms of stageprocess models for design which have and continue to influence architecture, design, and design education (Cross, 1984). These models are essentially morphological and in the main seek to quantify each activity and phase related to the design process as well as transform those factors which might normally be considered subjective in nature into objective, quantifiable aspects of an articulated set of prescribed stages. Many of the models were built on the primary assumption that it is possible to establish both agreed principles and and norms which would be worthy of continued emulation. According to these principles, procedures determined by theories regarding behaviours which were assumed to be common to all problem-solving type design activity would allow the designer to minimize risks imposed by preconceptions and subjective judgements, factors which are perceived to be threatening to the generation of good design solutions (Darke, 1984).

Jones and Luckman (1984), for example, have posited the following models of the 'design process' which tend to exemplify the analysis-synthesis orientation to design-as-problem-solving-process and can be seen as typical of 1st Generation Design approaches as defined by Rittel (1984):

SYSTEMATIC DESIGN:

1. ANALYSIS: Listing of all design requirements and the reduction of these to a complete set of logically related performance specifications.
2. SYNTHESIS: Finding possible solutions for each individual performance specification and building up complete designs from these with least possible compromise.
3. EVALUATION: Evaluating the accuracy with which alternative designs fulfill performance requirements for operation, manufacture, and sales *before* the final design is selected. (Jones, p.11)

THE PROCESS OF DESIGN:

1. ANALYSIS: The collection and classification of all relevant information relating to the design problems at hand.
2. SYNTHESIS: The formulation of potential solutions to parts of the problem which are feasible when judged against the information contained in the analysis stage.
3. EVALUATION: The attempt to judge by use of some criterion or criteria which of the feasible solutions is the one most satisfactorily answering the problem.
(Luckman, p.84)

In the late 1960's growing acceptance of what were perceived to be difficulties inherent to attempts to quantify what are essentially subjective factors within the design process caused a shift in the way design is generally conceptualized. Focus in design-related theory and research moved away from the classification and description of stages and stage-sequence models and more towards viewing design as a holistic process. Less attention was paid to normative theory and methodology and more to the development of models for design which took into account those factors which were recognized as subjectively based and thus less quantifiable. Assumptions which undergirded the analysis-synthesis models were examined more critically and challenged on the basis of a growing recognition of the failings of the unified approach, the most critical being, according to Darke (p.177), the lack of attention paid to the actual process of design as it occurs or unfolds in 'real' situations. Lobell (1975) delineates the issue in the following terms:

It is true that the conscious mind cannot juggle the numbers of variables necessary for a complex design problem, but this does not mean that systematic methods are the only alternative. Design is a holistic process. It is a process of putting together complex variables whose connection is not apparent to any describable system of logic. It is

precisely for that reason that the most powerful logics ever known have traditionally been used in the design process, that is, the powerful logics of the deep structures of the mind which operate free of the limitations of space, time, and causality, and which have traditionally been responsible for most creative work in all of the sciences and arts. In design we bring a lot of data to the mind, much of it unquantifiable, and we allow that data to dip in and out of the deeper structures of the mind, each time coming up with new integration forged by the powerful logics of the deep mind. However, we cannot consciously force these deep parts of the mind to function, just as we help the body learn how to ride a bicycle. The way this learning is done is through practice not through the conscious memorizing of steps in a system. ... Systematic methods in design often originate from people who are unable to achieve the necessary letting go in order to have access to deep structures, either through lack of natural ability or through poor education. Finding this process mysterious (particularly since they have never experienced it) they seek to demystify it through the establishment of a list of steps, which, if followed, guarantee a

design solution (p.122).

Nutt (1975) has also commented on the ways in which many design theorists have come to view normative design methods:

Linholm (1965) states that normative methods fail, at least in the public sector, because: they are not well adapted to man's limited ability to define; the investments in data and analysis cannot be justified; failure to agree on evaluation criteria, at all levels, does not permit a rational selection among alternatives; and normative methods are unable to capture or describe even a moderately complex design problem in its entirety.(p.302)

In regards to the ways in which behavioural theory or behavioural-based explanations inform conceptualizations of design, Rowe (1987) asks the following questions:

What is it about a definitive progression of activity that automatically results in a specific, further activity? Through what mechanism or means do we advance from analysis to synthesis? How is it that unique solutions are often rendered to problems, when the information processing that takes place seems so straightforward? As far as they go, staged-process models do illuminate certain commonly

observable features of design activity; yet the illumination is at a comparatively low level.(p.50)

Rowe's questions serve to define one of the central concerns held by theorists in regards to models of design methodology and study which suggest a thorough analysis of data, requirements, and mutual implications be undertaken before any move is made towards formulating a solution. Hillier (1984) and Darke (1984) offer, in contrast, the notion of design as a process in which it is possible, and perhaps more natural for a designer, to generate a solution or concept before the data is analyzed or the requirements worked out. This concept is exemplified within what Darke (p.179) calls her 'conjecture-synthesis' model of design - a model which recognizes the possible subjective basis or nature of the proposed solutions or 'conjectures' and assumes that these can be influenced by any number of factors including emotional/intuitive responses to social environments, personal predispositions and values, creative responses and perspectives, or perspectives influenced or determined by education and skills-training experiences. Darke calls these factors 'primary generators' and her conjecture-synthesis model of design emphasizes the need to recognize these factors.

This model, because it is not tied to an assumption that

problem-solving behaviours can only be explained in concrete, measureable terms, defines a more liberal, open-ended concept of the design process. Subjective (and perhaps non-quantifiable) factors are seen as critical aspects of that process and, in contrast to the analysis-synthesis orientation, the conjecture-analysis model attends more to both the wide variance that might exist in the ways individual designers approach a given design situation and the ways in which subjective responses to those situations might influence both judgements and the formulation of goals and conjectures. Darke's research into the ways in which architects approach design situations has led her to conclude that 1st Generation or analysis-synthesis models have little if any real application to the process of designing:

One of the shortcomings of the early phase of design methods research was that it concentrated on design morphology, a sequence of boxes bearing particular labels, rather than the way particular designers filled the boxes with concepts, and the source of the designer's concepts (p. 187).

Darke suggests that designers do not start, and are not inclined to start, with a consideration of a list of factors or predetermined performance limitations. Rather, she

claims:

... they have to find a way of reducing the variety of potential solutions to the as yet imperfectly understood problem, to a small class of solutions that is cognitively manageable. To do this they fix on a particular objective or small group of objectives, usually strongly valued and self-imposed, for reasons that rest on their subjective judgement rather than being reached by process of logic. ... It is clear in most cases that the design concept was arrived at before the requirements were worked out in detail, and necessarily so, since these requirements could only become operational in the context of a particular solution. (p.187)

Akin (1984) also believes that no model based primarily on quantifiable factors is complex enough to represent the real-life complexities of the design process, and Lawson's research (1984), which focuses on design strategies, appears to support Darke's conclusions regarding pre-analysis conceptualization:

... it seems quite reasonable to suppose that designers would evolve a methodology which does not

depend on the completion of problem analysis before synthesis can begin (p.206).

Many theorists and educators concerned with the application of design methodologies to architecture, applied design, and art & design education appear to agree with the basic notion of design-as-problem-solving-process. Design education literature yields many concepts and rationales for design studies curricula which appear to be anchored to this foundational concept. For example, in discussing how art and design education should respond to the changing role of the artist/designer in contemporary society, Green (1974) outlines his specific definition of, and criteria for, design:

Design is a human activity in which everyone is involved; it is a process of identifying needs and establishing critical priorities. ...All design decisions relate to the problem-solving process: such a process is clearly close to the fundamental processes of our lives. ... Experience of problem-solving is common to education, the design process, and daily life, and is therefore central to any ideas related to design education. ...This universal process of problem-solving is what design is all about. We are all involved in the critical

process of design. (p.7-8)

Horrocks (1969) has attempted to relate design process to the task of helping students find a means of indentifying and giving priority to those aspects of the physical and social environment which should be understood and perhaps changed:

Problem-solving is a basic human activity in which we are all engaged - the designer extends the potential of problem-solving by adopting a methodical approach. Problem-solving plays a prominent role in the activities and educational experiences we are discussing. It is a rational, decision-making process, and in some aspects differs from many traditional forms of art and craft education which have been most concerned with irrational, intuitive experiences.

...Problem-solving can be used as the vehicle for immediate experience - for example, where manipulation of a material provides a direct solution. At the other extreme it can provide the basis for a prolonged project involving much preliminary research and organization of information.(p.37-38)

Design education theorists such as Baynes and Harahan have,

however drawn attention to what they see as the limitations of design curricula based on a rigid concept of design-as-problem-solving. Baynes (1982) states:

It is easy to agree with those who say that designers are essentially problem-solvers but it is equally easy to see that in terms of education this begs a whole series of crucial questions. Whose problems? Can designers solve all kinds of problems? Are some problems insoluble anyway? It seems a pity that many of the models of design activity used in general education are still so narrow. (p.113)

The problems of adopting the concept of design-as-problem-solving as the foundation of design curriculum development and of transposing to or imposing onto prescribed curricula are alluded to by Harahan (1978):

Terms such as 'problem-solving' and 'open-ended problem-solving' are often used to describe students' experiences in design education. In design research also, much time has been spent in examining designers' behaviour and methodology. But in an educational context, although the open-ended approach can be applied interestingly, one feels terms like these are often misunderstood. In

particular there is, as one might perhaps expect, a great deal of variation in the extent to which teachers direct students towards certain kinds of understandings, and in the extent to which they leave students themselves to 'bridge-the-gap' between their initial understanding and a solution to a given problem. ... the whole question of the way in which open-ended problem-solving is used as a technique for learning in schools needs to be thoroughly investigated if it is to be properly understood. ... In recent years there has been a fairly widespread use of professional design methodologies in schools as vehicles for learning. Often, equating design education with a 'logical approach' to work or curriculum structure seems to have given rise to misunderstanding and prejudice. ... Problem-solving is often understood to consist of a series of sequential steps, but it would seem that these steps would be better termed patterns and, further, they do not appear to be automatic or mechanical. ... Much has been written about design methodology, but the solution of a problem in an educational context should, it seems to me, be primarily concerned with those aspects of the student's response to the problem that involve a

search for decisions as to how to proceed. In other words, a student must be helped to develop his own methodology, in contrast to the frequent instances in which students and teachers see methodology as a closed prescription rather than an encouragement to look for further possibilities. (p.3)

In order to further clarify the basic concepts on which the analysis-synthesis and conjecture-analysis models of design methodology are based it would be useful to isolate and analyze some sub-concepts which are coincidental to both and which serve as foundational binding agents in the structuring of more general design and design education concepts.

C. SUB-CONCEPTS

Notions of 'need', 'problem', and 'creativity' are integral to many statements and/or models related to design methodology and design studies concepts. In many cases these sub-concepts serve as the basic conceptual elements on which the more general concepts are developed. However, even while it is often held that such subconcepts are necessary to any general and/or particular notions of design and the design process it is possible to view them, in their own right, as being somewhat vague and ambiguous in the conceptual sense. If these sub-concepts are held as critical players in the task defining and/or validating broader concepts then there is also value in examining how reliable they might be in their given roles.

a. Need

Papanek (1970) has stated "All design must fill a human need" and therefore an understanding of how man has emphasized and de-emphasized particular needs and has devised means for satisfying those needs is essential to the task of determining how present and future needs might be attended to through the process of design (p. 47). Archer and Eggleston have pinpointed the identification of needs as

an essential and legitimizing aspect of the design process:

There can be no solution without a problem; and no problem without constraints; and no constraints without a pressure or a need. Thus design begins with a need. Either the need is automatically met, and there is no problem, or the need is not met because of certain obstacles or gaps. The finding of means to overcome these obstacles or gaps constitutes the problem. (Archer, 1984; p.59)

At the heart of the matter is the design process. This is the process of problem solving which begins with a detailed preliminary identification of a problem and a diagnosis of the needs that have to be met by a solution, and goes through a series of stages in which various solutions are conceived, explored, and evaluated until an optimum answer is found that appears to satisfy the necessary criteria as fully as possible within the limits and opportunities available. (Eggleston, 1976; p.17)

Terminology related to concepts of need sometimes differs. For example, Archer (1984) refers to needs as 'design goals' (p.349) while Jones (1984) calls them 'performance specifications' (p.349). In the fields of engineering and

architecture they are often categorized as the 'design criteria'. Whatever the label there remains the question to what extent the notions of 'need' or 'needs' have achieved consensual conceptualization in relation to design theory and design methodology.

Alexander and Poyner (1984) believe that the assessment of need is more problematic than might be generally assumed because the basic concept of need is not well defined (p. 125). The whole notion of finding ways to meet needs is still a highly ambiguous one and accordingly, they maintain, constitutes a central, unattended problem of design:

... people are notoriously unable to assess their own needs. Suppose then we try to assess people's needs by watching them. We still cannot be sure we know what people really need. We cannot decide what is 'really' needed, either by asking questions, or by outside observation, because the concept of need is not well defined. At the present the word need has a variety of meanings. When it is said that people need air to breathe, it means that they will die within minutes if they don't get it. When someone says "I need a drink", it means he will feel better if he has one. When it is said that people 'need' an art museum the meaning is almost wholly obscure. The

statement that a person needs something has no well-defined meaning. We cannot decide whether such a statement is true or false (p. 125).

Engineers, architects, designers, and artists may see the concept of 'need' in different terms than social scientists and educators. In pedagogical language for example, need is usually a general motive expression used to refer to any kind of motive or goal seeking behaviour. Perceptions of basic needs are historically, culturally, politically, psychologically, and geographically determined and the critical challenge facing those who wish to clarify and define need for the purpose of mapping design activity is to find the means of understanding and dealing with constantly changing collective and personal values, priorities, and perceptions of needs.

b. Problem

The largely unexplored bridge or interrelationship between the concepts of 'need' and 'problem' can be seen as a critical but generally ignored aspect of the conceptualization of the design process. Any attempt to clarify the conceptual interdependence of the two concepts tends to move in a cyclical fashion, beginning with an analysis of those factors which might determine need,

through a series of questions regarding the singular notion of problem and how it might be settled into the wider concept of design-as-problemsolving-process, then back to the issue of defining need.

There are many questions which can be seen as relevant to the issue of finding agreement about the concept of problem. What, in the most basic sense, is a problem? Are there different classes or types of problems which are not generally recognized but should be understood in relation to defining the broader concept of 'design-as-problem-solving-process'? If it can be argued that there are different problem types and that it is important to understand their characteristics and to differentiate between them before engaging in the design process, why would such classification be critical to our general understanding of design and the design process?

These questions draw attention to the conceptual link that exists between the concepts of need and problem, particularly as regards their importance to the task of conceptualizing and defining design as a problem-solving-process. Thorndike states that a 'problem' exists if an organism wants (needs?) something but the actions necessary to obtain it are not immediately obvious.

Rowe (1987) and Harahan (1978) suggest that a problem is a description of the process of sensing gaps or disturbing missing elements (needs?). Both statements seem to suggest that a definition of problem depends on a prior recognition of need and that if problem-solving is to be recognized as a function of the design process then the recognition of the nature of the relationship between need and problem is critical to any acceptance of that concept.

For the art & design teacher the issue of building problem-solving aspects into design-related classroom activities can be highly problematic. Kimball (1982) has suggested that design problems are never clearcut or black and white in nature but invariably shades of grey. A single design problem is a complex of a thousand or more sub-problems which are influenced or determined by the mosaic of personal values and felt needs, individual and/or collective visions of desirable futures, and constantly changing social and technological factors (Archer, p.17). Kimball claims that analysis of any design-related problem will illuminate the underlying layers of conditions and concepts which determine its formation:

Any problem, on close inspection, contains an almost unlimited variety of degrees of problem. ... design problems exist on a continuum ranging between a

total problem and a non-problem, and the difference between the two lies simply in the number of qualifications that modify the basic problem. ... The fact that design problems (like all problems I suspect) are so flexible makes it possible for the teacher to devise a problem of any degree of complexity for a particular subject. (P. 17-18).

It has been suggested that to facilitate a better 'fit' between the process or activity of design and the environment in which it takes place the diverse values, needs, and views of both those who design and those who are designed for must be taken into account (Jaques & Talbot, 1975). In this context 'problem-identification' can be viewed as a critical component of the design process. The importance of this 'pre-problem-solving' stage of design should, according to Jaques & Talbot, be recognized and assigned a larger role than is presently the case within design activities:

Problem identification must begin by attempting to identify the variety and criticality of those views, and to assess the implications of conflicts within them. We can say therefore that problem identification must begin by relating the initial dissatisfaction with the pertinent views of what the

situation is and what it ought to be. ... Design currently lacks even the most basic competence in problem identification, and much design is based on laissez-faire assumptions about what are the acceptable or right solutions.(p.111)

Thomson (1975) sees difficulties inherent in what he calls the 'weaving' nature of the design process - the weaving of knowledge, data, and assumptions into the 'fabric' of a plan of action or solution. These difficulties, according to Thomson, are due in part to a general lack of understanding of the range of problem types that can be encountered when establishing or working through design operations. The inability to distinguish one particular problem from other similar problems is, he believes, a direct cause of many of the conceptual and operational traps which can hinder or render invalid a design operation (p.159-164).

In searching for ways to circumvent such traps Thomson has formulated a taxonomy of what he believes are the most basic problem-types:

COMPLEX PROBLEMS - solutions are well described by their parameters and values. Designing a car might be an example of a complex problem.

RANDOMLY COMPLEX PROBLEMS - describe the behaviour of some object within a field of other objects. Satisfies the requirement (need) to reduce a large field of behavioural events to a few reliable and describable parameters.

PROBLEMS OF ORGANIZED COMPLEXITY - deal with overlapping concerns of interest groups. Attempts an agreement of a variety of concerns for a specific course of action. Thomson terms these 'soft' problems.

Rowe (1987) has also posited into the field his own taxonomy of problem-types which serves to characterize the distinctions made by other theorists:

WELL-DEFINED PROBLEM - those for which ends, or goals are already prescribed and apparent; their solution requires the provision of appropriate means. Rittel refers to this class of problem as 'tame' and states that they can be exhaustively formulated ... and solved by a knowledgeable man without the need for further information.

ILL-DEFINED PROBLEM - those where both the ends and means of solution are unknown at the outset of the problem-solving exercise, at least in their entirety. Although the general thrust of the problem may be clear, considerable time and

effort is spent trying to clarify what is required. A large part of the problem-solving activity consists of problem definition and redefinition.

WICKED PROBLEMS - Those without a definitive formulation or the possibility of becoming fully defined. Additional questions can always be asked which leads to a process of continual reformulation. There is no explicit basis for the termination of the problem-solving activity - any time a solution is proposed it can, to some extent, be developed still further - and any solutions proposed are not necessarily correct or incorrect. Plausible alternative solutions can always be provided.

While Thomson and his colleagues in the fields of design theory and methodology are attempting to validate the process of problem-identification, there is, coincidentally, some limited degree of attention being paid the issue by those concerned with placing it into an educational context. Roberts (1982) has stated that he believes some school-based practitioners have found taxonomies of problem-types useful to their classroom work and Kimball (1982) has written about the structuring of design problems and related implications for the development of design-related lessons and units. Maser (1987) has formulated a model for 'design planning'

which recommends analysis of problem type, structure, and function which might have implications for design studies curriculums and Horrocks (1969) has proposed a systematic approach to problem-solving activities in the classroom which emphasizes the importance of having the teacher and students undertake a process of isolating, defining, and understanding a problem before any attempt is made to move towards devising a solution. In direct reference to the central concept of design-as-problem-solving-process Green (1974) has proposed a model for problem-solving in which problem and needs-identification are related directly to an analysis of technological, economic, and social factors.

Papanek (1970), who conceptualizes design in terms of an integrated series of simultaneously occurring 'biological' functions (as opposed to a more commonly held concept of a series of prescribed mechanical operations), sees the need for the education of student-designers as 'horizontal-generalists' rather than as 'vertical specialists'. According to Papanek the generalist-designer must, of necessity, be capable of isolating and defining problems in relation to their degree of complexity and the context of what he terms the 'human factor' - the biological, psychological, and kinesthetic senses of mankind. Papanek contends, however, that most design

curriculum fall " ... lamentably short of providing practice in this area" (p.55) and appears to be correct in this assessment as there is little evidence to indicate at this point that the work of theorists such as Jones and Thomson has served, to any significant degree, to inform or influence theory, research, and curriculum development related to design education.

c. Creativity

For some theorists creativity is a pre-condition of design activity or the design process: unless the situation allows for subjective responses and creative behaviours on the part of the designer the activity does not qualify as a 'design activity'. Archer, for example, sees the creative element as the " ... essence and nature of designing" (1984). He considers creativity to be that essential aspect which serves to distinguish the act of designing from other problem-solving activities (p.4). Luckman (1984) also sees creativity as critical to the designation of an activity as explicit design activity:

The process of design is the translation of information in the forms of requirements, constraints, and experiences into potential solutions which are considered by the designer to

meet required performance characteristics. Here we shall insist that some creativity or originality must enter into the process for it to be called design. If the alternative solution can be written down by strict calculation, then the process that has taken place is not design.(p.84)

According to Lobell's (1975) view of design process the design act and the design process are typical examples of extensions of the creative act and the creative process. Lobell questions the validity of systematic design methods which are based on the assumption that design procedures can be adequately formulated on predetermined rules or established methodologies. As an alternative to what he perceives to be the rigid, inflexible nature of such methods, he offers a concept of design process which accounts for what he calls the workings of 'deeper structures of the mind'. This concept views any established 'logic' which seeks to pre-formulate or pre-quantify thought and methods in the service of design as not adequate to the task of connecting the disparate systems of thought which the deeper structures of the mind bring into play during design activity. The mind, Lobell claims, works with logics infinitely more complex and powerful than any which can be measured or represented on paper:

... if it is accepted that design is a creative act in that it brings together two or more disparate matrices or systems of thought which can only be connected by the powerful logics of the deeper structures of the mind ..., then the question is, how do we obtain access to these levels of the mind in order to design? Another phrasing of the question would be: what kind of design process would be sympathetic to the logical powers the mind actually has?(p.126)

While Archer, Lobell, and Luckman appear to believe that the degree to which a problem-solving activity allows and/or invites a designer to apply subjective/creative insights and behaviours determines its qualification as 'design activity', Thomas and Carroll (1984) have arrived at similar conclusions through the analysis of the ways in which designers themselves appear to assess problems in terms of their well-definedness or ill-definedness. Thomas and Carroll looked at how designers categorized given problems relative to the extent to which they appeared to allow for subjective input. Their research indicates that designers tend to view ill-defined problems as those which allow for subjective/creative input and original thought and well-defined problems as those which do not. Therefore, designers tend to see ill-defined problems as design

problems and well-defined problems as something else. Thomas and Carroll outline the general issue in the following terms:

... there are certain human conventions by which they may stay within the formal system. But, there is no law of the universe that says that they MUST stay within that formal system. If they VIEW the problem as allowing creativity, they may change the groundrules. They might decide that in order to prove the theorem, they will assume its converse and show how absurd the result would be. The goal of the problem was not well-specified.

Conversely, something which we typically think of as a design problem, such as designing a house, might be VIEWED otherwise. Suppose that an architect gives a client a questionnaire to fill out concerning their requirements for a house. Suppose further that this architect has a standard set of features and variations which are determined by the questionnaire results. In fact this is NOT design. Much of what we call progress may be viewed as a process of rendering ill-structured design problems as more well-structured procedures for accomplishing the same results - without requiring design.

We have therefore been to a highly problem-solver-oriented problem-solving definition of design. For us design is a type of problem-solving in which the problem-solver views his/her problem or acts as though there is some ill-definedness in the goals, initial conditions, or allowable transformations.(p.221-222)

Darke's model of design as a conjecture-synthesis process can be related to these conclusions regarding the interactive nature of problem-solving and creativity. Darke argues that designers are not naturally inclined to utilize rigid, predetermined stage methods and that adherence to such models would likely impair or limit the design process by leaving little room for the designer to apply subjective/creative aspects to the activity. Designers, she claims, naturally tend to first fix on conjectures and/or objectives which are strongly valued and self-imposed for reasons which rest on subjective responses or judgements rather than on prescribed logics or imposed, pre-determined methodologies.

It appears then that concepts of design which consider creativity as criterial to the design process tend to formulate their definitions in regards to the idiosyncratic nature of the relationship between the designer, with

his/her held values and innate capabilities, and the problem itself. Within this context the following factors appear to be considered most important in regards to this relationship and to any subsequent definition of design or design process:

1. The degree to which the problem is open-ended or ill-defined.
2. The designer's perception of the problem as well-defined or ill-defined.
3. The designer's responses or reactions to the problem relative to its categorization as a well-defined or ill-defined problem (the degree to which the problem allows for subjective/creative input).
4. The ways in which the problem might influence, limit, or govern the responses or behaviours of the designer.
5. The extent to which the designer believes it is possible to alter a well-defined problem into a more ill-defined problem.
6. The extent to which the designer is concerned with the nature of the problem (if the issue of subjective/creative input is considered important or not).

Archer's, Luckman's, Lobell's, and Darke's theories imply that the design process owes its genesis to the interaction

between the designer's basic capabilities and the character of the problem and that the definition of an activity as a design process depends on the degree to which the problem allows for subjective/creative input. In addition there is the added implication that there exists a critical locus in the relationship at the point at which the designer first encounters a problem and determines both to what extent he/she can respond on a subjective/creative level or if it might be possible to convert a well-defined problem into an ill-defined one. Further exploration of the nature of this first critical encounter and its implications for the unfolding of the design process might prove valuable to both creativity and design methodology research.

While such claims and implications pinpoint the critical role which a designer's subjective/creative responses play in the design process and while such theories posit into the field of design methodology what seems to be a convenient means of defining design activity and process, these points-of-view do little if anything in terms of clarifying questions related to determining either the real nature and origins of creativity or if it is indeed possible to eventually educate for creativity for the purpose of enhancing design abilities.

Notions regarding the primal role of creative capabilities within the design process and claims which see the design process as an extension of the creative process nonetheless dovetail conveniently with dominant theories and concepts within the field of creativity research itself. These tend to collapse around three particular areas of focus: the Creative Person, the Creative Process, and the Creative Product.

The field of creativity research and theory encompasses a wide ranging complex of orientations, assumptions, and research evidence which has not yet coalesced into an integrated and unified theory of creativity (Rosner, 1974). Several generations of research has failed to yield either a consensual definition of creativity or agreement on the most valid and reliable means of determining what creative capabilities, processes, and products really are. In this regard Pfeiffer (1979) states:

Despite the accumulation of knowledge and information on the subject of human creativity by educators and scientists in recent years, one finds a pervasive sentiment amongst earnest and perplexed writers that the very meaning of the word creativity is fundamentally unclear. ... No one definition has evidently proven general enough to accomodate the

broadly diversive experiences and experimental findings of various inquirers, yet specific enough to suggest criteria for sorting out the distinctly creative aspects of experience. (p.129)

Issues related to measuring the characteristics of creative individuals, determining when a process is creative or not, deciding whether or not a product can be considered a valid indicator of creativity, or agreeing that what is isolated and measured has anything to do with creativity, remain highly problematic and contentious.

In analyzing the notion of creativity in terms of its role as a criteria for a definition of design a case can be made for seeing a conceptual link existing between concerns within the field of design methodology (Archer, Lobell, Luckman, and Darke) and some related to the field of creativity research. A number of assumptions and beliefs appear to be common to both domains and although the legitimacy of using creativity as a necessary condition of design has been brought into serious question by the lack of general agreement about the nature of creativity, it can be suggested that these shared concerns and assumptions might serve as the basis for further research directed at exploring the relationship between design and creativity. The

following appear to be elements of thought common to both fields:

1. The form and direction of an activity is determined by the nature of the interaction between artist (designer) and medium (problem).
2. A critical feature of the creative (design) act is the absence of any rules (prescribed methodologies) - the following of which would lead to a pre-specified end (product).
3. The artist (designer) is the 'first' cause (Heyfron, 1985) of the creative (design) process - it is the designer's held values, innate capabilities, and predispositions which are at play in response to the problem and which determine the nature of both the 'conjecture' and the subsequent search for the means to make it concrete (design activity or process) - how a designer responds to the inherent 'freedom' (or lack of it) within a situation to register a personal vision or solution.

While it might be argued that there are design-related circumstances in which either the ambiguous nature of subjective/creative responses is taken for granted or the lack of an agreed, precise definition of creativity is not considered a hinderance to particular design procedures, it

might serve some purpose to recognize and analyze whatever problems might be inherent in building a framework for design curricula around a concept of design which considers creativity an essential criteria. If it is argued that creative behaviours (including those which take place inside a formal educational setting) are a necessary condition of design activity then the fact that the basic nature and function of those behaviours is not well understood, or understood at all, offers just cause for seeing the development of related goals and objectives as highly problematic and unresolved issue.

While artists, designers, architects, and theorists might be naturally predisposed to accept the critical role creativity plays as the 'essence and nature' of design, and while they might tacitly agree that without creativity the design process might be something other than what it is assumed to be, the fact remains that the concept of creativity is a vague and ambiguous one and that any statements about, or concepts and models for design which in any way relate to the notion of creativity as a necessary pre-condition should be considered in this light.

D. PROBLEM-SOLVING AS A BASIS FOR DESIGN EDUCATION CONCEPTS

From the early part of the 19th century and on design has, in the main, generally been considered a practical process or activity. This is in contrast to views regarding philosophy, the arts, and the social sciences which tend to be as more concerned with knowing, expressing, and speculating. In the main design studies have tended to mirror these points-of-view. With the industrial revolution came a need to make the study of design more a matter of formal schooling than had previously been the case. Design studies courses began to be included in school curriculums and usurp traditional crafts apprenticeship approaches. In the 1830's Schools of Design were established in Great Britain with the ostensible purpose of encouraging an improvement of design in relation to the manufacture of mass-produced goods. (Lawrence, 1982)

Over the last one hundred and fifty years there have been many shifts in educational philosophy and ideology and the role and place of design studies within the schools has generally been, as with all subject areas, determined by the educational philosophy of the day. A significant period in the history of design education was the 1870's when a finer distinction between the fine arts and design began to be

defined. Educators such as Forbringer and Walter Smith, responding in their fashion to the changing values and priorities precipitated by the industrial revolution, helped focus more attention on the need for education to keep pace with the times by committing itself more formally to the training of design specialists. The evolution of 'applied arts' curriculums sat well alongside the prevailing art education philosophy of the day which emphasized the mastery of factual, systematically organized information and the instrumental uses of art (Hamblen, 1984).

Yet, even while art education has responded to shifts in social and economic priorities with concomitant changes in foundational concepts and guiding principles, the study of design has not, during the same span of time, significantly altered its basic goals and priorities from those established in the 1870's. The perception of design studies as a function of training students in skills and methods appropriate to specialist applications within industry, crafts, architecture, and commercial and industrial design remains dominant and mainly defined in terms of the requirements of those domains. The concept of design as a functional, practical activity has served to inform and influence the planning and implementation of what have become traditional and entrenched approaches to the study of

design within many industrial arts, craft, technology, applied art, home economics, and even fine arts programs.

Baynes (1982) has pointed out that design, as we tend to see it, is inexorably bound up in the economic, cultural, technological, and industrial fabric of contemporary life and, because of the critical role design plays at all levels, educational systems should be very concerned with finding ways to make the study of design an integral part of the educational experiences by which children learn about the world and the way it works.

Many education policy statements, curriculum profiles, and communications related to design and design education theory provide evidence that problem-solving is seen as the core, or one of the core concerns of design studies programs. When many curriculum statements or design education theories are unpacked and analyzed the process of problem-solving can often be seen as the conceptual basis on which definitions of design and design education are made. Eggleston (1976), for example, holds a not uncommon concept of design as an interactive process shared between those who make things and those who use them. According to Eggleston, the 'design process', defined in the following terms, is at the heart of what schools should offer in the way of design studies:

(Design) ... is the process of problem-solving which begins with a detailed preliminary identification of a problem and a diagnosis of the needs that have to be met by a solution, and goes through a series of stages in which various solutions are conceived, explored, and evaluated until an optimum answer is found that appears to satisfy the necessary criteria as fully as possible within the limits and opportunities available. (P.17)

The relevance of the design process to the needs of twentieth-century occupations, Eggleston claims, is unmistakable and for education systems to not address those needs by providing design-related experience and training would be irresponsible.

Kimbell (1982), whose book has been adopted as a guiding text by many art and design educators has also based his approach to design studies around the concept of design-as-a-problem-solving-process. In regards to secondary school art and design courses Kimbell proposes that design education be seen as an extension of handicraft in the sense that technical competence is used as the medium for the development of 'design-thinking' skills. Design education, Kimbell claims:

... is about making children think (i.e. recognize and solve problems) in the context of materials and tools. The acquisition of technical competence goes hand in hand with the experience of employing that competence in the solving of design problems. Consequently much of the art of composing a design course for young children lies in finding or concocting problems that may successfully be tackled with very primitive tool skills. (p.12)

Green (1974) offers a concept of design education which centers around the notions of developing critical understandings of human needs and with providing educational experiences which will help determine whether or not those needs have been met. Green sees the 'design process' as critical to the ultimate shaping of the built or designed environment and feels that 'responsible' design solutions are not the result of casual, intuitive activity but rather of an educated, problem-solving methodology:

... it is a process of identifying problems and needs and establishing critical priorities. It requires research, data collection, organization of resources, and rational analysis and measurement. And as a solution evolves, by rational synthesis or practical trial and error, it takes on a form and

has to be tested and evaluated. ... All design decisions relate to the problem-solving process: the basic process of identifying a problem then testing a proposed solution. Such a process is clearly close to the fundamental processes of creative education and our daily lives. ... Experience of problem-solving is common to education, the design process and daily life, and is therefore central to any ideas related to design education. (p. 7-9)

Green believes the designer to be the 'decision-maker' who determines "all aspects of the environment" (p.9) and emphasizes the importance of artist/designers adopting an efficient and socially responsible role within the workings of mass society.

Other design educators agree with the concepts of design as a practical activity and of the designer as an educated specialist. Black (Piper, 1973) sees design and design activities in the schools in these terms:

Design is a problem-solving activity concerned with invention and with formal relationships, with the elegant solutions to problems which are at least partially definable in terms of day-to-day practicability. (p.34) The central tasks of colleges

of design is to imbue the student with an appreciation of professionalism, with the capacity to study a problem in depth, with the ability to advance from analysis to synthesis, to be sufficiently self-critical, and to be able to dispassionately evaluate his solution. (p.38)

Both Black and Kestelman (Piper, 1973) have attempted to clarify the role design studies should play within the general curriculum by differentiating between fine arts and design concerns. Kestelman sees 'the Arts' as a gratuitous activity which appeals solely to the imagination, involves emotions, and has no material limitations or planned ends in view. In contrast he states "... the design subjects, are in the first place specifically designed for some utilitarian end, whether for articles of use or for the advertising and promotion of such articles". (p.48)

Horrocks (1969) also states:

A designer can be defined simply as a person who solves problems. ... - the designer extends the potential of problem-solving by adopting a methodical approach. ... It is a rational, decision-making process, and in some aspects differs radically from many traditional forms of art and craft education which have been more concerned

with irrational, intuitive experiences. ... it can provide the basis for a prolonged project involving much preliminary research and organization of materials. This range of experience in its extended and immediate forms is seen as the basic essence of the intended art room activity. (p.37)

In the same document, Kingsland also supports the notion of problem-solving as the core of design activity and concludes that such activities can be adapted to any level of learning to provide 'useful' educational experiences. (p. 15)

All the aforementioned statements explicate positions regarding the nature of design and the function of design activities within the schools which appear to be solidly entrenched in 1st generation conceptualizations of design and design methods.

The Design Council, which plays a large role in promoting and advising design education development in the British education system has tended, at least in many of its policy and working committee statements, to agree with functionalist conceptualizations of design and design education. In framing a concept of 'Conceptual Design' the Council has stated:

... (design) involves identifying needs or requirements, weighing up and analyzing possible solutions (including those that are already known) and coming to a properly thought out decision as to what design or designs will be most promising.

(Yoemans, 1984)

In its 1981 report the Design Council identified the principles on which its Education Advisory Committee believes good design education in schools should be based. In pinpointing design 'activities' as the most significant aspect of design education, the council goes on to outline the following definition of 'design activities':

Design activities ... vary in form and emphasis, but they have in common the aim of giving the student an experience of:

1. Examining a given problem or situation in order to identify and state the opportunities and difficulties involved.
2. Undertaking research and compiling data on the problem or situation and the factors affecting it.
3. Analyzing the information gained.
4. Preparing a brief against which design proposals can

be tested, so as to overcome the difficulties indentified.

5. Proposing responses to the brief and choosing the most appropriate.

Such statements imply varying degrees of emphasis within what can be considered as formal criteria for design 'activities' or design education in the schools, they appear, because of the focus on needs assessment, problem-solving methodology, and skill-development, to be also firmly tied to 1st generation conceptualizations.

E. DESIGN AS A BASIC HUMAN CAPACITY

Coincidental and similar concepts which define either creativity or design in terms of universal human capacities exist in both fields of study. The 'humanistic' concept of creativity appears to be based on a belief that everyone possesses a capacity for creativity (Maslow, 1959; Gardner, 1983;) while design theorists such as Baynes (1984), and Daley (1984), see the aptitude for design as a capacity similar to that which determines language development and which encompasses the ability to envisage alternate physical realities.

While the notion of creativity remains resistant to measurement and precise definition it has been pointed out that in many ways various concepts and definitions of design and the design process interweave with notions of creativity to form a conceptual construct in which creativity is seen as the fundamental, albeit undefinable fuel that drives the engine of design.

Conclusions drawn in research by Darke (1984) and Hillier (1984) underscore the line of reasoning adopted by design theorists who reject the empirical approach of the behaviourist based analysis/synthesis model of design, with its emphasis on the importance of specialized skills and established methodologies. The opposing stance tends to conceptualize design more in terms of a natural, universal human capacity for the imaginative manipulation of objects in time and space and in a general sense perceives design activity as a collective procedure in which all participants have a hand in determining the goals and outcomes of the design process.

In the 1970's theorists such as Alexander, Jones, Archer, and Rittel began to change their positions regarding 'systems' approaches to design. Jones (1984), for example, turned away from a behaviourist orientation and the logical

frameworks which defined his early theories and shifted his focus to flexibility, random process, and chance - aspects of the arts which he began to see as more important to the design process than measured behaviours and predetermined methodologies. These factors served to inform his developing interest in resolving the conflicts which he saw as existing between rationality and intuition, logic and imagination, and order and chance within the design process.

Other theorists began to test the boundaries of the most commonly-held design concepts and first-generation methodologies. Rittel (1984) concluded that concepts of first-generation methods are not, in the end, very useful to the act of designing and promoted the idea of second-generation methods which are essentially anti-expert in nature and which advocate a more general, participatory approach to design. Alexander (1984) decided that development and study of design methodology in general has failed to contribute to better design and Archer (1984) maintains that logical design methods represent an essentially 'alien' mode of reasoning. Design methods, claims Archer, should not ape methods of the sciences or humanities but should be based on ways of thinking which can be recognized as natural to the design process and as distinct from other approaches.

The notion of design as an innate human capacity represents a significant shift away from the concepts which undergirded the analysis/synthesis models of design methodology through the 1950's, 60's, and 70's. This broad notion of man as a natural designer evolved as much as a consequence of an inability to understand and adequately explain certain factors or behaviours which appeared to come into play during design-related activity as from a lack of evidence that system-based methods positively advance the practice of design as a whole.

Recognition of the role subjectively-based conjectures and behaviours play within the design process opens broader questions regarding the degree to which their nature and function can, and perhaps need to be understood. Daley (1984), in outlining what she believes is the crucial issue of pinpointing knowledge claims within design theory, has posed a number of fundamental questions which she feels help define the general issue of the knowledge which designers might take to design activities:

1. Are the processes by which designers make their decisions susceptible to systematic measurement?
2. If so, by what sort of examination?
3. Are such processes 'conscious' in all their facets?
4. If not (and it seems clear they are not) what are the

- consequences of attempting to translate them into terms of that which is examinable in a straightforward sense?
5. What is the nature of the knowledge which designers carry with them to the task or activity of designing?
 6. What is the nature of the metaknowledge of such skills and practices to which design theorists aspire? (p. 295)

The answers to such questions, claims Daley, can only be framed in epistemological terms. We can arrive at an understanding of design in a most general sense through understanding "... how we manipulate our conceptions of reality in such a way as to make innovations in spatial relationships and create wholly-new object configurations" (p.291). Daley argues:

... an imaginative manipulation of objects in space and time is a condition of all intelligible human experience, and if we are to understand the rather special manipulation designers perform on the outer frontiers of ordinary understanding, then we must see it within this context - within an understanding of the fact that 'imagination', in the eighteenth-century sense is fundamental to all experience of the world, and that the most mundane seeing of an understandable world is, in a very real sense, a creative act. (p.295) ... The capacity to

visualize an as-yet-unmade object and to manipulate spatial relationships lies at a fundamental level of cognitive ability, and any explanation of this capacity, or the processes which it involves, must address itself to those *a priori* structures which make conceptual construction of the world of objects possible. ... Only a relatively small (and perhaps insignificant) area of that system of knowing and conceiving which makes designing possible may be amenable to verbal description. To talk of propositional knowledge in this area, or to make knowledge claims about the thinking processes of designers, may be fundamentally wrong-headed. The way designers work may be inexplicable, not only for some romantic or mystical reason, but simply because these processes lie outside the bounds of verbal discourse; they are literally indescribable in linguistic terms. (p.300)

Daley's point is that it is a fatal mistake to regard design processes as straightforwardly rational. The designer should be seen not as an intellectual simply executing decisions but as a human being whose entire mental life is concerned with the parameters and priorities related to his social nature and consequent value-structures.

Archer (1984) adopts a similar point-of-view. He believes that the act of designing is a function of a cognitive system which is somewhat distinct from other way of thinking but nevertheless common to all:

My present belief, ... is that there exists a designerly way of thinking and communicating that is both different from scientific and scholarly ways of thinking and communicating, and as powerful as scientific and scholarly methods of enquiry, when applied to its own kinds of problems. ... It is widely accepted, I think, that design problems are characterized by being ill-defined, ,, , in the course of evolution, human beings have found quite effective ways of dealing with (ill-defined problems). It is these ways of behaving, deeply rooted in human nature, that lie behind design methods (p.57-67).

Archer and his fellows researchers at the Design Education Research Unit at the Royal College of Art in London are engaged in an examination of the way in which we form images, then externalize, manipulate, and evaluate them. This process, they suspect, constitutes a cognitive system comparable with, but different from, the verbal language system and Archer (1984) outlines the hypothesis in these

terms:

... we believe that human beings have an innate capacity for cognitive modelling, and its expression through sketching, drawing, construction, acting, and so on, that is as fundamental to thought and reasoning as is the human capacity for language. Thus design activity is not only a distinctive process, comparable with but different from scientific and scholarly processes, but also operates through a medium, called modelling, that is comparable with but different from language and notation. (p.349)

Daley's propositions appear to be anchored to the Kantian notion that cognitive structuring of a world of 3-dimensional objects is central to human knowledge and understanding and that such structuring is an act of mind (though not a conscious one) rather than a function of a world impinged on the mind. Thus the imaginative manipulation of objects in space and time is seen as a condition of all intelligible human experience. The mind is therefore not considered a passive receptor but an agent in an active process. Daley points to Bower's (1979) experimental work in infant perception, which indicates that even in infants only a few weeks old there exists both an

understanding that objects have solidity and extension and expectations about the behaviour of objects in space and time, as proof that human understandings of objectness, space, and time are factors through which experiences are made intelligible. This stands in opposition to the Piagetian view that these understandings are learned concepts built up from particular experiences.

In this regard Daley (n.d.) states:

The basic cognitive features of design capability are bound up with intellectual development at all levels. The capacity to visualize a non-existent object and to co-ordinate unseen spatial relations lies at a fundamental level of cognitive ability, and any explanation of this capacity must, it seems to me, take into account those *a priori* structures which make comprehension of a world of objects possible. When designers design, they make leaps into primeval levels of mental life, manipulating the constituents of our picture of physical reality. (p.9)

Piaget of course suggested that pre-school children are incapable of imagining viewpoints other than their own but Baynes (n.d.) has pointed out that Donaldson has challenged Piaget by claiming that children can in fact

'de-centre' effectively and imagine the situations and experiences of others. Baynes sees this as a crucial issue for design education. To have design experience, he claims, it is essential to be able to imagine alternative worlds and to foresee the possibility of change taking place through time.

Over the past ten years the focus of Archer's work at the Royal College of Art has steadily shifted from concern with systems and procedures to gaining knowledge about the way designers know what they know and to the analysis of mental states and thought processes (Baynes, 1985). Associated research has led to the formulation of a general concept of design which identifies 'design awarenesss' or 'design capability' as a capacity of all humans. As a result of many years of struggle with conceptual and definitional problems related to design and design education Archer has placed in the field a definition of design which attempts to account, in a comprehensive way, for all the subjective, objective, personal, and universal factors which he considers salient to design activity:

Design is that area of human experience, skill and knowledge that reflects man's concern with the appreciation and adaptation of his surroundings in

the light of his material and spiritual needs. In particular it relates to configuration, composition, meaning, value, and purpose in man-made phenomena (Baynes, 1985).

The man-made world, as Papanek (1970) has pointed out, is formed and changed in a continual, reciprocal, interactive process with its users. How humans set about changing their environment to suit their felt social, physical, economic, and aesthetic needs is viewed by Baynes as a process which is as much a definition of 'human-ness' as the use of language or the development of social conventions. At the center of this 'ability' to change the environment is the fundamental capability to, as Baynes terms it, "... imagine that the world might be other than the way it is" (1983). 'Design ability' is seen, in this context, as the ability to imagine, then bring about, desired changes in places, products, and communications. The ability to visualize or imagine a model of what might be is considered an innate capacity which is not linguistic in character but has been shaped by our perceptions and has parallel properties to the physical world as interpreted through our basic senses. It is the nature of man's ability to create external equivalents to internally visualized

images or models which now interests many researchers and theorists and provides the focus for what is a developing field of enquiry.

Baynes believes that professional designers simply further develop or educate this universal capacity for 'designing' to a high, economically viable degree (1983). By interrelating Daley's conceptualization of design capability as a cognitive function which makes intelligible perception possible with Archer's and Bayne's theories it is possible to discern the emergence of a generalized concept of design as a transforming process - a finding of ways and means to transform internal images into concrete, external form. Placed in an educational context this conceptualization can be translated into goals which might look towards the transforming of this natural capacity or capability into a more refined, educated 'design ability'.

There appears to be a growing interest in gaining an understanding of those factors which determine and influence the ways in which we perceive, interpret, and interact with our environment and which ultimately cause us to manipulate the man-made world in the ways we do. Darke believes that the exploration of the subjective

aspects of design activity - of "looking inside the designer's head" - constitutes the most interesting direction for design research to now take (p.187) and Thomas and Carroll believe that the analysis of the activity of designing - one which they see as encompassing an important way that humans actually operate in the world - provides a viable means for better understanding complex cognitive structures and operations which are innately characteristic of humans (p. 221). Archer believes that 'designerly ways of thinking', deeply rooted in human nature, are quite appropriate to dealing with the ill-defined or untamed problems - those which he considers to be both the real problems of everyday life and those with which the designer should be most concerned. This implies that design concepts, particularly as they might influence design and design education research and practice, could be best based on acceptance of the notion of design as a universal, basic capacity (Cross, 1984).

a. Concept of 2nd Generation Methods

If it is to be proposed that the study of ways of thinking and the nature of knowledge claims related to design activity might prove useful to the development of

design-related activities in the schools it might be appropriate to analyze the ways in which the concept of design as a basic human capacity might interrelate with Rittel's concept of 2nd generation design methods and with Broadbent's conclusions regarding architect's and designer's attitudes towards the notion of the designer as all-knowing specialists.

Based on his belief that 1st generation, analysis/synthesis methods have contributed less to progress in the field of design than might be generally assumed, Rittel offers, as an alternative, a concept in which design is perceived as a more participatory, co-operative venture - a process in which the idea of designer as ultimate 'expert' and final arbiter of how everyone else should live and shape their environment is overthrown. In his dismissal of 1st generation design methods Rittel states:

The systems approach of the 'first generation' is inadequate for dealing with wicked-problems.

Approaches of the 'second generation' should be based on a model of planning as an argumentative process in the course of which an image of the problem and of the solution emerges gradually among the participants, as a product of incessant judgment, subjected to critical argument. The

methods of Operational Research play a prominent role in the systems approach of the first generation; they become operational, however, only after the most important decisions have been made, i.e. after the problem has already been tamed. (p.138)

Broadbent (1984), in lending support to this approach, believes that designers have indeed grown progressively less concerned with making final decisions (which they recognize might be founded on false or incomplete assumptions regarding needs, values, types of problems, and appropriate methodologies) and more interested in finding ways to encourage others to participate in a process which helps determine what they themselves want.

According to Broadbent an increasing number of designers and/or architects do not wish to be party to any activity which "... inhibits the potential of other people to grow into what they conceive themselves to be" (p.340). In this regard the role of a central design 'expert' is not viewed as being as critical to the process of design as previously suggested in 1st generation approaches. This 'argumentative structure', as Rittel labels it (Broadbent, P.340), is essentially anti-expert in orientation and guided by the assumption that expertise and knowledge are distributed

amongst a wider range of participants. No one person, it might then be assumed, has any justification to claim their knowledge as superior to anyone else's.

At the heart of this idea of a generally distributed knowledge is Rittel's notion of the 'symmetry of ignorance' which serves to define, in his terms, the act of designing as " ... making up one's mind in favour of or against various positions of each issue" (p.340). In this 'argumentative' approach to designing the designer is seen not as an expert who alone has the knowledge and the training necessary to adequately recognize and solve problems or whose task it is to tell others what they should do and have, but rather as a facilitator or teacher who respects the knowledge brought to the situation by others (in effect recognize their natural design capabilities) and helps them question, plan, and decide for themselves.

Current interest in citizen-participation, advocacy-planning, and charette techniques exemplify the ways in which architects, for example, are being influenced and/or guided by this design orientation.

b. Concept of 3rd Generation Methods

Broadbent (1984) believes there are questions which should be asked in regards to the disparity that might exist between what 1st and 2nd generation theories propose should happen through the design process and what actually does happen as a result of the use of such methods. Rittel, Jones, and Alexander have also concluded that 1st and 2nd generation approaches are based on ill-founded assumptions and beliefs. In pinpointing what he feels are the most severe limitations of the 2nd generation theories, Broadbent claims that while these approaches are more liberal and more respectful of human values and needs, they do, in the end, tend to overcomplicate the design process and impede progress towards conclusions which will finally satisfy all concerned. (p.343 - 334). In spite of the admirable intentions inherent in the concept of 2nd generation methods Broadbent concludes that the design process does, in the final measure, require the participation and guidance of the 'expert' designer.

According to Broadbent what cannot be avoided in the application of 2nd generation methodologies are the implications of the inevitable and necessary imposition of personal values and preconceptions into the design process

and the generated solutions. The influence that subjective/creative factors have over the procedures and outcomes of design activity cannot be ignored or circumvented, he claims. Having concluded that assumptions and claims underlying 1st generation concepts cannot be substantiated, Broadbent goes on to suggest that the best that 2nd generation concepts can offer is a process of identifying a 'highest common factor' of user needs which may be manipulated to conform to the designer's own needs and values.

Broadbent agrees with both Landau and Hillier (1984) who see parallels between methods adopted by scientists and by designers. In referring to Popper's concepts of scientific methodology Broadbent delineates the notion that, like the scientist, the designer, upon deciding that certain phenomena are worthy of investigation, becomes committed to those phenomena. The designer will begin with hunches or conjectures (refer to Darke's conjecture/analysis model) related to this phenomena and will then tend to collect data which supports the initial conjecture. The designer's goal is to then test that conjecture as thoroughly as possible and prove or disprove, if possible. The following statement by Popper (1965), which defines his idea of a scientific 'conjectures/refutations' methodology, serves to exemplify

the parallels Broadbent, Hillier, and Landau see between the methods of science and design:

All the scientist can do ... is to test his theories, and to eliminate all those that do not stand up to the most severe test he can design. ... it is only in searching for refutations that science can hope to learn and advance. It is only in considering how its various theories stand up to tests that it can distinguish between better and worse theories and so find a criterion of progress.
(P.103, 113)

By suggesting such a parallel between scientific and design thinking and methodologies Broadbent creates an opportunity to posit into the field of design methodology a new concept of what he terms '3rd generation' design methods. This conceptualization would repudiate Rittel's notions of 'symetry of ignorance' and participatory design activity and reintroduce a concept of the design process as one which requires a design 'expert' to bring certain perspectives, knowledge, and expertise (design 'ability') to bear on the procedures. It would be assumed that clients and other participants would not have these particular qualifications but what would make this approach significantly different from 1st generation methods would be the designer's offering

up of conjectures and solutions for critical analysis, refutation, and additional input by all other concerned parties. The designer is, therefore, conceived of not as someone who knows how someone should live or what is best for them but as a source of particular knowledge, expertise, and aesthetic sensibility which allows him/her to present certain possibilities for analysis, refutation, acceptance, or rejection.

F. CURRICULUM STATEMENTS

If it is accepted that curriculum statements either imply or explicitly represent the underlying educational philosophies and priorities of those who formulate the curriculum guidelines, then a comprehensive analysis of such statements might yield the following information:

1. The degree of emphasis given a particular subject matter or field of study.
2. The philosophical basis on which the aims, purposes, and content of the curriculum are formulated.
3. The extent to which that philosophy is or is not rationalized.
4. The extent to which the aims, purposes, and content are made clear.
5. The ways in which, or the extent to which stated aims and purposes uphold the basic rationale for the curriculum.
6. The extent to which goals and intended outcomes are closed or remain open-ended.

In direct relation to the concerns of this study a limited, preliminary analysis of available Canadian provincial art curriculum guides might serve to indicate whether the ways in which the term is used to described design-related

aspects of the curriculums serve to clarify and/or define the basic concept of design or provide Canadian art educators with a clearer notion of why design experiences might be important to the educational process and how they can best approach implementing design activities into their programs. This preliminary content analysis might also serve to answer the following questions:

1. Is there any degree of contiguity across the Canadian systems regarding the basic concept of 'design' or the aims, purposes, and content of design-related curricula?
2. Is there a high degree of concern evident within the curriculum documents for defining the basic concepts of 'design' or 'design education'?
3. In what ways, if at all, is the study of 'design' perceived as a component of the art curriculums?
4. Are the aims, purposes, and content of design-related activities, programs, units, or lessons clearly defined?
5. What kinds of definitions for 'design' and/or 'design education', if any, are offered within the curriculum documents?
6. What conclusions and implications might be drawn from such information?
7. Are there curriculum models in place in other systems which exemplify approaches to the study of design which are significantly different than that of the Canadian

models?

a. Content Analysis of Provincial Art Curriculum Documents

In the introduction it was argued that art educators are likely to be less confused, and likely to find more general agreement, about terms such as 'painting', 'drawing', 'sculpting', 'potting', and 'printmaking' than would be the case in regards to the term 'design'. If the argument were to be extended it could also be said that the use of terms such as 'painting' and 'drawing' within curriculum documents and educational discourse would not significantly, if at all, complicate or confuse the issues being dealt with. Except in extreme cases where practitioners or educators might debate fine points regarding overlapping concerns or methodologies there is generally little if any confusion or lack of agreement over these traditional concepts. In regards to 'design' as it might concern educators and curriculum developers the situation appears to be somewhat more complicated and difficult.

Green (1971) has pointed out that words and concepts are the tools with which we think (p. 13). The meaning of a term is its use and that to describe one is to describe the other. Green proposes that the analysis of a term's use will

reveal, among other things, the differences of meaning a term might receive in different contexts and how differences in those contexts might lead to one or another understandings and use of the term.

Analysis of design-related statements found within curriculum documents can serve to describe a term's use both within the collective and individual contexts. Such a description can provide insight into what meanings are attached to or implied by the use of the term and can provide clues as to the degree of agreement and/or confusion which exists over the concept within the context of art curriculum development. The following charts summarize the nature of design-related statements found through a limited analysis of Canadian provincial art curriculum guides available at the writing of this study. Particular attention is paid to uncovering stipulative definitions of design, rationales for design-related activities, references to the elements and principles of design, particular course offerings, overall emphasis or de-emphasis of design-related activities, descriptions of strategies, procedures, and content of design-related lessons, units, projects, and programs. This content analysis procedure is limited in nature and is intended to function primarily as an aid in the process of determining if meanings are or are not

clarified. Documents from Saskatchewan and Quebec were not available at the writing of this study. This analysis procedure could serve as the basis for a more comprehensive analysis and comparison of the various approaches to the issue of design as a component of art curricula.

MINISTRY	STIPULATED DEFINITION	RATIONALE	GOALS & OBJECTIVES	REF. ELEMENTS & PRINCIPLES	DESIGNATED COURSES	
ALBERTA	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	
<p>A very comprehensive set of curriculums in which design is dealt with in only the most basic terms of understanding the "vocabulary" of art and applying the elements and principles of design to visual composition. Appears that the study of design particularly in relation to distinct applied, communication, and environmental design areas has been ignored.</p>						
BRITISH COLUMBIA	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	
<p>Elementary, 1985 - Stipulative Definition related to "...an organized arrangement of one or more elements. Major content concepts deal with 'Appreciation' and 'Creation' with the elements and principles of design related directly to activities associated with themes such as Myself, Families, Canada, etc. Secondary, 1982 - Design is related to major learning outcomes in terms of demonstrating a knowledge of and ability to use the elements and principles of design. Within each program or activity related to the major content areas (Imagery, Criticism, Application, Vocabulary) the 'Design' component is prescribed in terms of that knowledge and application. There is no attempt to rationalize the study of design in terms of a more precise definition or concept of design.</p>						

Not Apparent
 Stated But Vague
 Stated, Described

MINISTRY	STIPULATED DEFINITION	RATIONALE	GOALS & OBJECTIVES	REF. ELEMENTS & PRINCIPLES	DESIGNATED COURSES
MANITOBA					
<p>1978 - Design designated as one of eight major components of art curriculum (Painting, Ceramics, Sculpting, Fibre Arts, Drawing, Photography, Printmaking) but it is stated that Design be considered as a "reference" component concerned primarily with understanding and applying the elements and principles of design. Design is rationalized in a vague way in relation to understanding the "attributes" of design for the purpose of perceiving and analyzing the designed-environment. The elements and principles of design are related directly to music and dance as well as visual arts projects and activities.</p>					
NEW BRUNSWICK					
<p>1980 - Stipulated Definition related to "visual organization" with reference to 19th century concepts of the production of "attractive and useful" objects. Rationale for design is vague but appears to be based on understanding the elements of design as common to all natural and man-made things. The study of design is described in terms of the "discovery" of design "concepts", "factors", and "ideas", but these terms are not defined or explained. Emphasis in grades 7 - 9 on an introduction to the elements and principles of 2 dimensional design but no expansion on that foundation evident for later grades. No distinct Applied Design courses offered.</p>					

Not Apparent
 Stated But Vague
 Stated, Described

MINISTRY	STIPULATED DEFINITION	RATIONALE	GOALS & OBJECTIVES	REF. ELEMENTS & PRINCIPLES	DESIGNATED COURSES	
NEWFOUNDLAND						
<p>1978-81 - Comprehensive approach to design studies with a Unit Handbook which focuses on the aims of helping teachers and students understand how design works and what it does. Design is described as the 'core' of all creative expression and the primary objectives are related to understanding visual language (elements and principles of design), understanding design concepts, problem-solving, and analyzing the designed-environment. Introduction to the elements and principles at the primary levels with courses or activities in Communicative Design, Theatre Arts & Costume Design, Applied Design, and Textile Arts prescribed for secondary levels. 'Design' is a core component of senior secondary art studies and is compulsory. No Stipulative Definition of design or design-related terms provided although it is implied that design be seen in terms of the understanding and application of the basic elements and principles.</p>						
NOVA SCOTIA						
<p>1979 - A rationale for design is stated but refers, in vague terms, to understanding the "procedures of the designer" and the elements and principles of design as an integral part of all composition. The stated objective in regards to design is to understand and apply the elements of design (visual organization). 'Drawing and Design' is described as a component of the art program with emphasis on teaching design "fundamentals" in relation to commercial art, product & advertising design, interior design, design & colour, and the history of design in association with architecture and sculpture. Descriptions of design-related activities and strategies is limited and goals and objectives unclear.</p>						

Not Apparent
 Stated But Vague
 Stated, Described

MINISTRY	STIPULATED DEFINITION	RATIONALE	GOALS & OBJECTIVES	REF. ELEMENTS & PRINCIPLES	DESIGNATED COURSES	
ONTARIO	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	
<p>1986 - The core content of the Visual Arts program is divided into 'Design', 'Studio', and 'History' components. A rationale for design is stated and is related, in general terms, to understanding the elements and principles of design. No Stipulative Definition of design is provided. A wide range of specific 'design' courses are offered including Fashion Design, Applied Design, Information Design, Environmental Design, Interior Design, and Stage Design. Goals and objectives for each of the courses are clearly stated. Each design course has the Design, Studio, and History components as the basis of the course contents.</p>						
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	

Not Apparent
 Stated But Vague
 Stated, Described

III. ANALYSIS AND INTERPRETATION

In CHAPTER II two design and design-education related paradigms or conceptual orientations were isolated and offered as critical aspects in the development of both the practice and study of design over the past one hundred years. It was established that there is a body of opinion or held belief that design is most appropriately defined in relation to the process of problem-solving. This particular orientation has an historical basis which can be traced back to the advent of the industrial revolution. It was further established that some theories and models of design and design education which are tied to the problem-solving concept and which have been most influential from the mid 19th century to the present have been seriously challenged. Some researchers and educators maintain that claims and assumptions common to 1st generation theories and methods cannot be substantiated and do not necessarily facilitate the most appropriate or productive design procedures. The second paradigm examined is generally based on the broad notion of design as a basic and universal human capacity and this conceptualization is recognized as the foundation of an emerging field of enquiry related to design and design education.

Assumptions and claims related to both paradigms were examined and refutations and counter-claims provided. The following is a summary of the main assumptions and claims found underlying the 'Problem-Solving' paradigm:

1. It is possible to determine and measure human behaviours which are common to all problem-solving, design-related activities.
2. It is therefore possible, and perhaps preferable, to prescribe formalized stages or methods of design procedures based on these behaviours.
3. The utilization of such prescribed methods would allow the designer to minimize risks imposed by subjective judgements and/or lack of knowledge.
4. Subjective judgements are dangerous to the design process.
5. Problems can be understood to the extent that they can be precisely defined and classified.
6. The process of identifying and classifying problems is a necessary condition of the design process.
7. 'Well-defined' problems represent the most valid problem-type for consideration within the design process.
8. Problems are defined in terms of understood needs.
9. It is possible to fully comprehend all the physiological, psychological, and cultural determinants

of 'need' thus providing for a more precise definition of 'problem'.

10. The notions of 'problem' and 'need' are interactive and interdependent.
11. It is possible to predetermine the ways in which 'needs' and 'problems' should influence the design process.
12. Creativity is a pre-condition of the design process.
13. Creativity is best defined in relation to subjective responses to given 'problem situations'.
14. A process or activity is not a design process or design activity unless the conditions for subjective/creative input are satisfied.
15. It is possible to predetermine what those conditions should be and how they might be best satisfied.

In response to such claims the following refutations or counter-claims were uncovered:

1. It is not possible to isolate or measure behaviours deemed typical of design-related, problem-solving activities.
2. Behaviours that are seen to be necessary and sufficient to the design process do not necessarily represent all the behaviours and/or capabilities which might actually be brought into play during the design process.
3. It is not possible to reduce problems to precisely

defined categories.

4. The design field lacks even the most basic competence in problem identification.
5. The sub-concept of 'need' is ill-defined.
6. Designers, like all others, are unable to totally comprehend the full extent of both their own needs and the needs of others.
7. It is not preferable or necessary to conform to pre-determined, prescribed design methodologies in dealing with design-related, problem-solving situations.
8. Conforming to rigid, prescribed methodologies inhibits the designer and limits the design process and does not necessarily facilitate satisfactory design solutions.
9. Prescribed, rigid methodologies limit or prevent subjective/creative responses, behaviours, or input on the part of the designer.
10. While the notion of 'creativity' as a necessary and critical pre-condition of the design process might find some degree of agreement within the fields of design methodology and art & design education there remains, even within the field of creativity research itself, a distinct lack of agreement regarding the exact nature, form, and function of creativity.

The 'Basic Capacity' paradigm, which appears to be evolving

around the central notion of 'design awareness' or 'design capability' as basic and universal human capacities, challenges those 1st generation concepts of design which tend to interpret or define 'design' in terms of educated capabilities, learned skills, and specialist applications. As this paradigm encompasses an emerging field of enquiry it is difficult at this point to gain a clear picture of the central questions and issues around which related research might coalesce. However, the focus of research such as that undertaken by Darke (1984), Archer (1984), and others at the Royal College of Art, indicates a growing interest in exploring and better understanding the nature of basic attitudes, knowledge, and capacities which might be brought to design activity.

As Baynes (1976) has pointed out, the emphasis in design and design education research has moved from an established concern with systems and procedures, to an interest in understanding the way designers know what they know and do what they do. Now, current preoccupations center around the analysis of basic mental states and thought processes as they might apply to the process or activity of designing. Three primary arguments have been isolated in relation to the 1st, 2nd, and 3rd generation claims and concepts subsumed within the two major paradigms. These arguments are

seen as representative of the shifts in conceptual orientations towards the design process over the last forty to fifty years. The arguments are as follows:

1. The process of design is entered into and controlled by the trained specialist designer utilizing prescribed methodologies. These methodologies facilitate the generation of the most appropriate and successful solutions to 'tamed' or fully understood design-related problems. Further, the designer alone possesses the skills and knowledge necessary for a complete understanding of related needs and problems and to the determination of appropriate goals and outcomes. Subjectively-based responses, judgements, or behaviours on the part of the designer are seen as detrimental to the design process and are best kept in check by adherence to clearly defined stage-process (1st generation) methodologies.
2. Everyone has a capacity and a need for organizing and manipulating their environments to satisfy both practical and aesthetic requirements. It is also not possible for the specialist designer to fully comprehend or appreciate the needs and responses of others, confidently predict the direction the design process will take, or precisely pre-determine the eventual outcome or product. Therefore, it is inappropriate that

the specialist designer be the sole arbiter of the design process or of its results. All concerned parties should contribute, should help determine needs and desired outcomes, and should share the responsibility for those outcomes (2nd generation methodology). The specialist designer should act as a facilitator who helps others question, plan, and decide. It is accepted that subjective responses and input have value to the process.

3. The participatory approach to the process of designing can overcomplicate the proceedings and impede progress towards final solutions. However, it is recognized that the specialist designer brings the kind of essential knowledge and expertise to the proceedings which other, untrained participants cannot. The role of the specialist designer is seen as critical to the process. He/she analyzes the situation and offers conjectures, possibilities, and solutions for critical analysis, refutation, acceptance, or rejection by the other concerned parties.

These arguments, when transposed to an educational context, carry significant implications for the way design studies or activities might be dealt with within art & design or general curricula. If used as a basis for rationales for a

design studies programs or activities the first and third arguments or points-of-view would commit programs to approaches to classroom experiences whose primary functions would be the promotion of particular skills and stage-process methods and vocational-type training in specialized design fields. Certainly at the secondary level there exists numerous models of Fashion Design, Commercial Design, Stage Design, Industrial Design, Design Technology, Communication Design, and Craft & Design courses which serve such a function.

The second argument might encourage a more cross-curricular approach to the study of design - one in which design-related experiences, problems, and challenges are seen as integral to all subject areas and in which the student would be encouraged to explore beyond subject constraints and definitions and to utilize information, knowledge, theories, and methods from other sources. Baynes, Archer, and Daley, can be viewed as prominent proponents of the second argument. In reference to the 'Basic Capacity' orientation towards design in the schools, Baynes (1985) describes the study of design as a 'dimension of the curriculum' - a field of educational experiences in which "... design, like language, is a concept beyond any one existing school subject". (p.238)

The limited analysis of the Canadian curriculum documents reveals that in general the curriculum designers perceived the concept and the study of design primarily in terms of having students understand and apply the elements and principles of design. In this sense it can be argued that agreement regarding the concepts of design and design studies does exist, in a fashion, across those systems. Rationales for design, where they exist, are basic in nature and tied to relating an understanding of the elements and principles of design to the organization of visual compositions. Goals and objectives, whether implied or explicitly prescribed also tend to relate to the same concern. Only two systems provide advanced secondary study in particular applied design courses and only the British Columbia (elementary) and the New Brunswick documents provide a clear Stipulative Definition of design. These results appear to indicate that Canadian art curriculum developers have, to date, concerned themselves with design-related concepts and curriculum-related activities only within a very basic and narrow conceptual framework. There appears to be little if any concern shown for reconceptualizing design education within Canadian art education. There is little evidence in the documents of concern with developments in design education which have taken place in the United Kingdom or Australia, for example,

or of reference to theories, concepts, and curriculum models related to those systems. In looking at the use of the term 'design' within the Canadian curriculum documents it can be concluded that, in this particular case, the meaning of design is defined primarily as 'the elements and principles of design as applied to the organization of visual compositions'.

IV. CONCLUSIONS AND RECOMMENDATIONS

It was suggested in the introduction to this study that fundamental concepts are basic to any intelligent thought or discourse about educational matters. Even the most primary theoretical and practical curriculum work requires the support of terminology and concepts which are generally understood. It was further suggested that the work of evaluating, developing, revising, and implementing curricula can be confused and made difficult by reliance on terms and concepts which prove to be vague and ambiguous. This study set out to test the hypotheses that the term 'design' is vague and ambiguous and could, therefore, be considered unreliable when applied either to discourse relating to design or design education or to the work of developing and articulating the aims and purposes of design-related activities within art curricula.

This study has established that the term 'design' remains vague and ambiguous and is therefore generally unreliable when utilized within the language of the fields of design, design theory, design methodology, and art & design education theory and curriculum development. It appears, on the basis of the material examined in the study that there exists, across all the related fields and education systems,

a wide diversity of notions regarding both the concept of 'design' and the way it should be dealt with within art curricula. It also appears that the term 'design' has not found a high enough degree of general agreement and understanding across and within those fields to allow for easy communication about design-related concerns, theories, and issues.

It would be difficult, given the limited nature of this study, to draw conclusions regarding the extent to which discourse and work related to the development of design education curriculums is influenced by this lack of understanding and agreement. An examination of the available Canadian art curriculum guides does appear to indicate however, that in regards to the study of design within secondary art courses across Canada there is little if any agreement or contiguity in regards to either defining the basic concept of 'design' or in fitting design studies or activities into the art curriculums. A comparison of the Canadian documents with other selected curriculum models also indicates that Canadian education systems have paid significantly less attention to design education issues than have their British and Australian counterparts, as prime examples. Descriptions of design-related activities within Canadian art curriculums tend to be much more basic in

nature (or uninformed, it might be argued) than those found in the British and Australian models. Further comparison of the various approaches to design education would constitute a sound basis for an additional study. It would require another study, perhaps in the form of a general survey of art educators and curriculum developers, to gain any insight into what correlations might exist between confusion or lack of agreement over the basic concept of 'design' and the development of existing design studies aspects of art curriculums. However, on the basis of my practical experience and the findings of this study I believe such a survey would reveal a diversity of held notions, beliefs, and assumptions regarding the concepts of design and design education on the part of Canadian art educators and that further study would reveal some correlation between that lack of general agreement and the basic and uncohesive state of design education across the provincial educational systems.

In the course of examining the logical/conceptual terrain of the fields of design theory, methodology, and education, two paradigms were isolated as the major orientations in regards to the conceptualization of design, assumptions, presuppositions, and claims intrinsic to those paradigms were examined along with various counter-claims and

refutations which served to challenge many of the underlying premises. In turn three basic orientations towards design methodology (1st, 2nd, and 3rd generation concepts) were seen to be subsumed within the major paradigms and recognized to have important implications for the development of rationales for the study of design within the schools.

Examination of the theories and principles set forth in the concerned fields indicates that 'design' is an open concept, a concept that has yet to find a high degree of consensus either within or across the design professions, the fields of design theory and research, or art & design education and curriculum development. Communications from a variety of sources, which span a forty year period of design and design education history, provide evidence of a wide complex of underlying assumptions and claims related to the conceptualization of design and its study. The conclusion that the term 'design' remains vague and ambiguous appears well justified. It would also seem appropriate to conclude that a consensual definition of 'design' - one that would find a high degree of agreement both within and across the concerned disciplines - has not and likely will not be easily found.

Within the 'Problem-Solving' paradigm 'design' is primarily defined in relation to procedures, educated understandings, data collection, and the application of prescribed methodologies. Here the conceptual construct is built around assumptions, claims, and presuppositions regarding the measurability, control, and predictability of responses to design-related situations and problems. It is generally assumed, and many of the most prominent models of design methodology and design education are based on this assumption, that it is possible to predetermine what methodologies would best facilitate good or successful design procedures and results. It is also assumed that the outcomes of those procedures can be predetermined and controlled. Methodologies are established according to the belief that behaviours relevant to the design process and related methodologies are measurable, understandable, and predictable.

Such claims do not appear to be substantiated by scientific data nor is it clear how such value and subjectively-based notions of design could be tested. Without solid evidence to validate '1st generation' claims the concept of 'design', as it relates to the 'Problem-Solving' paradigm, remains vague and ambiguous in spite of the wealth of attempts to establish generally agreed operational definitions and to

entrench what some consider to be appropriate design methodologies.

In regards to the 'Basic Capacity' paradigm the general concept of 'design' is anchored to a much broader, open-ended notion of basic human capacities or predispositions. Here axiological presuppositions regarding basic human nature and the universality of human responses to particular stimuli and environmental conditions provide the basis for a definition of 'design'. Humans are seen to have a 'need' and a natural capacity for organizing, manipulating, or 'designing' their environment for practical and aesthetic purposes. We are all natural 'designers'. All of us have a basic capacity which can be further expanded or refined through various educative processes or experiences. A capacity educated towards a higher capability if you will.

It is obvious that the 'Basic Capacity' paradigm sits in distinct contradiction to the claims inherent to the 'Problem-Solving' paradigm. However, because the assumptions which undergird the latter are themselves so open-ended and general in nature it is an open question whether the concept of 'design' can be anything but vague and ambiguous when defined within this context. While there does exist a substantive body of research and testing related to basic

human capacities (most notably in the areas of numeracy and literacy), the determination of what might constitute appropriate concerns or focus of 'Design Capacity' related research has yet to be defined to any reasonable extent. Given the vague nature of the general notion of the 'Basic Capacity' paradigm and the lack of research and conclusions against which underlying assumptions can be tested, the basic concept of 'design', in this context, also remains vague and ambiguous.

Of some import to the process of drawing conclusions regarding the vagueness and ambiguity of the concept of 'design' is the fact that during the course of examining material for this study no explicit examples of the following claims were uncovered:

1. The basic concept of 'design' is precisely, adequately, and/or appropriately defined.
2. There isn't any confusion or lack of agreement regarding the meaning of the term 'design'.
3. There is a consensus both within and across educational systems as to the appropriate aims, purposes, and content of design-related activities within art & design curricula.
4. There is one model of a design curriculum which should be considered ideal and as appropriate for all systems.

5. Design education is a priority issue for art curriculum developers in Canadian provincial systems.

In regards to testing the hypothesis that the term/concept of 'design' is vague and ambiguous the conclusions can therefore be summarized as follows:

1. It is evident that the term can have more than one meaning and that the meaning is often governed by the context in which it is used.
2. Given that there are a variety of contexts in which the term is applied the concept can be seen to be conceptually ambiguous in the most general philosophical sense.
3. There does not, as yet, appear to be any rule which can specify for every case whether the term is valid or invalid. In other words, there is no generally agreed rule or set of rules which specify what necessary features the term must have in order to apply. The term of 'design' is vague as well as ambiguous.
4. Because of its vagueness and ambiguity the term 'design' cannot be considered reliable when applied to discourse relating to design and design education particularly in the case of communications across disciplines. It is difficult to get a consistent view of how conditions for its use in one schema might be considered as appropriate

for its use in another.

5. In reference to Soltis's model of 'Analytic Situations' it can be concluded that both 'Differential' and 'Conditions' type situations apply to the term/concept 'design' as it is utilized within the fields of design theory, methodology, and education.

The analysis of the design-related content of the selected curriculum documents is too limited to substantiate any claims or assumptions regarding a positive correlation between a lack of agreement over the concept of 'design' and the ways in which design-related activities are described or prescribed in art curriculums. Any number of variables not considered in this study might eventually be isolated as determining factors in the formulation of approaches to the study of 'design' within secondary art curriculums. However, on the basis of limited content analysis conducted in this study the following conclusions relating to the the study of 'design' within the field of Canadian art education can be offered:

1. Design-related statements within the various Canadian curriculum documents indicates commonality across the provincial systems primarily in terms of a general conceptualization of design studies as the 'understanding and application of the elements and

- principles of design'.
2. Comparison of the document statements indicates a wide variance in the degree of concern regarding the issue of defining the concept of 'design'.
 3. Collectively the curriculum documents do not appear to help in clarifying the general concept of 'design' or in providing Canadian art with a definition of design beyond that related to the organization of the elements and principles of design.
 4. In the majority of the Canadian curriculum documents the issues of defining the concept of 'design' and of articulating the aims and purposes (of presenting a rationale for) of design-related activities have been either ignored, avoided, or excluded. The reasons for such are unclear.
 5. Goals and objectives related to design activities are generally associated with gaining an understanding of the elements and principles of design and with applying them in the organization of visual material.

In the course of gathering material and data for this study the following conditions relating to the general field of art & design education in Canada also became evident:

1. Canadian art educators do not have the support of the kind of complex of supporting agencies (all dedicated to

the development of design studies within schools) that British and Australian educators enjoy.

2. There is limited attention paid to design education issues within Canadian art education literature.
3. While British educators can gain a degree in Design Education, no Canadian institution offers a comparable option for student art teachers.
4. Within art teacher training programs across Canada little basic training in design and/or design education is offered to student teachers.
5. There appears to be no articulation of design studies programs through the elementary, secondary, and post-secondary levels of education in any of the provincial systems.
6. There does not exist in Canada any professional design educators associations comparable to the N.A.D.E. in Great Britain.
7. The extent to which the issue of design studies as a component of art curriculums has been addressed within the Canadian educational community sits in extreme contrast to the British and Australian models. The British educational community has long been concerned with design curriculum development and it is this source which provides the bulk of related research and reference material.

One general conclusion which can be drawn from this study is that further conceptual and content analysis in the areas of design and design education is necessary if Canadian art educators are to gain a greater understanding of the relationship between agreement over basic terminology and concepts and the development of design-related curriculums. A case for seeing a direct and critical link between holding a particular orientation towards the basic concept of design and the adoption of particular approaches to the study of design within a curriculum are easily made. If it is held that the 'Problem-Solving' paradigm delineates the basis of what might be considered appropriate aims, goals, procedures, and strategies for the study of design then implications for the form and content of such programs or activities can be recognized. Programs, units, lessons, or activities based on 1st generation assumptions and claims would serve the primary function of involving the student in problem-solving, skill-developing methodologies with concern for the training of specialist, professional designers. Such an orientation might tend to emphasize discrete programs of study such as Fashion Design, Commercial Design, or Communications Design, with little or no emphasis on cross-curricular implications.

Approaches based on 'Basic Capacity' paradigm concepts might

see the study of design in broader terms as a 'dimension' of the curriculum (Baynes, 1985) - an educational experience which is not bound by particular subject areas or constrained by adherence to particular specialist methodologies or predetermined goals and criteria. The purpose of lessons or activities based on 'Basic Capacity' concepts might be defined in terms of introducing the student to the broader notion of design as an integral aspect of everyday life experiences. Such an approach might not necessarily discourage the education of specialist designers but might emphasize, instead, the broadening and educating of that capacity for 'design' which is seen as basic to all.

Implications related to communications about design education issues can also be drawn from this study. It is evident that 'design' remains a vague and ambiguous concept and it is likely that in any given group or community the establishment of a consensual conceptualization or operational definition of 'design' would take considerable time and effort. Work related to developing design curriculums which proceeds without the aid of a generally understood and agreed basic concept might run the risk of either becoming impeded by prolonged debate over proper definition of basic terminology or of entrenching goals

strategies, and activities which are not as well considered or as appropriate as they might otherwise be. It is also possible that educators and design practitioners might encounter considerable problems when trying to communicate across disciplines about basic design and design education issues. Each might adopt different 'special' languages and erroneously assume that particular concepts and definitions are understood and accepted in other domains.

This study supports the argument that such problems can and do exist and are likely to somehow influence design and design education-related discourse and work. The lack of design or design education courses in art teacher training programs across Canada has a number of significant implications for both the design professions as well as art and design education. For example, most college fine art programs in Canada have a requisite 'design foundations' course of some form in place and many art schools and community colleges offer either two or four year applied design diploma programs. Because few secondary art teachers have any significant degree of formal training or direct practical experience in design or design education, high school students graduating to post-secondary design programs often enter their new programs of study with little if any knowledge about even the most basic aspects of design theory

or design history or with limited legitimate practical experience in design project work. Many college design courses are taught by artists with no training or experience in design or design education and many of those view design courses as nothing more than a preparation for work in the drawing, painting, or sculpting classes. There appear to be no in-service design education courses available to Canadian art educators comparable to the *Design Dimension Project* which operates throughout the U.K.. Where applied or commercial design programs are offered few if any of the instructors at the college level have degrees in education and many teach only on a part-time basis. These instructors tend, therefore, to be generally uninvolved with, or unconcerned about, issues relating to the articulation of secondary and post-secondary design studies programs. Communication between college fine art and applied design programs and art teacher training programs at the universities is generally non-existent.

It is ironic that provincial governments will provide for the study of design at the post-secondary level while so little is done to help the secondary teacher better prepare students for entrance into those programs. In comparison a recent tour of a dozen secondary schools throughout the United Kingdom provided evidence that senior secondary

students in the U.K. are significantly more advanced in terms of design knowledge and experience than their Canadian counterparts. In many of the British schools the students have a number of design, design technology, design and craft, as well as fine art courses to choose from. In addition they have the option of entering a program which offers a concentrated series of sophisticated design projects and related exams and which culminates in a General Certificate of Secondary Education in design. Most school districts in the U.K. employ an 'examiner' who supervises design programs in all the district's schools. In most cases those teaching design courses in British secondary schools have experience and/or training in design and design education and they can look to agencies such as the *Design Council* and the *Curriculum Development Committee* for ongoing support and information. In addition there is considerable work being done in finding ways to introduce design experiences into British elementary schools. A complete articulation of design studies programs from elementary through post-secondary may soon be a reality in the United Kingdom.

There is little evidence of a similar degree of concern for the articulation of design studies within Canadian art education and the limited state of design education in

Canada does not seem to focus much attention onto the basic issues of finding consensus about either the concept of design or appropriate aims, purposes, and content for design activities in schools. If the hypotheses dealt with in this study were reduced to a 'chicken or egg' question it would be impossible, on the basis of this study, to determine to what extent the vague, ambiguous, and unreliable nature of the term 'design' has caused art educators to ignore or neglect the development of design education in Canada to degree they have. The question of whether the existence of generally understood and agreed operational definitions of design or design education would more readily encourage interest in design education or would facilitate more research into design curriculum development could form the basis of another study.

The field of design education has, in the main, been guided by developments and the evolution of theories and methods in the design professions. Design education has therefore generally been viewed in terms of the study of 'applied arts' (in which the issue of problem-solving is a critical factor) and/or, as is the case in many college fine art programs, as simply the study and application of the 'elements and principles' of design.

Yet in spite of the fact that design-related studies of some kind are offered at secondary and post-secondary levels and in spite of the fact that most art teachers commonly utilize terms such as 'design', 'visual design', 'design elements', 'two or three-dimensional design', 'design characteristics', 'designerly quality', and 'to design' in their instructional language, it appears that the issues of clarifying what it is we really mean by 'design' and how it might be accounted for in art curricula remain unresolved and highly problematic.

Theorists such as Sparkes (1986), who look at design from a sociological-historical point-of-view maintain that constant changes in the socio-economic framework of society serve to keep the notion of 'design' in a constant state of flux. Accordingly changes in approaches to the activity of designing are seen to be less a matter of the nature of a designer's natural and creative capabilities than of economic, technological, and social pressures. However, shifts in theoretical orientation and research emphasis have occurred and as a result the boundaries of design theory, methodology, and education concepts are proving to be more flexible and open-ended than many educators might have presumed. Research related to various fields such as Social Learning Theory and Cognitive Psychology is contributing

information to the fields of design and design education which indicates it would unwise to assume that the notion of 'design' can be contained within a rigid conceptual/definitional framework. Getzels and Csikszentmihalyi (1976), for example, have undertaken extensive longitudinal psychometric studies of fine art, commercial design, and art education students and have concluded that each is motivated to enter their respective fields out of distinctly different personal value-systems. Roukes (1988) has set forth a concept of 'design synectics' which seeks to encourage a synthesis of creative behaviours and capabilities, patterns and methods of thinking and problem-solving, and exploration of the formal elements and psychological forces within visual compositions. These and other theories and lines of enquiry offer fertile ground for continued exploration and analysis of design and design education issues.

Because the notion of design cannot be easily contained by any one theory or concept the problem of finding a definition or set of definitions that will satisfy or have utility for everyone is greatly exacerbated. This situation might, however, simply reflect the intrinsic nature of design itself. Baynes (1976) has stated that words cannot easily hold the concept of design and in fact, can easily

distort it. Each concept or definition of design, he suggests, is inadequate by itself and there is, and perhaps can or never should be, no single definition which will truly satisfy our sense of the reality of design as a quality or activity existing in the world. In fact it is possible that acceptance of a single concept or definition of 'design' might prove to be a less than positive factor in regards to our perceptions of design and design education. Baynes (1976) sees the variety of concepts, claims, theories, and assumptions as the point and that the playing off of each against the other can create a dialectic out of which a better understanding of design and design capabilities will emerge.

This study does make a case for recognizing that because the work of developing and integrating curriculums requires understood and agreed concepts and precise language, the vague and ambiguous nature of design creates special problems in relation to the task of determining the aims, purposes, and content of design-related activities within art curriculums. In this regard Baynes (1976) emphasizes the need for art & design educators to build a better foundation for understanding the potential of design activity and for planning those activities for the classroom. This study has explored and attempted to define one particular area which,

it is believed, should be analyzed further if such a foundation is to be established. The following are recommendations for additional lines of enquiry which might serve to further clarify and articulate design education-related language and further distinguish art & design education concepts and concerns:

Curriculum Development and Research;

1. Replication of the Royal College of Art's 1973 *Design in General Education* survey which sought to analyze existing design studies programs and to contribute to a body of knowledge on which further development could be based.
2. Survey of Canadian art educators to determine perceptions regarding design-related activities within art curricula. In particular attempt to determine the context in which design is taught in Canadian schools, teacher's perceptions of their own design programs, problems that teachers experience in teaching design, teacher's priorities for assistance in design-related areas, sources of background knowledge and training in design and design education, sources of influences and concepts, and the teacher's perceptions of the aims and purposes of design-related activities within art

curricula.

3. Analysis of the network of agencies which work in support of design education in the U.K. including the *Design Dimension Project*, the *Design Council*, and the *National Association for Design Education* and the ways in which they influence the development of design curricula.

4. Survey and analysis of teacher-training programs across Canada to determine in what ways or to what extent art teachers in-training are provided experiences or information related to design and/or design education.

5. Analysis of models for design education from other educational systems. In particular an analysis of the ways in which the introduction of the national curriculums for art & design (G.C.S.E.) has influenced the teaching of design in the U.K.

In regards to facilitating more and better discourse about design education among art educators in Canada the following are recommended:

1. Analyze and attempt to clarify, for yourself and others, your own beliefs, assumptions, and theories regarding design and design education.

2. Measure these against the way in which you conduct

design-related activities in your classroom.

3. Be more specific in using terms and defining concepts and points-of-view when communicating about design and design education issues.

4. Be more specific in labelling particular course and/or activities such as Fashion Design, Commercial Design, Architectural Design, Fabric Design, Stage Design, Media Design, etc. Establish Stipulative Definitions if necessary or if it will help communications.

5. Continually try to clarify for yourself and others why design-related activities are important educational experiences and how they can be integrated into the curriculum.

6. Avoid 'Definitional Irresponsibility' - resist the temptation to define terms and concepts in any way that seems simply convenient.

V. REFERENCES

- Adams, E. (1984). Curriculum development in art and design education. Journal of Art & Design Education, 3(3), 333-345.
- Akin, O. (1984). An exploration of the design process. In N. Cross (Ed.), Developments in design methodology (pp. 189-208). Chichester: Wiley & Sons.
- Alexander, C. (1984). The state of the art in design methods. In N. Cross (Ed.), Developments in design methodology (pp. 309-316). Chichester: Wiley & Sons.
- Alexander, C. & Poyner, B. (1984). The atoms of environmental structure. In N. Cross (Ed.), Developments in design methodology (pp. 123-134). Chichester: Wiley & Sons.
- Allison, B. (1982). Identifying the core in art and design education. Journal of Art & Design Education, 1(1).
- Archer, L. B. (1984). Systematic method for designers. In N. Cross (ED.), Developments in design methodology (pp. 57-82). Chichester: Wiley & Sons.
- Baynes, K. (1976). About design. London: The Design Council.
- Baynes, K. (1982). Beyond design education. Journal of Art & Design Education, 1(1), 105-114.
- Baynes, K. (1984). A view of design education in Britain. Journal of Art & Design Education, 3(1), 5-18.

- Baynes, K. (1985). Defining a design dimension of the curriculum. Journal of Art & Design Education, 4(3), 237-243.
- Black, M. (1973). Notes on design education in Great Britain. In D. W. Piper (Ed.), Readings in art and design education: 1 after Hornsey (pp. 29-45). London: Davis-Pynter.
- Brendendieck, H. (1974). How do we see the world today? In R. Barnham (Ed.), The Aspen papers (pp. 73-76). New York: Praeger.
- Broadbent, G. (1984). The developments of design methods. In N. Cross (Ed.), Developments in design methodology (pp. 337-346). Chichester: Wiley & Sons.
- Brodbeck, M. (1973). Logic, language, definition, and concepts. In H. S. Broudy, R. H. Ennis, & L. I. Krimmerman (Eds.), Philosophy of educational research (pp. 615-617). New York: Wiley & Sons.
- Cross, N. (Ed.). (1984). Developments in design methodology. Chichester: Wiley & Sons.
- Daley, J. (1984). Design creativity and the understanding of objects. In N. Cross (Ed.), Developments in design methodology (pp. 291-301). Chichester: Wiley & Sons.
- Darke, J. (1984). The primary generator and the design process. In N. Cross (Ed.), Developments in design methodology (pp. 175-188). Chichester: Wiley & Sons.

Department of Education, (1985). Design in action.

Australia: Queensland Department of Education.

Department of Education & Science, (1985). G.C.S.E. - The national criteria: Art & design; Craft, design, and technology. Great Britain: Welsh Office.

Design Council, (1971). Industrial design education in the United Kingdom. London.

Design Council, (1976). Engineering design education .
London.

Design Council, (1980). Design education at the secondary level. London.

Design Council, (1987). Design and primary education. .
London.

DiBlasio, M. K. (1978). The need for critical examination of belief claims in art education. Studies in Art Education, 19(2), 28-53.

Dobbs, S. (1971). The problem of communication in art education: the need for a theory of description. Studies in Art Education, 12(2), 28-33.

Education Department of South Australia, (1978). Planning design courses for secondary schools. Adelaide.

Eggleston, J. (1976). Developments in design education.
London: Open Books.

Eisner, E. (1968). Curriculum making for the wee folk. Studies in Art Education, 9(3), 53.

- Frankena, W. (1966, October). A model for analyzing a philosophy of education. The High School Journal.
- Gardner, H. (1982). Art, mind, and brain - a cognitive approach to creativity. New York: Basic Books.
- Geahegan, G. (1975). Curriculum projects and criticism: the need for conceptual analysis. Studies in Art Education, 18(1), 8-13.
- Getzels, J. W., & Csikszentmihalyi, M. (1976). The creative vision: A longitudinal study in problem finding in art. New York: Wiley & Sons.
- Green, P. (1974). Design education: problem solving and visual experience. London: B. T. Batsford.
- Green, T. (1971). The activities of teaching. New York: McGraw Hill.
- Harahan, J. (1978). Design in general education. London: Design Council.
- Hamblen, K.A. (1984). An art education chronology: A process of selection and interpretation. Studies in Art Education, 26(2), 111-120.
- Hills, P. J. (Ed.). (1982). A dictionary of education. London: Routledge & Kegan Paul.
- Hirst, P. H., & Peters, R. H. (1970). The logic of education. London: Routledge & Kegan Paul.
- Hobbs, J. (1973). The problem of language and values in aesthetic education. Studies in Art Education, 15(1),

5-9.

- Horrocks, A. (1969). Art rooms. In K. Baynes (Ed.), Attitudes in design education (pp. 31-84). London: Lund Humphries.
- Jaeger, R. M. (Ed.). (1988). Complementary methods for research in education. Washington: American Educational Research Institute.
- Jaques, R., & Talbot, R. (1975). Problem identification for design: finding the right problem to solve. DMG-DRS Journal, 9(2), 110-114.
- Johnson, I., Cardinale, R., Chapman, L., Dorethy, R., Feldman, E., Lewis, H., & Lovano-Kerr, J. (1979, Spring). Priorities for basic research in art education - Report of subcommittee b of the doctoral advisor's roundtable. Review of Research in Visual Arts Education, 10, 1-5.
- Kestelman, M. (1973). The aim & content of art education. In D. W. Piper (Ed.), Readings in art and design education: 1 after Hornsey (pp. 46-52). London: Davis Poynter.
- Kimball, R. (1982). Design education: The foundation years. London: Routledge & Kegan Paul.
- Lawrence, G. R. (1982). Art education and the curriculum in England and the United States: a question of status. Educational Studies, 8(2), 157-164.
- Lawson, B. R. (1984). Cognitive strategies in architectural

- design. In N. Cross (Ed.), Developments in design methodology (pp. 209-220). Chichester: Wiley & Sons.
- Lobell, J. (1975). Design and the powerful logics of the mind's deeper structures. DMG-DRS Journal, 9(2), 122-129.
- Luckman, J. (1984). An approach to the management of design. In N. Cross (Ed.), Developments in design methodology (pp. 83-98). Chichester: Wiley & Sons.
- MacDonald, J. B. (1971). Curriculum theory. Journal of Educational Research, 197.
- Maser, S. (1987). Design as science. In S. Vihma (Ed.), Form & vision (pp. 90-99). Helsinki: University of Industrial Arts.
- Mason, R. (1987). Art & design and environmental education. In S. Vihma (Ed.), Form & vision (p. 50-59). Helsinki: University of Industrial Arts.
- Nutt, P. C. (1975). Model for design methods and research. DMG-DRS Journal, 9(3), 300-310.
- Ornstein, A. C. (1977). An introduction to the foundations of education. Chicago: Rand McNally.
- Park, J. (1963). Selected readings in the philosophy of education (2nd ed.). New York: MacMillan.
- Papanek, V. (1970). The education of the art professional: The designer. In E. B. Feldman (Ed.), Art in american higher institutions, (p. 39-59). Washington: N.A.E.A.

- Pfeiffer, R. S. (1979). The scientific concept of creativity. Educational Theory, 29(2), 129-137.
- Phenix, P. H. (1975). Realms of meaning. In M. Gobby, J. Greenwald, & R. West, Curriculum design. London: Croom Helm.
- Piper, D. W. (Ed.). (1973). Readings in art and design education: 1 after hornsey. London: Davis Poynter.
- Popper, K. R. (1965). Conjectures and refutations: The growth of scientific knowledge. New York: Basic Books.
- Rittel, H. W. (1984). Second generation design methods. In N. Cross (Ed.), Developments in design methodology (p. 317-328). Chichester: Wiley & Sons.
- Roberts, P. (1982). What is design? Journal of Art & Design Education, 1(2), 237-243.
- Roukes, N. (1988). Design synectics: Stimulating creativity in design. Worcester: Davis.
- Rowe, P. G. (1987). Design thinking. Cambridge: M.I.T. Press.
- Scheffler, I. (1960). The language of education. Springfield: Charles E. Thomas.
- Skerl, J. (1987). Man follows form. In S. Vihma (Ed.), Form & vision (p. 126-129). Helsinki: University of Industrial Arts.
- Smith, B. O., & Ennis, R. H. (1961). Language and concepts in education. Chicago: Rand McNally.

- Soltis, J. F. (1978). An introduction to the analysis of educational concepts (2nd ed.). Reading: Addison Wesley.
- Sparkes, P. (1986). An introduction to design & culture in the twentieth century. London: Allen & Unwin.
- Thomas, J. C., & Carrol, J. M. (1984). The psychological study of design. In N. Cross (Ed.), Developments in design methodology (p. 221-236). Chichester: Wiley & Sons.
- Unruh, G. G., & Unruh, A. (1984). Curriculum development - problems, processes, and progress. Berkely: McCutcheon.
- Webb, N. (1987). Editorial. Review of Art Education. 15(1).
- Yoemans, M. R. (1984). Art and design: Interdependent and interrelated? Journal of Art & Design Education, 3(3), 316-322.