EDUCATION OF CREATIVITY: PROCEDURES AND PROCESSES

by

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INTRODUCTION

It contains beginnings, predicts endings, and offers in-betweens. Somewhere within individuals lie the structures upon which they assemble thought. Education produces the patterns of how one thinks, and, ultimately, affects what one thinks.

This belief, in one form or another, is almost intrinsic to the civilized way of life. No one could publicly deny 'education' without accepting condemnation as one who is not concerned with the fate of his society; and no one could logically plan for a society without offering a means of transferring the knowledge to its members, thus assuring the continued existence of that society.

Currently, one is frightened by the possibility that our knowledge is of such complexity that present techniques do not adequately acculturate contemporary man into contemporary life. So experiments begin. Since the war, there has been a proliferation of new models[1] with which to organize information, not necessarily add to it. The by-products of this search have been finding their way

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[1]See: a. General system theory
General System Theory. by Ludwig von Bertalanffy (George Braziller, 1958)

b. Structural functionalism
"Structural Functionalism Revisited," by Jerald Hage, Department of Sociology, University of Wisconsin

c. Cybernetics
The Human Use of Human Beings. Cybernetics and Society. by Norbert Wiener (Avon Books, 1950)

d. Game theory (published in 1944 by J. von Neumann and O. Morgenstern)
"Critiques of Game Theory." Behavioral Science, Vol. 4 (1959)

into education ideologies as well. And so man begins to discover and believe in the true complexity of the knowledge that he seeks to communicate. But while the search for "Creative Education" has become the center of much investigation and learned thrashing within nearly all the related disciplines, the "Education of Creativity" has not. The reason being that: education is designed to make people appreciate that which has come before. Adequacy and competence can hardly be built by encouraging a dissatisfaction with that which exists. "Nor is education really concerned with progress: its purpose is to make widely available, knowledge that seems to be useful. It is communicative, not creative."[2]

A mistaken belief seems to have been carried over: a belief that 'creativity' is somehow 'magic,' that there is no newly perceived complexity or simplicity in the process of design, only more or less magic. Simultaneously, design is often denied the benefit of a process (whether ordered or chaotic) and creativity is seldom regarded as a concern of education (whether formal or informal).

Education of creativity is apparently a paradoxical contradiction of terms; while design process has never been correctly viewed as a redundancy of meanings. To assemble the three into 'Design Process Education' must seem to approach a literary absurdity. It is not. It is not because:

Design is not magic. It is the transformation and translation of discovery into events.

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[2]Edward DeBono, New Think, p. 45 (Avon Books, New York, 1967.)

Process is not mechanistic. It is the individual's interpretation of method.

And education must not be pedantry. It is the stimulation to interpret.

There is a parallel between the process of design and the process of education. Education deals with the development of tools with which to deal with uncertainty and design is the use of those tools. Therein lies the link. Education can only communicate tools, not creativity.

But in this communication, education affords potential influence over creativity. Inherently, education stimulates an interpretation of those tools which it communicates. How a designer begins to use existing tools, as well as how he begins to identify and develop new tools, is directly dependent on his perception of 'tool' itself. This perception initiates in the educational process. That is, the form in which a tool is introduced to a student has direct bearing on how he will use it.

What range of interpretation does the tool present? How does the tool stimulate translation and transformation of information into events?

These questions lead to design criteria for the educator. His attitude toward design determines how he defines a tool and its range. The operation is that of making one's attitude and one's logic parallel.

Historically, that parallel was a two-dimensional one. The designer's concern was toward the problems of a minority to produce specialities and to solve dilemmas of a specific class. The profession remained isolated within itself and, at the same time, segregated problem definition from problem solution.

Design problems had origins unrelated to conditions or events, and the process of problem solving was a 'magic formula' or artistic creation. Within the 'mystery,' one acknowledged a type of step-by-step procedure which characterized the nineteenth century concept of time: a chain of isolated events, linked only through a dialogue between the designer and himself. It was an additive procedure; the whole seen as a collection of parts, which could be disassembled, as it were, and used elsewhere.

The education of design in architecture was the memorization and categorization of these previously defined parts (e.g. the Beaux Arts method). The design process became one of describing all of the workable combinations of static, unchangeable parts. One was taught 'how to draw:' a particular way of drawing, when in fact, that particular way of representing reality was the result of only one way of thinking. The range of interpretation was wide enough to include only one.

The limits of such a range is obvious. Thoughts do not exist in isolation, they run in streams. To isolate the products from the thinking that produced them is to make of education nothing more than an arbitrary adherence to rules and forms.

For architecture, this thinking, at best, was a fragmented concept of handling information adequately suited for only simple organizations; but, it must be admitted, a concept with which a surprising number of effective combinations were derived. To deny the contributions of history because its manner of conception no longer satisfies current needs would be as big a folly as denying the potential inherent in the present: a present which sees the mechanical arrangement

of parts as an operation which can more easily be performed by the computer.

Things have grown from simple to complex, in terms of magnitude and interrelationship, and with the technical revolution came a change in society. The balance between attitude and logic was upset.

With the presence of the machine, the realization came that there are bounds to man's cognitive and creative capacity, limits to the number of issues that he can consider simultaneously, and limits to the complexity of a decision that he can consider wisely. Aware of his limitations, man can no longer afford to believe that design is a two-dimensional concern. Using such a thinking to handle today's complexities proves difficult to control. This is clear in practice by the fact that frequent failures of individual designers to produce well organized buildings that are responsive to multiple criteria, are due to the increase in magnitude and complexity of existing problems.

Somehow, the designer is ignoring or misusing the potentials inherent in the mental and physical frameworks of design. Within design is the formulation of a logic, guided by an attitude. As the attitude increases in complexity of concern, so must a logic effectively change. Logic, by definition, is the means of achieving a goal, primary to the goal itself. Logic is a tool to develop conceptual order.

But many have directly equated this level of abstract order with a rigidity or a formalism that tends to strictly govern the resulting reality. The so-called logic of Jacques Francois Blondel or Vignola, for instance, referred to rules according

to which the elements of an architectural style could be combined. As rules, they may be 'logical.' But this use of logic is purely a mechanistic device of form, with no relation to the needs and forces that are accepted in the real world.

Logic, as a mechanism, is often used today as a geometrical order rather than rules of a style. This 'order' often tends to produce a cold visual rigidity, as seen in the constraint of the steel-skeleton office building.

The problem is one of process. The geometry of logic becomes the final geometry of the building, directly. This is a substitution. No translation has taken place. Abstract configurations have been equated to a physical reality. This, in design, is a fallacy. The symbol is always a simplification and deformation of the reality which it represents. Frank Lloyd Wright defined and used specific recurring elements in his design which, following his death, became symbols of his architecture and ultimately replaced the logic that produced them.

Logic is an abstract framework used to manipulate symbols, invent new structures, and produce patterns and relationships. These inventions generate concepts which are then formulated and transformed into physical reality according to the needs and circumstances of the actual problem. It is a matter of integrating the use of abstract and real tools rather than selecting one or the other.

In the same sense, it is not a question of accepting or rejecting historical information, but rather asking how can the information be applied as design criteria.

Educationally, one can realize the importance of communicating historical contributions in order to establish a knowledgeable appreciation of the past. But such knowledge can be a dangerous thing if it exists purely as information that is memorized, and later generalized to a point where only its physical image is retained and repeated as a design product.

Again the problem is one of process. Potentially, historical information offers the designer conceptual input. But in order for information to be useful at the conceptual level, the designer must seek new physical translations in terms of new needs and constraints.

Education should communicate historical information in a form that stimulates new translations of defined concepts.

For example, after World War I, Gropius saw the need for new translations of old information. The concern was with problems in relation to society, or rather, to the techniques that would change society. The involvement was not with the isolated object (product), but with the cause and effect relationship between the product and its period in time (process). On the basis of this formulation, the Bauhaus came about. Initial developments concerned themselves with the abstraction of the object. Through this abstraction, design started to become the formulation and manipulation of relationships into a kind of convergence about a point, a culminating event.

Designers had seemingly come to terms with the machine and the loss of magic that it entailed. But that loss was intellectual and not mechanical. It was

in terms of the thinking and not the doing. Systematic procedures were used by the designer to ask himself the next reasonable question.

But this thinking was subject to a second regression. The end of World War II brought a vast increase in needs that had to be met quickly. The concern for solving problems in relationship to the whole of society was termed a luxury that the world, at that time, could not afford. The concern was rather with quantity. This was usually viewed as a trade-off with quality. Isolated products appeared which were additive and often contradictory solutions.[3] Instead of relating to society, answers were distorting it. Often systematic methods were used. But they only replaced the magic formula with a mechanical one. Procedures remained additive. The result was new conflicts within the whole of the environment. Nothing was contributing to the quality of the whole.

Elements in isolation deny all relationships to the whole. The result is chaos.

Unable to adequately handle the complexities of these new problems, the designer resorted to his claim as an artist and relied on the magic of his

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[3]See the Prague TO8B building system. Prague, Czeckloslavakia.
This system was developed to quickly and efficiently satisfy an extreme demand for housing. It was expedient to ignore the serious, but correctable flaws in planning and construction that were evident early in the development. After mass-production began, however, it was no longer feasible to make the necessary changes, and construction has continued for 25 years. Due to the initial flaws, the entire system is now neither fast nor efficient, and actually takes longer to erect and finish than standard construction.

intuitiveness; or he redefined himself as an 'environmental scientist' and mechanically plugged systematic methods into structural assemblies. In both cases, the potential for creativity was lost.

Intuitively, the designer cannot translate his idea into the magnitude of the problem and suffers loss of control. Mechanically, there is no room for an idea to pervade the rigidity of a limited definition of parts. Again the problem does not present itself as a choice between mutually exclusive opposites, but rather as a need to investigate the potentials of using them in combination.

Method needs interpretation and adaptation before it can be useful in an individual's design process. Thus, if education is the stimulation to interpret, then the potential lies already within the existing information. The change is not with what is communicated, but how it is communicated. The change is in the educational process.

"Improvements in our educational practices are to be of an order that will meet the challenges of the scientific and social revolution through which we are now living."[4] The result of this revolution is information that is complex, interrelated, and functioning within highly integrated wholes. The rate of change is faster than ever before, allowing one life span to witness a complete turnover in a life style. Language patterns are noticeably changing. New words describe relationships between parts and not so much the parts themselves.

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[4] Jerome S. Bruner, The Process of Education, p. 23 (Vintage Books, New York, 1960.)

New relationships are forming. Concepts of human growth, birth, and death are becoming redefined due to medical discovery and social change. Isolated relationships converge. Technological developments are directing the human mind, man's environment, and the machine into a highly integrated functional whole. Education that communicates facts in isolation, acting together only at random, contradicts the operational usage of those facts in society.

Consequently, education has been diagnosed as in need of a new order. For the education of creativity, that order must semantically, syntactically, and pragmatically parallel the new order of design. Educational investigations must therefore seek the dynamics of that order.

Up to this point, design, whether intuitive or systematic, has been an activity which has additively improved that which exists. But the new discoveries of the scientific and social revolution have hastened man's awareness of the interrelatedness of all things in his world. Contingincies overlap, patterns bridge unrelated concerns, and the complexity of all things increases to a level at which additive control is impossible.

Suddenly, problems are no longer isolated, and architecture must now become a strong means of integrating a cause and effect chain of events that relates to every aspect of growth and life. Therefore, for the first time, the designer has no decision in the acceptance or rejectance of society's relationship to the designed event. Aware of the need for interrelatedness, the designer must attempt to incorporate this awareness into his design process.

The development is already beginning. For example: by definition, the 'conformist' is one who believes in the importance of the object within the environment. His design process is an attempt to improve upon the object's reality. His assumption is that by improving the object he can also improve the quality of life. By implication, its opposite also exists. It is one which is concerned not with the object, but only how the object affects the culture. At the extreme, it pleads no belief in the object at all. It is an attempt to stop the production cycle of new objects into the environment. It contemplates the use of existing parts in new ways, to serve new needs.[5]

Each of these attitudes are examples of conceptual beliefs concerning the object in a cause and effect relationship with society's problems. Thus, design vocabulary is concerned with describing those relationships. The quality of relationships: 'simultaneity,' 'interpenetration,' 'superimposition,' 'space-time,' 'transparency,'[6] etc., pervades the literature of contemporary architecture.

These definitions and descriptions are of a new order. They are 'dynamic' in that they are how information works together. They are operations, not elements. Furthermore, these operations occur at many levels, in many different situations.

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[5]Emilio Ambasz, editor, Italy: The New Domestic Landscape (Museum of Modern Art, New York, April, 1972.)

[6]For: 'simultaneity,' see R. Buckminster Fuller
'interpenetration' and 'superimposition,' see Walter Gropius
'space-time,' see S. Gideon
'transparency,' see Rowe and Slutzky

Their application to architecture being only one particular translation. Their strength lies in the fact that they do not exclude other disciplines with seemingly unrelated input, but instead describe them with the same vocabulary. For example, 'simultaneity' is a parallel operation in math, philosophy, music, and art. Yet, understanding the potential meaning of this translation is recognized as a problem.

"We respond and rarely seek to analyze the nature of our response. It may indeed be futile to attempt such analysis and since the elusive quality of these words (descriptions and definitions) resists semantically simple explanation, perhaps any definition of them can only result in sophistries. Yet paradoxically, it becomes evident that unless the evasive nature of these words is examined, we are in some danger of misinterpreting the forms of lucid complexity to which they sometimes refer."[7]

Somehow, all the rules, definitions, and methods that exist must be used in a new way. Dynamic attitudes need dynamic logics. That is, how does the designer make his awareness of complexity operational? How does he control these complexities without limiting their development and/or change? It seems that all which was perfectly clear has instead become clearly ambigious. A means is sought to clarify the ambiguity.

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[7]Colin Rowe and Robert Slutzky, Transparenz, Kommentar von Bernhard Hoesli. Le Corbusier Studien 1, p. 10 (Birkhauser Verlag Basel, 1968.)

THE MEANS

The way man has used his mind now limits him. Actually, understanding must arrive at a level that is more useful. Rather than end through a separation, categorization, and selection; the idea now seeks application into many situations at once, both general and specific. It initiates a force that generates continuing activity. One application tends to influence, in a positive or negative way, the meaning or operation of another. This is an evolution: increased integration or differentiation of relationships between forces, in a continuous manner over time.

Complexity is an evolution from a simple state. To incorporate all the factors of a complex problem, or meet the needs of a complex situation, a simple idea must also evolve.

So the designer requires new operations for his thinking: new ways to make ideas evolve. His logic must incorporate simultaneous and integral qualities. In complexity, the same operation may occur at varying levels, each carrying a different meaning. In complexity, operations are integrated, or differentiated to produce an event which is dependent upon that interrelationship for its meaning. In complexity, intuitive and systematic procedures are interrelated. "The new synthesis of logic and empiricism of our day has taught us that it is meaningless to assume that domains of knowledge exist where the intellect is not competent."[8]

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[8]Christian Norberg-Schulz, Intensions in Architecture, p. 82 (MIT Press, Cambridge, Mass., 1965.)

Literature labels this concept of thinking as generalistic, integral, fourth-dimensional. It is an activity which continually translates information into new situations. How the information works in each situation refines its use as a relationship. And as a relationship, it is thus stored in its most potentially operational form.

This activity of forming relationships is the result of a dialogue. Accepting, storing, and using information is cyclic and reciprocal. The dialogue represents two-directional communication, which evolves according to stimulus and response from both the source and the receiver.

The dialogue 'exchanges' information in an attempt to find a synthesis. Interrelationships between levels and within levels are the subjects of discussion. The dialogue is a placement of one level in a state of superimposition with another. Exchange preserves control without limiting. "The art of progress is to preserve order amid change and change amid order."[9]

The dialogue uses this exchange, which is inherently the mechanics of mental activity, this associative flow of ideas, in its most potential way; it uses perception, the one distinction between mind and machine, and attempts to increase it and make it conscious.

Perception is the mind's ability to grasp relevant relationships without necessarily being aware of the details of the elements being related. One

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[9]A. N. Whitehead, Process and Reality, p. 515 (New York, 1959.)

continually assembles descriptions about what he perceives. These descriptions are exchanges between perceiver and that which is perceived. In order to realize this continuity, one must be aware that input is often feedback; the act of exchange itself has affected the form or meaning of the information that is observed.

The inability to accept this concept is often the product of education which views itself as a distortionless window on collections of knowledge. For although concerned with communication, education has often failed to perpetuate the 'means' by its extreme emphasis on the 'ends.' With no recognition of the act of perceiving, of generating a dialogue, the influence of the object on perceiver and perceiver on object is lost. For the individual, the dialogue does not exist.

Through such a procedure, an individual's creativity dies. For the ability to perceive, to communicate, to generate a dialogue between himself and an object, between any two forces, and control that exchange, is the inherent creative power of the human mind. Tests of creativity by Mednick and Mackinnon (1962) on architecture students have repeatedly shown that the ability to form a relationship and develop it, is strongest in the creative person. To ignore that quality of the individual places education in a precarious dicotomy.

Dealing only with the ends of a situation limits the individual's ability to communicate. Language is communication, as well as an operation of deriving codes through which communication can take place.[10] The product of education

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[10]Norbert Wiener, The Human Use of Human Beings. Cybernetics and Society, p. 107 (Avon Books, 1950.)

has been the ends of one language. Its use refers to the previously existent, not to the present,[11] and hardly to the future.

"Language may be used in several basically different ways which all fulfill important functions within the process of interaction."[12] The goal of education should perhaps seek to activate the dicotomy, rather than ignore it. To educate creativity should then be to communicate languages with which to communicate.

In this way, each language is then seen as a tool. The more it is used, the more it is understood as a tool. Increased use in varying contexts initiates dialogue and a process has begun. For use in one context and use in another gives the same tool two meanings at once. Both meanings strengthen the use of the tool and increase the understanding of its use in another context. The tool is perceived as dynamic.

Such an awareness expands the dialogue's activity to intersect or parallel other dialogues occuring elsewhere. Once one experiences the dynamics of his own thought process, its structure is recognizable elsewhere, although forms or contexts are different. Analysis becomes a discussion of the interaction of means, and new tools that initiate these means are subject to discovery.

If design is the translation and transformation of discovery into events, then using these new tools in one's own dialogue produces new meanings and thus perpetuates the cycle.

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[11] Marshall McLuhan, Counterblast (Signet Books, New York, 1969.)

[12] Norberg-Schulz, Intensions in Architecture, p. 63

To initiate this cyclic thinking requires the educator of creativity to establish new priorities in his list of educational objectives. The process of visual thinking must preceed or initially equate the execution of products. The ability to translate and to transform is dependent upon the ability to interpret. Interpretation is the use of one's perceptive power. The designer must first learn how to interpret before he can effectively design within defined limits. How one thinks influences what one thinks.

It is obligatory, then, for the educator to stimulate the student's thinking, visually and verbally, interpreting information in new ways, thus forming new information: discovery. The wider the range of discovery, the stronger the concern for investigation and further thinking.

Such attempts distinctly contradict former educational practices, which define a narrow range of acceptable 'discovery,' usually based on value judgements, and concentrate on producing a student who is knowledgable of facts within that range.

It is better to select from a variety of self-evolved alternatives than to arbitrarily stab for the right answer. Realizing that information changes according to how it is perceived begins the search: a search not for new information, but for new tools with which to generate and discover new and existing information.

The educator is responsible for developing and maintaining the dialogue as an effective tool for investigation, to the point where the next problem and investigation are imposed not by the educator, but by the student himself.

To implement such a goal, the educator must make general use of specific ideas. He seeks forms through which to communicate structures. He seeks a range of tools performing in a range of contexts, in a range of complexities, in order to communicate a general awareness.

The objective of such is to grasp a framework within which much information lies, rather than taxing memory with the linkage of arbitrary specifics.

Tools of the architect, whether they be languages, phenomena, methods, or materials, should be presented and used as frameworks. Thus, as in a progression, the student's ability to handle the complexity of specific parts increases simultaneously with his strengthened awareness of the limits of the whole. The concept is one of understanding first the entirety, and then studying the interrelation of parts. It again contradicts previously accepted educational attempts, which see the student's increase purely in terms of a quantitative complexity in design product: the first year student designs a chair, second year designs a playground structure, third year a house, etc. In terms of problem solving, the design of a chair and that of a house are of equal complexity. The difference in design quality of a freshman house and that of a fourth year student need only be in complexity of concern and execution of detail.

Because the educational and design progression is from simple dialogues to complex ones, how the information relates to other information is always the subject of communication, rather than what the information is, and within what context design occurs is always of equal importance to the design itself.

Hans Sedlmayr sought descriptions of historic relationships.[13] He attempted to discuss 'basic formative principles.'[14] His book on Borromini illustrates the attempt. He first describes Borromini's design principle of architectural gestalten. Space-form, space-boundaries, vertical organization and other important relationships are described within the framework of 'relief-units.' The properties of these units are examined and it is discovered that they have possibilities for variation. They could be used in such a way as to create an ambigious form. Sedlmayr realizes that this formal structure has several 'levels' at which different formative principles are reigning. He compares the state of affairs to the distinction of 'melody,' harmony, and rhythm in music.

Through such a discussion, Borromini's design elements are not only related to historical tradition, but are understood as states in his own design development. From the whole to the parts and back to the whole, become the states of context in which each relationship is discussed. The discussion is continual interaction in itself and it conveys Borromini's work as an activity, a dialogue, conveyed as how he conceptually and physically manipulated an idea.

Through a working language, Borromini's experience is translated into a student's experience. One becomes exposed to Borromini's <u>products in terms of his process</u>.

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[13] Hans Sedlmayr, <u>Die Architektur Borrominis</u> (Munich, 1939.)

[14] Hans Sedlmayr, <u>Kunst und Warheit</u>, p. 94 (Hamburg, 1958.)

Because, however, the dialogue must retain a certain multi-directionality in order to remain an effective tool, one must assume, by implication, that the reverse is also true. It should be possible, simultaneously, to describe processes in terms of products. The information recovered, obviously, will be different. This difference begins to be the strength of the dialogue itself. Reusable information is generated where originally there were only objects, and products are assembled where before there was only criteria.

Thus, through the search for process, solely in terms of products, one can compare personalities from what one can perceive about individuals' work:

Frank Lloyd Wright	Le Corbusier
perfection of a principle.	exploration of a principle.
the principle was in terms of his attitude. it gave meaning to that which he did.	the principle was in terms of his logic. it made operational that which he thought.
viewed time as incremental.	viewed time as an integrated whole.
solved problems by connecting elements previously in isolation.	solved problems in a conceptual cause and effect framework.
new interpretation of form through a re-definition of the elements of form.	new interpretation of form through a re-definition of the concept of form.
change of elements.	change of relationship of elements.
developed a language of descriptions that are valuable for the understanding of his own work only.	developed a language of relationships conceptual enough that it could be used to describe more than one idea.

Each of the previous parallel discussions are seen as means of generating certain kinds of information, of producing a range of thinking, from which criteria

could be derived. For this to occur, the thinking must also be simultaneously translated into a meaningful, physical, design discussion in terms of the individual.

A model is a way of making thoughts operational. A model is derived from looking at things in many different ways and operating upon their similiarities. The mathematical model is an example. Any equation is no more than two different ways of describing something. Yet the usefulness of having two ways instead of one is so great that it is one of the cornerstones of mathematics. Having two different ways of looking at something on either side of equal signs makes it possible to manipulate the whole into solutions of its parts.

Model formulation deliberately passes through the mind multiple comparisons. The time and probability properties of the brain then automatically effect the interaction of these comparisons to yield an effective continuation of the thought. This activity can be described as the dynamics of process. It is known to literature as 'stream of consciousness' (that is, a collection of elements, often in a series of events as they occur in the author's mind, organized by the fact that the patterns are more or less linear in structure). One event within the stream, consequently, tends to influence or even produce the next event.

Information must be organized in terms of this stream, as it occurs in thinking, in order that all thoughts have potential relationships to the initial idea.

Models form an objective framework within which an idea can be generated. In problem-solving, it is easy to recognize the need for an idea, but in non-problem situations, it is much more difficult. It may be that the biggest problem

is that there is no apparent problem. When conditions are subjectively smooth and adequate, it is difficult to isolate specific areas which need improvement. Defining a problem in design is a matter of formulating one: finding a condition on which to base decisions.

Such a reorganization of information does not have to await the impact of new facts; it can take place whenever one appreciates the arbitrary nature of a theory or perceives a misconception, and seeks to evolve an alternative.

Every model contains a set of variables which the model is capable of satisfying through controlled manipulation. This manipulation is the function of an applied logic. As in mathematics, where permissable operations are performed entirely within a rigid body of rules and theorems, so also must design models be consciously manipulated.

If one realizes the higher truth that both models and systems of logic are arbitrary, then a situation can be constructed where one can be tested against the other. Once a model is chosen, it is vigorously pursued by logic until one or the other fails, then another is chosen and pursued.

Communication of this thinking, educationally, must be a conceptual progression from simple to complex. An initial step in model thinking deals in seeing personal thoughts and the manipulation of these thoughts objectively. The student must realize that his thinking is a result of complex conditions and the results of his thinking effect other conditions.

To stimulate this realization, it is essential to force the student to see

something in many different ways. Such exercises can introduce media in order to alter what is believed true. In this way, it is a means of visually discussing an object in more than one way; the results being distinctly separate representations of the same reality. Exercises can exist within a wide range of complexity:

1. Sketch an object three times, each time discussing a different level of information about the object.
2. In designing a classroom unit and the integral organization of twenty of them, build five models which discuss different levels of concern, effecting the whole, that the problem has generated.

Models can be introduced as a set of limitations out of which an idea, or a problem in need of an idea, can be generated. In this way, limitations tend to stimulate thinking, not hinder it.

> Given: a 20" by 20" sheet of paper. Without cutting any away, or adding any paper to it, design a packaging container for any marketable three-dimensional item.

Here one is forced to develop relationships out of the given limitations. A cut, seen through the limitations of the problem, must now acquire a more refined definition. No longer concerned with being an operation that adds or takes away parts of the sheet of paper, a cut must be a manipulatory vehicle that increases the number and interrelationship of possible folds. In this way, cuts and folds become vehicles for three-dimensional form and function.

In generating a new building from a baroque plan, the geometry of form now provides a framework through which investigation of transformation to the third dimension can take place.

Categorized in basic forms: realistic - represents some form of reality (space, form, structure)

symbolic - code with which to represent reality

abstract - description of a process or a concept,

models are frameworks in which concepts are formulated. They represent the fluidity of a situation where nothing is rigid and everything is doubted. A concern with the way an individual perceives his thinking generates the idea. Logic develops the idea by using it in a rigidly defined context. Both model perception and logical thought are needed to develop concepts and transform them into events.

Again, what is attempted is to create a dialogue. Models generate a relationship between information by concentrating on qualities that are similar and relevant to that similarity. The result is the ability to carry over new and old meanings into other forms.

This process exposes a relationship to varying contexts and examines its performance 'logically.' Both ways of thinking reinforce each other, and apply the mind in two different ways. Perception is flexible and quick; logic is rigid and slow, making conscious all the mediating factors which are the qualities of a satisfactory perceptual model.

The use of models forces the interaction of logical and perceptual thinking through the model's inherent need to be interpreted, applied, and re-interpreted.

A language of interaction, models can become the common denominator of all languages.

It becomes ultimately a matter of teaching both thought and how to respond to thought.

Stimulation to form models for thinking can occur directly and indirectly, in terms of the group and the individual. Classroom activity should represent the same fluidity that is the inherent quality of perceptual thinking. That is, nothing is out of context as long as it relates to the student's particular model of thinking. On the contrary, the classroom becomes an experimental laboratory where the student uses tools as a model, in varying contexts, with different media, under self imposed rigidities of logic, according to his needs. The educator generates action in quantity and demands quality; but what the level of concern becomes is dependent upon the student's particular use of the dialogue.

Models become not only a way of thinking, but the form in which new information is communicated to the student. It potentially is a verbal, visual, and thought language. When the language becomes this three-dimensional, design is merely an activity of translation and transformation from one language to another.

To use information, the student must differentiate in terms of that which is static and factual, and that which is dynamic and vehicular. The former being information that is documented and stored in 'file cabinets,' the latter being mechanisms that are operational in problem solving.

To see information as an operation which has a specific meaning in accordance

to its context, always gives it the possibility to be used again. As a vehicle, that operation can be performed in another context and thus carry a new meaning; or the meaning can be placed in a related or unrelated context and cause another operation to occur. In either case, vehicles are information viewed as means rather than ends.

Media is potentially a vehicle. Every media has certain patterns and characteristics for the handling of information, and every media technique can repeat a certain quantity or quality of information and reject the rest. The media, in effect, causes a change in information. Thus, media can act as an outside force which enables the description, manipulation, or complete distortion of known information.

Phenomena can be vehicles. If a particular grid is used as a vehicle, it becomes the vocabulary with which information in a perceptual situation is discussed. What is done to the grid in terms of investigation and manipulation determines the range of the potential discussion.

Another way to generate dialogue comparison is by setting up simple thought inversions. This is often nothing more than allowing the opposite extremes of every state to be considered relevant information. Define a condition and deliberately reverse its quality. Instead of assuming the sun revolves around the earth, assume the earth moves around the sun. Instead of assuming that something moves in a curve through space, assume that the space is curved.

The initial state and its inverted counterpart define the extremes of a new

range within which the problem can operate. In a design situation, the dialogue is then a discussion between these extremes. The scientific validity of one or the other extreme is not the issue; but the potential inherent in the comparison is.

Comparison of extremes tends to be cyclic: one state determining, by implication, the limits and freedoms of the other. Knowing this, the cycle, in itself, can act as a vehicle.

Perceiving information in terms of dualistic descriptions emphasizes the level of interrelatedness that determines the qualities in the first place. Each of the various meanings become a framework for discussion that is strengthened and further expanded by applying the discussion at various levels.

Such an activity is a basic generator of design operations and design criteria. One need only understand the concept of cyclic qualities in order to make the dualism operational. Generating cyclic discussions instigates understanding through use.

The understanding of history and the perception of history could, for example, be described as cycles of change:

By definition, change is a variable. In history, it occurs constantly over time. Any operation functioning over time is being affected by events which either reinforce or hinder the continuity of the operation. The result over time is change. The change that continually occurs is quantitative. Experienced, however, over long periods of time, it is non-observable, because quantitative changes are normal, incremental adjustments, they remain invisible.

But, at certain points, accumulations of these normalcies manifest themselves as qualitative change. They appear abrupt and often unexplainable within a context, although they are only the result of slow accumulations. The pattern seems to repeat as cycles.

It may also be said that those conditions which cause interaction can be discussed as variables, that is, change. People living in a house respond to variable conditions and make the situation entirely different than a house which is empty. People are the dynamics of a building, they make its meaning variable. The physical reality of a building is a constant, in that it is a set of fixed points that function in a framework of interaction. For a building to respond to this interaction, its fixed points must have the ability to alter their relationship to the whole of the building, according to need through use.

The preceeding discussions were simply a matter of giving constants a variable relationship, and variables a constant quality. It is a matter of making the cycle from variable to constant operational.

In order to perform qualitative operations, it is necessary to perceive the meaning of a quality in abstraction and not to confuse this meaning with the image that it carries in any other real context. Meaning in abstraction could be termed conceptual meaning. It is a description of how something works without dependency on a specific event. The language of the designer can describe both abstract and real states of meaning and operation, using the same vocabulary. Descriptions of interrelationships in varied contexts strengthen their conceptual

meaning. In this way, abstraction and reality are cyclic states in the development of a concept. Within each state are infinite contexts: situations that carry certain concrete images with its meaning. The image contains characteristics peculiar to itself, or to the vehicle used to represent it. Assembling the possible combinations becomes a playground for generating possibilities.

In terms of a vehicle, the analogy represents another operation which the designer can employ to perceive the arbitrariness of an image as well as the definition and meaning of its concept. It is another way of breaking down the rigidity of a particular way of looking at something, another way of describing a dialogue.

The analogy transfers the relationships of one situation to another, possibly more easily handled situation. In this way, a particular relationship may be studied in two contexts simultaneously, comparing the causes and effects of each situation upon the relationship itself.

The analogy offers possible expansion to any design problem. It enables the designer to always make one more step, to continue his search even if it is in a tangent sort of way. Sources of direct input are not always predictable and only very seldom do they produce new interpretations. But the analogy is a tool with which to gain input from indirect sources.

In a problem solving situation, it is logical to assume a set of limits within which a solution must lie. Boundaries are defined by assumption in order to generate a framework of operation. But those boundaries are imaginary and

information outside of them may also be useful. The analogy compares the meaning of information within the boundaries, by comparison to unfamiliar things outside of the boundaries.

Results of the comparison strengthen the understanding of the relationship which was familiar to both: interpretations can be manipulated consciously.

Defined and used in a range of situations, the analogy (the activity of the comparison) takes the form of many operations.

Logically, the analogy infers that admitted resemblences have probable furthur similarity, and thus becomes a tool of strategy.

Linguistically, the analogy is considered a process by which new or less familiar words, constructions, or pronunciations conform with the pattern of older and more familiar ones. Here the analogy acts as a generator of new meaning.

Biologically, the analogy is a state of similarity in function between things dissimilar in origin and structure.

Whatever the application, the analogy forces images into a framework of relationships. Such a framework has the potential to generate new images or new contexts through further development and translation. The analogy aids the designer in perceiving this activity, one which is basic to design itself.

With the use of the analogy comes the realization that design input can potentially come from anywhere. The educator must expose and enforce a search for similarities that become operational. New information can be presented and discussed in the form of analogy. All images have analogous potential and should

generate new questions for the student as well as the educator.

Through the analogy, music, art, poetry, philosophy, and science are all relevant directions in the search for information. Such relevancies should be exposed and explored through use and demand:

> Sketch a Baroque cathedral in terms of the cube.
>
> Diagram a music composition in terms of pattern in structure.
>
> Analyze a magazine in terms of scale change in the environment.
>
> Design a prefabricated piece of furniture that exhibits qualitative change.

The discussion invariably becomes not only how to stimulate growth and potential, but how to make better decisions with them. Values can be viewed as non-consciously determined elements in decision-making. Criteria, then, are consciously determined elements in decision-making. Design tools enable values and criteria to interchange, making perception conscious and logic less limiting.

Education of creativity should stimulate the use of such tools and the development of new tools according to individual interpretation. Initially, the degree of interpretation depends upon external stimulation. At first, it begins in the form of education, but slowly, that stimulation must internalize to become involvement. Degree of involvement is directly proportional to amount of concern for quality. Inherently, there evolves a minimum level of quality that a professional can accept, both in the supposed process and in the proposed product.

The world is presently filled with those who do their job, who fill their slot

in the machine of production, while the questions of "why" and "how" in terms of "what" are ignored. Thinking only pertains to a narrow range of concern. Results may bring immediate benefits to that particular range, but are usually counteractive elsewhere. The change in thinking must be concerned with increased awareness. Isolated quantitative decisions weaken objectives and new products no longer offer qualities that the older ones did. Why accept the loss? Why believe the logic that produces this loss?

The trade off between economic forces and creativity does not need to exist. There can be a good ten thousand dollar house as well as a good fifty thousand dollar one. But the wider the range of concern, the greater the need for interrelationship of concerns. In this way, quantities become part of the quality judgement, not a substitute for it.

This becomes the design model in the educational as well as professional sense. Translating this model into design concerns and transforming those concerns into successful physical realities are operations that must be performed by the conscious use of tools. Because tools are languages, how they are used determines the extent of what they can do. Education should be exploration into the dynamics of these determinants. Ultimately, the strength of a designer lies in his ability to discover new tools and new uses for tools.

CONCLUSION

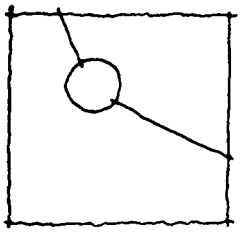
It is essential to understand the attitude which is the basis for this discussion. Placing the concept into the form of another media will strengthen the communication of its meaning. What follows then is a visual description of three design episodes, each following the logic of a different 'language.' 'Intuitive,' 'systematic,' and 'integral' are the labels of each, representing the counterpoints of the previous discussion.

Each 'episode' is a documentation of the activities of an individual design process, with care taken to accurately schedule an actual pattern of thought. Displayed as a way of thinking, each can be perceived in terms of its characteristics and how potential those qualities are to the operational definition of design.

The implications of what each language can do are exposed through comparative information. The difference is one of procedure and process, a difference that can no longer be ignored by designer or educator.

definition: offers the 'black box' stimulus to produce the object. the product is the result of undefined forces that mysteriously 'feel' their way into the solution. the process is a chain of isolated events, linked only through a dialogue between the designer and himself.

' INTUITIVE '



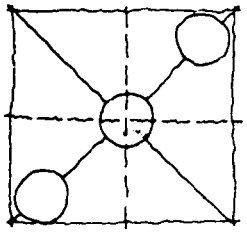
premise: the weakness of the method resulted in the weakness of the process and ultimately the failings of the solution. the students' steps and educators' responses*represent, as closely as possible, the general design and educational tendencies observed in the use of only intuitive thought..

*(student work, undergraduate dept. of architecture, catholic university of america, washington, d.c.)

---

definition: offers a response to 'quantitative concerns' with a mechanical formula that produces the object. the product is the result of manipulating the formula until a workable solution is reached. the process is one of defining parts within a rigidly limited range of acceptibility. parts are linked only through a dialogue within the scientific formula.

' SYSTEMATIC '



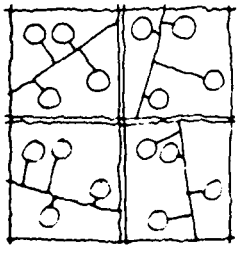
premise: the weakness of the method resulted in the weakness of the process and ultimately the failings of the solution. the students' steps and educators' responses* represent, as closely as possible, the general design and educational tendencies observed in the use of only systematic thought.

*(student work, graduate school, eus, vpi & su, blacksburg, virginia. design methods in architecture. broadbent and ward. 1969.)

---

definition: offers a means of integrating cause and effect and translating those interrelationships from an abstract state to a real one, and back again...producing an object. the product is an evolution of complexity from a simple idea. the process is a cycle which seeks to expand its range, simultaneously and integrally. the designer carries on a dialogue with any or all information responding to this cycle.

' INTEGRAL '



premise: the strength of the method resulted in the strength of the process and ultimately, the strength of the solution. the students' steps and educators' responses * represent, as closely as possible, the general design and educational tendencies observed in the use of integral thinking.

*(undergraduate school of architecture, vpi & su, blacksburg, virginia)

problem: design a house for a couple with two children.
site is square. area is 1,375 square feet.
height of house cannot exceed 25 feet.
spatial requirements:

(1)	master bedroom	150 square feet
(2)	children's bedrooms	100 square feet each
(2)	bathrooms w/bath	45 square feet each
(1)	kitchen	120 square feet
(1)	combination living room/ dining room	220 square feet
(1)	outdoor patio	100 square feet

---

problem: design a small house for a couple with two children.
mathematically and graphically:
identify
analyze
synthesize
all design criteria.
(social
economical
structural
spatial
functional).

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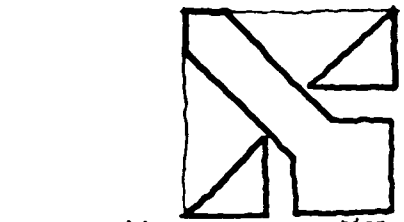
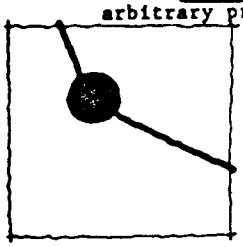
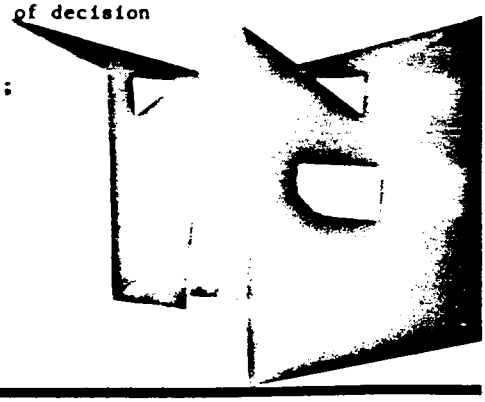
problem: design a house for four people that fits within the volume defined by a 25 ft. cube.



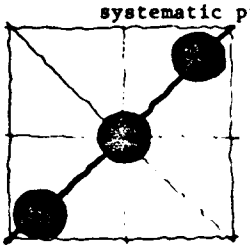
(what?)
limits of solution identified
and accepted. personal preference
about form is basis of decision
and also basis for
response, typically;
"control massing"

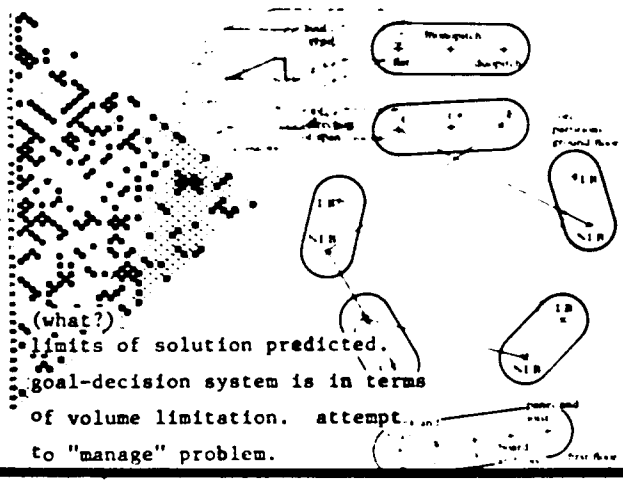
arbitrary preconception





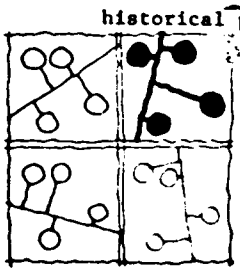
systematic preconception

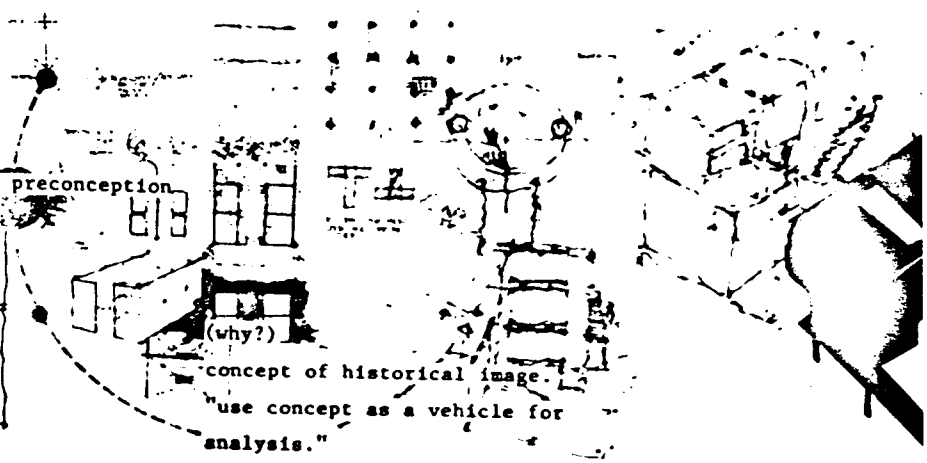




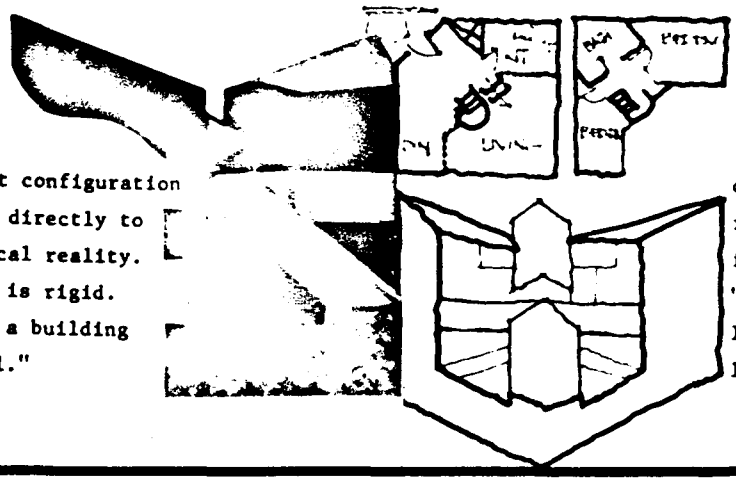
(what?)
limits of solution predicted.
goal-decision system is in terms
of volume limitation. attempt
to "manage" problem.

historical preconception



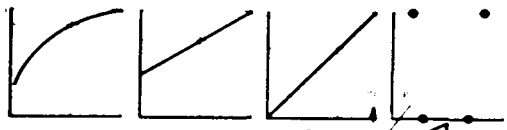


(why?)
concept of historical image.
"use concept as a vehicle for
analysis."

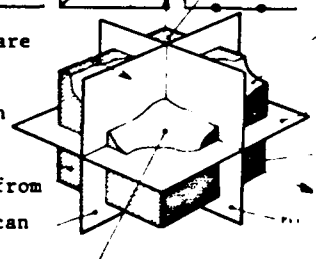


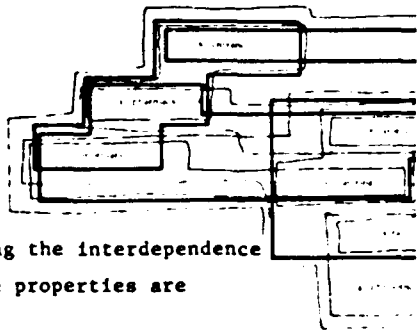
abstract configuration equated directly to a physical reality. reality is rigid. "select a building material."

categorization of parts identifys needs. respons in terms of specifics; "kitchen is too small. living room needs more light."

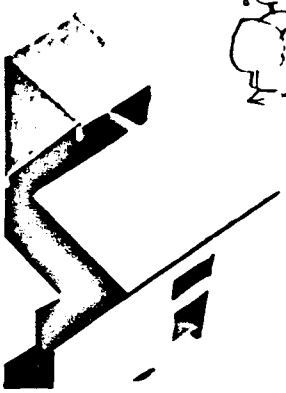


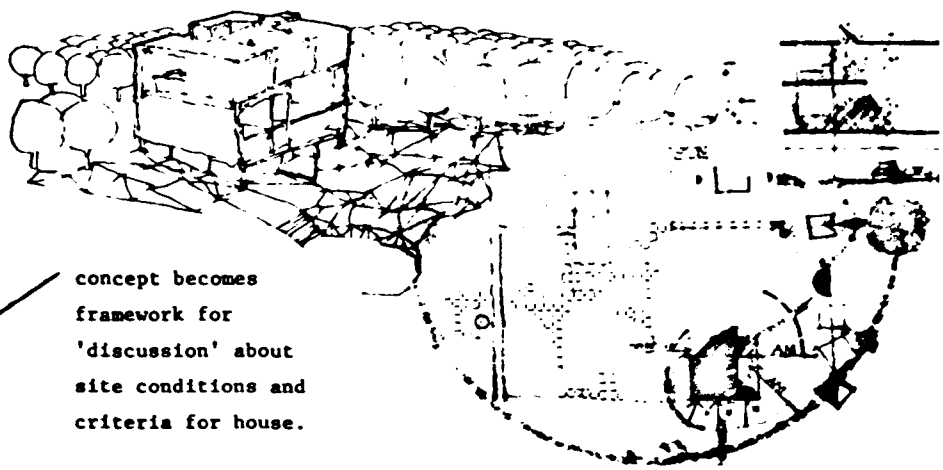
acceptable limits are systematically formulated for each category. "provide an arena from which a solution can be selected."



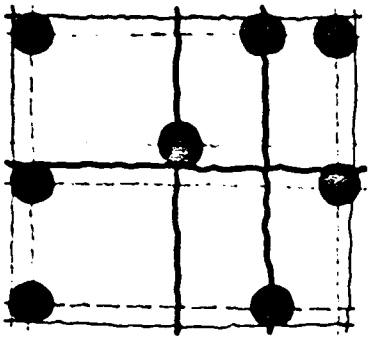


laws controlling the interdependence (if any) of the properties are identified. "try the critical Path method."

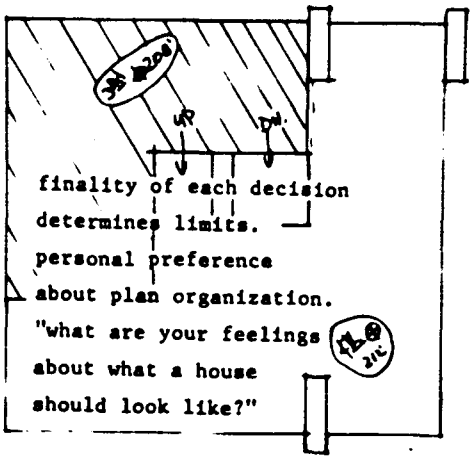




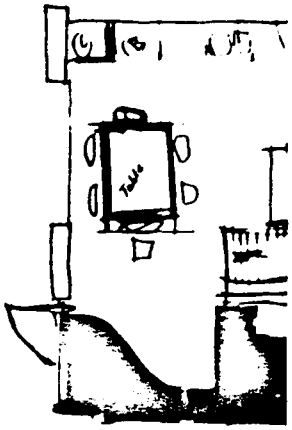
concept becomes framework for 'discussion' about site conditions and criteria for house.

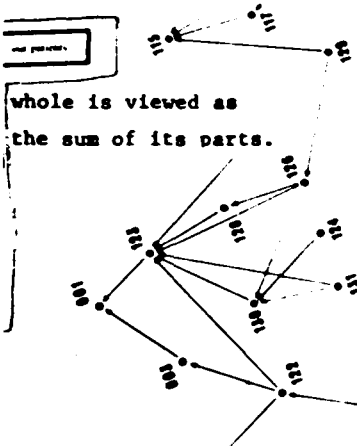


a new preconception necessitates new beginning.
"another solution might be stronger."

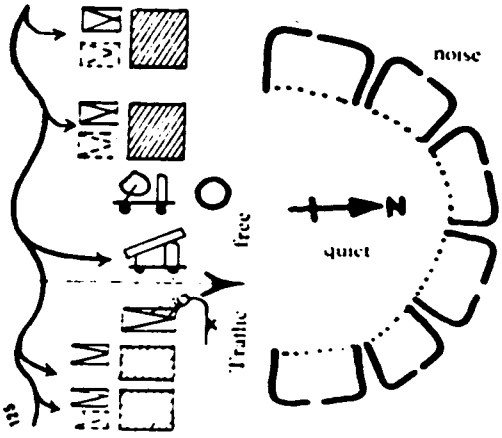


finality of each decision determines limits.
personal preference about plan organization.
"what are your feelings about what a house should look like?"



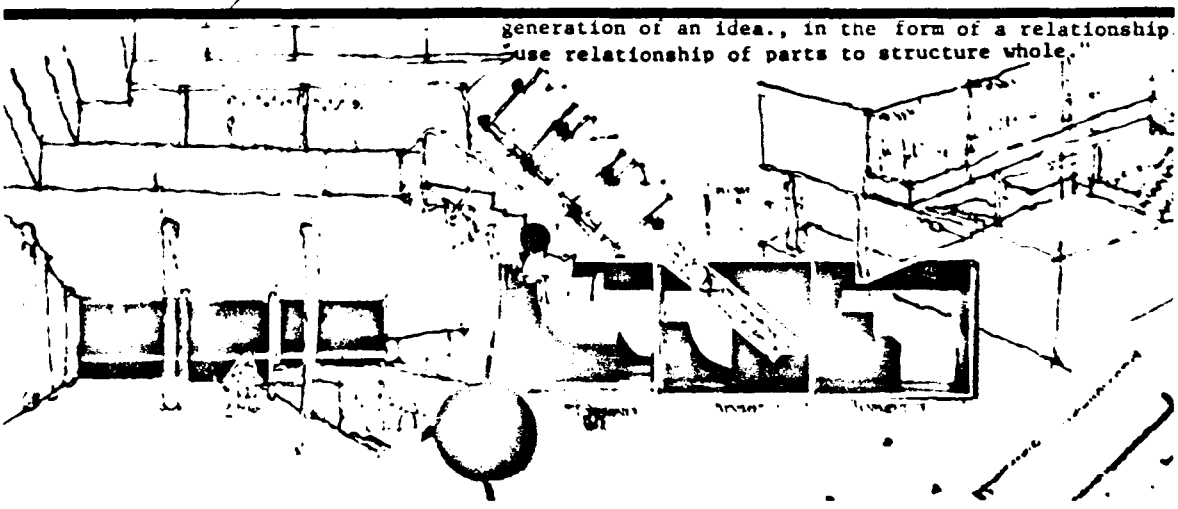


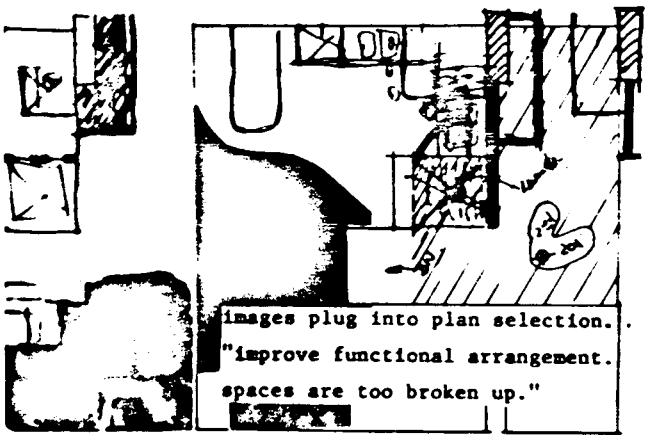
whole is viewed as the sum of its parts.



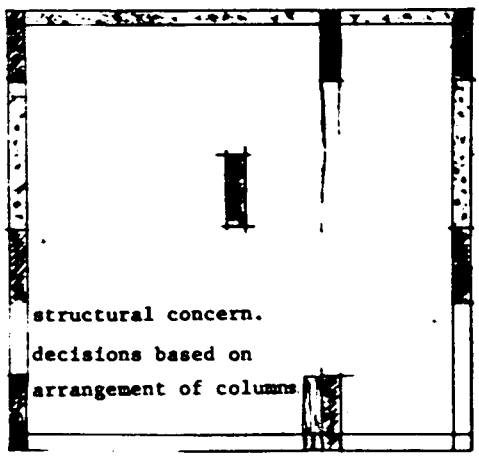
categorical analysis of properties. abstract configurations are equated to physical realities.
"spatially describe what each relationship looks like."

generation of an idea., in the form of a relationship.
use relationship of parts to structure whole."



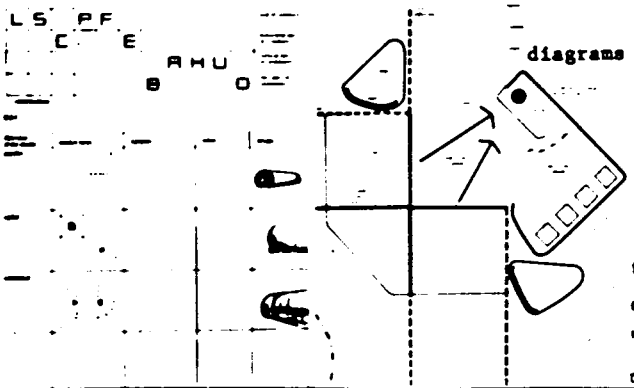


images plug into plan selection.
"improve functional arrangement.
spaces are too broken up."

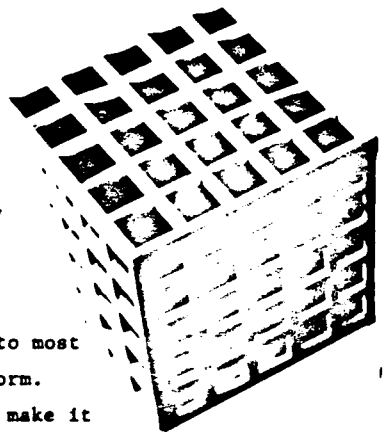


structural concern.
decisions based on
arrangement of columns

analysis of forms.
"which form is best for your
set of relationships?"

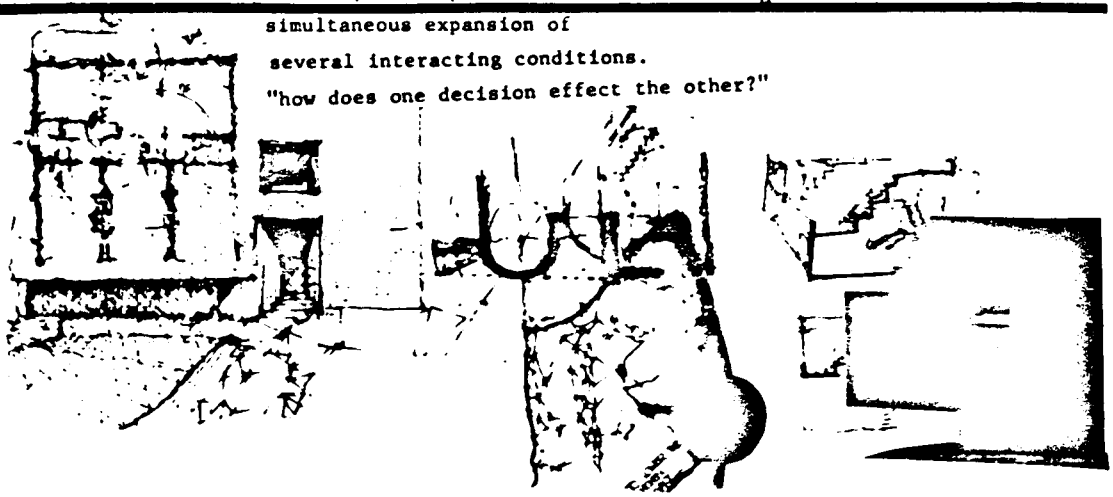


diagrams invariably
become
schematics
of arbitrary
forms.

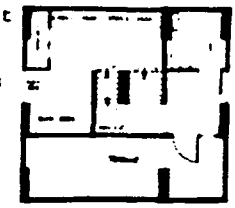


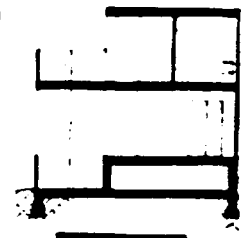
translation to most
convenient form.
"how can you make it
more interesting?"

simultaneous expansion of
several interacting conditions.
"how does one decision effect the other?"

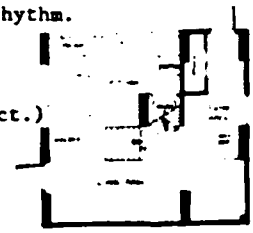


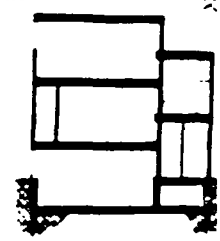
all decisions except detail are made in plan. other levels of concern are in retrospact.

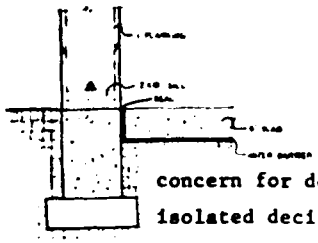




"improve facade rhythm. elevations do not relate to plan." (also in retrospect.)

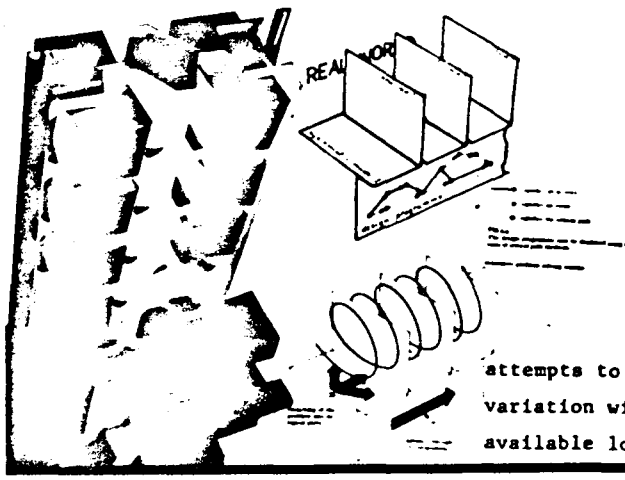


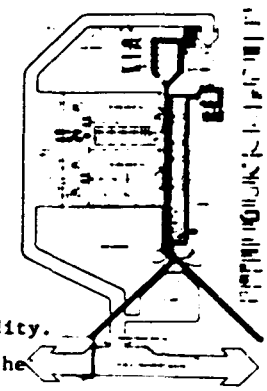




concern for detail. isolated decisions about construction.

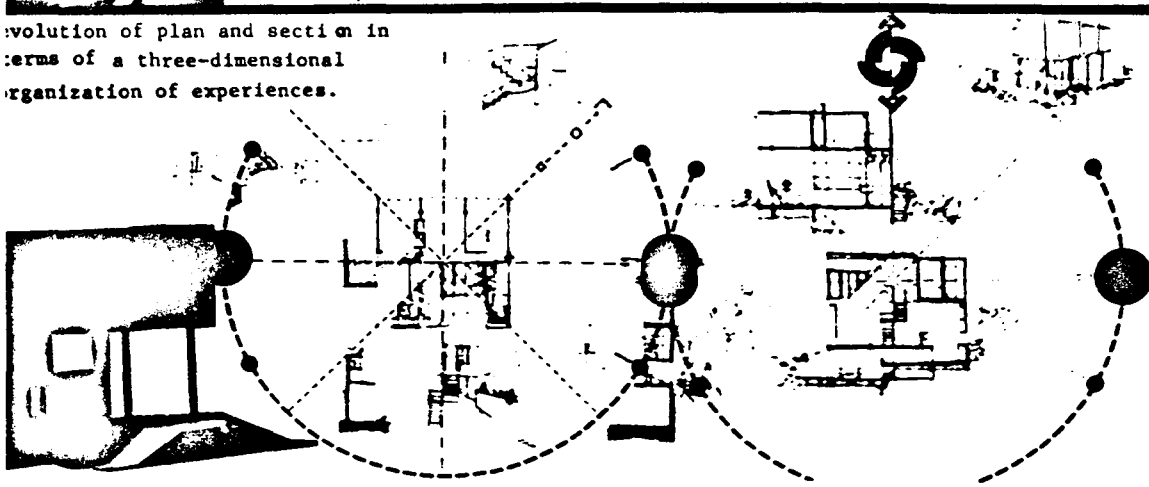
variation: an arbitrary rearrangement of parts.



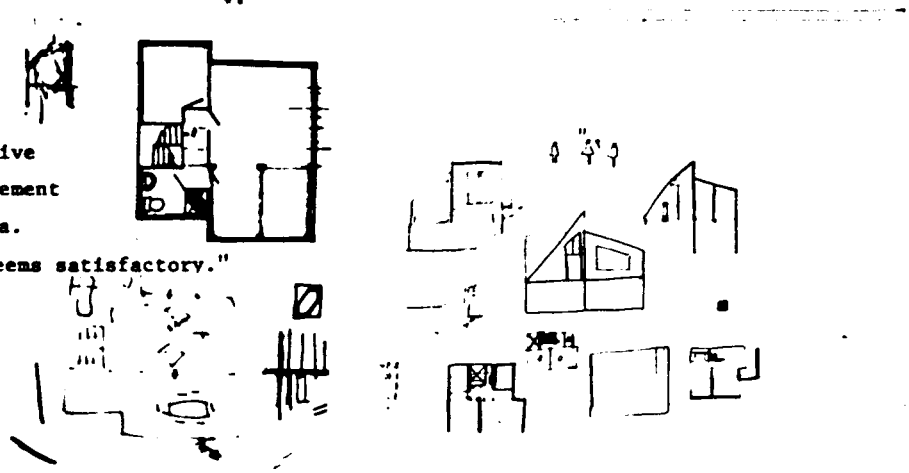


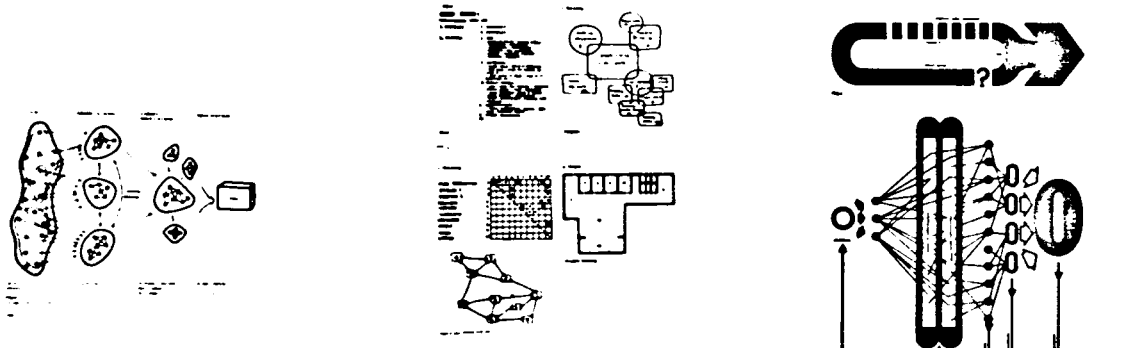
attempts to vary resulting rigidity. variation within mechanisms of the available logic.

:volution of plan and secti on in :erms of a three-dimensional ›rganization of experiences.

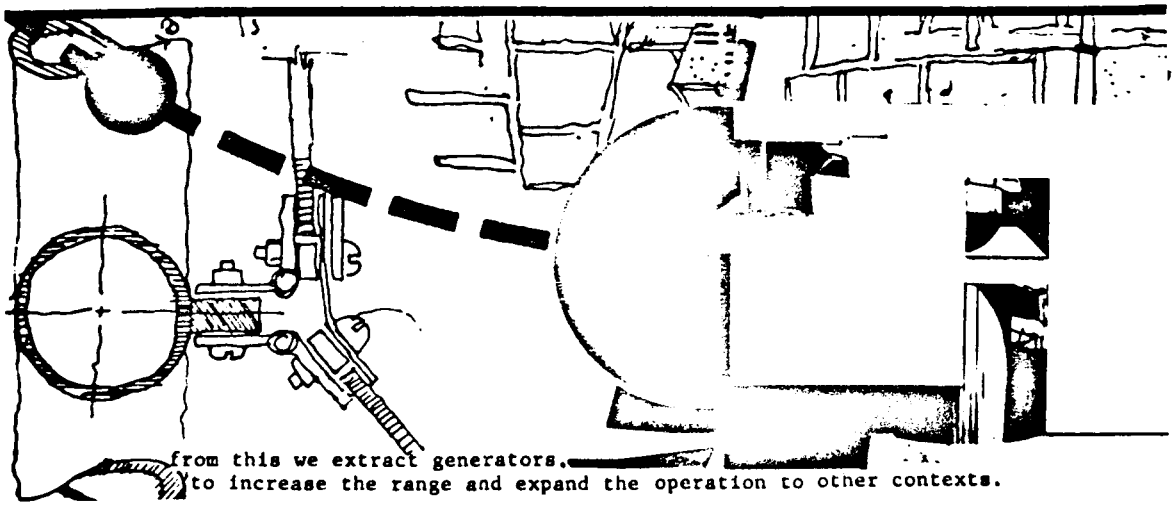


limits permit additive
changes or rearrangement
of selected criteria.
"this arrangement seems satisfactory."



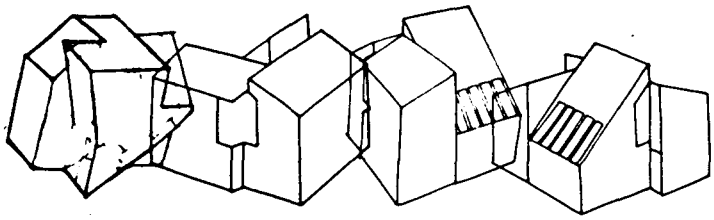


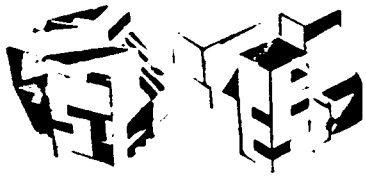
personal selection of identified steps.
"document and order your design process."



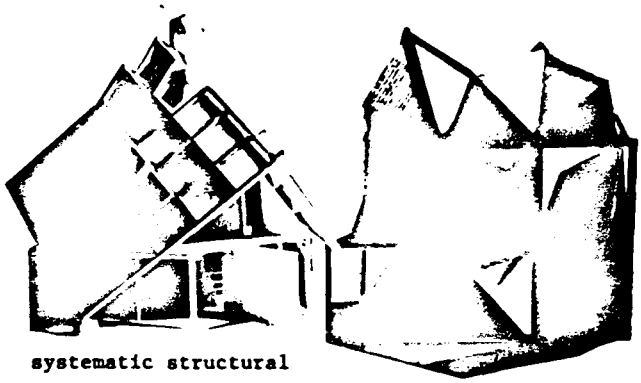
from this we extract generators,
to increase the range and expand the operation to other contexts.

an idea at another level of perception necessitates another beginning.



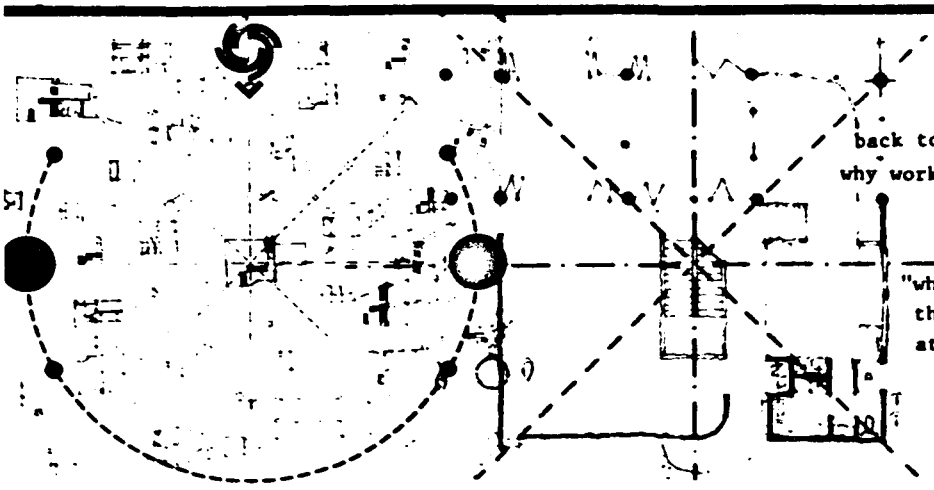


personal preference about volume interaction determines the limits of acceptibility.
"increase the height difference of roof pitch."



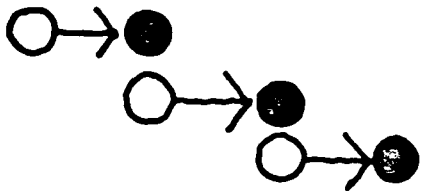
systematic structural element.

systematic form element

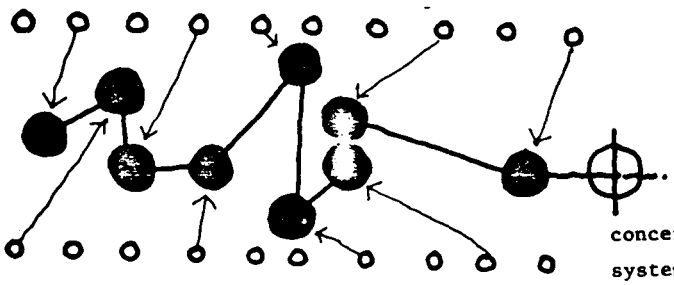


back to earlier sections.
why work to contradict it?

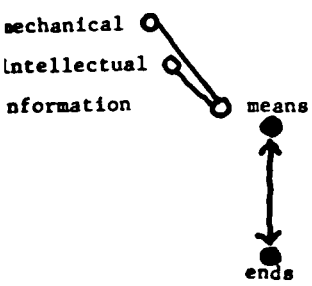
"what was the logic that arrived at this point?"

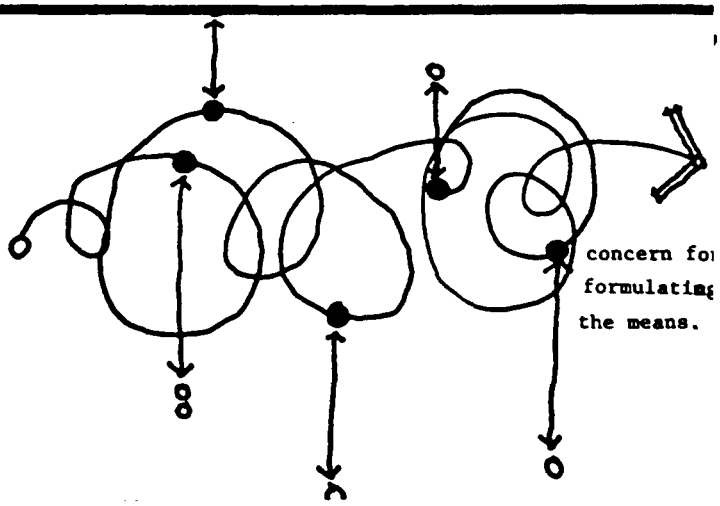


concern for finality of product.



concern for order of steps.
systematic process.





concern fo
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EDUCATION OF CREATIVITY: PROCEDURES AND PROCESSES

by

Belinda Carol Reeder

(ABSTRACT)

It has been said, perhaps not unwisely, that design education is, in itself, a design problem. That is, the process of design is parallel to the process of education. (The goal of design education is to generate creativity and the goal of design has something to do with generating creatively.) These were the assumptions.

It is suspected that different processes produce different products. What kind of information does a specific educational process generate? Two processes used in design and education, the intuitive and the systematic, were studied by viewing the products of each. This was the investigation.

The weakness of the two processes, both in education and design, defined a need for a process that was integral and could communicate the complexities of present information. This was the problem.

Using this awareness, specific tools were described in terms of design education: tools with which it might be possible to bring the communication of facts in line with their operational usage.

Conclusions as to the operative strength and potential meaning of this new integral thinking are then drawn comparatively. Three studio situations in design

education are documented. The problem in each case is basically the same; it is the design logic (of the student and of the educator) that differ.

The first situation is intuitive, the second is systematic, and the third is integral. Strengths and weaknesses of these processes are seen through a vertical comparison of products.