<u>Architecture and Design Education</u>

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Because many students have not had chances to visit many countries to see famous buildings designed by the pioneers of modern architecture, they are at a disadvantage as designers, and as a consequence their resources for designing are limited. Travel and reading may ameliorate this disadvantage because creation is a patient research. One needs to be inventive and have a higher aspiration.

Professors of architecture are helping students pursue directions that the students choose. This can be done through lectures, sites trips, and readings. Lectures also attempts to influence the student's values and perceptions and responds to the varieties that the student can improvise. The student must discover what architects are thinking about. How they dealt with the principles of unity in diversity, or unity and variety, site considerations, graphics presentation and planning followed.

Each student eventually has preferences, predilections, and predispositions which are going to direct his perceptions and responses. But because the critical relationship between the professor and the student is out of balance the latter as authority and the student as an undergraduate. The student tolerates the professor because there is no alternative. The professor acts as a critic and performs to a captive audience. It would be better to recognize that both parties have personal goals and intentions, and these are probably not identical. The best solution then is to let the student start designing wherever he is, and then to help him moving on from there, and encourage him develop not insisting to mold the student according to the point of view of the instructor. His most important task is to identify, to promote, to identify and help the student to see what he is trying to achieve.

The job of the design critic is then not easy and challenging in order to service a variety of student needs. A variety of ways to ameliorate the impact of such problems is by looking at methods of architectural criticism used in literature and art, and methods of architectural criticism. The assumption is that if the design critics are aware of the variety of methods they will be better able to respond to the different concepts of designs handed to them by their students.

The design critic should then be leading not responding to the whims of his students. He has to explain the goals intended in the theory of architecture, focuses on characteristics of the building fabric itself, the dynamics of behavior in and around the building, or the generative processes, contextural, noting influences that affected the design such as the socio political factors, and the economic environment.

It is the design critic task is to be capable of responding to the student's concern instead of implementing his agenda for solving the projects' problems, but to suggest what the consequences are of any decision and when it is appropriate.

The way of modes of thinking is by a system called Personalized System Instruction where a conceptual system with which to contrast the more generally held view. It is to encourage an attitude of mind which will lead to search further for different ways of viewing the very important business of designing higher education and, therefore, of improving the learning of our students. A number of universities created audio-visual centers in an attempt to improve their teaching. However, innovation has a much larger context than that which involves only the use of hardware, followed by a consideration of alternatives in order to achieve the objective this is followed by the implementation of a preferred strategy and the collection of evaluative data in order continually to improve the system. It is important in terms of student performance in the course. No matter how beautiful a given design may look, if in practice it fails to teach the students very much, or fails to develop certain skills, or fails to provide personal development for the students. Then the design itself must be considered as one which needs to be designed and improved upon. This must be the case, and from the point of view of all the teaching staff involved – it maybe a beautiful design. The focus of educational then emphasizes a shift away from teaching, a shift towards the students' own learning and development.

Education, from another point of view, can also be considered as a collection of current concepts and trends which derive either directly from this framework or from those social sciences which are closely related to education and design. Let us consider what they can offer higher education especially in the teaching of design.

Education is one of those domain where the outcomes which are thought are often far from trivial, but yet where proper attention to these outcomes is often lacking.

It is not to important outcomes, but when one asks exactly what it is that one is trying to achieve, answers very often become vague because they know that outcomes are sometimes extremely difficult to specify in education, educators have a natural tendency to remain fuzzy in their analyses of these outcomes, and this opens the door to non-effective teaching and learning.

It is important moreover, to realize that there is a continuum operating here. It can be quite rightly argued that some outcomes in higher education are simply not specifiable in explicit terms; to do so would require such an immense effort that it is simply beyond the scope of our current capabilities.

Within the context of a specific course, we could expect the student to be able to indicate which are the main advantages and disadvantages of interview techniques in evaluating the success of a given design.

By a certain period of time, the student will have experienced and be able to describe five different biases which should be avoided in an interview situation. The essentials of the idea are first to specify objectives in terms of what the learner does, second, that we use action verbs to describe this learner behavior. In summary it is essential for design educators to keep this emphasis of objectives in mind while designing their courses. The specifications of learning objectives proceeds itself from the process of task analysis in terms of the structure of that task. It is the process of breaking down a complex task into its constituents in order to identify and relate the various sub-tasks which make it up.

The student is evaluated then in terms of how well he can perform a given task or how well he has achieved a given learning objective and not in terms of whether he is superior or inferior to some other set of students.

Through task analysis, we can determine the structure of a given task such that we are able to identify each level of prerequisites. If we consider that learning consists of different levels of complexity, it is a natural follow-on to consider that an optimal learning pattern will involve the acquisition or mastery of each level before going on to the next higher level.

The design curriculum needs to be examined to determine exactly what the discipline is teaching or what it should be teaching. The problem of the diversity of orientations and specialisms need not prove burden-some , as any curriculum will have a core section and a surrounding section containing numerous areas of interest. The important point is that once a mapping out of the discipline is obtained and translated into a set of learning objectives, the essential groundwork is laid out for the actual design of educational systems of various sorts through which the aims of the discipline can be achieved.

However Christopher Alexander, who having set up one of the most complex design systems, said "the whole thing was a terrible mistake; that the only thing design methods ever did is to put designers specifically into the state in which they cannot design beautiful building "But what does Alexander do when it actually comes to designing?

First of all he works pragmatically; he goes onto the site and literally sticks posts in the ground. He says" Yes that's about right for this room, that one's a bit small, move those post over will you". While normally the teaching of architecture are in four stages, to tackle a project, syntactic in the first year, pragmatic in the second year, typological in the third year architecture. In the fourth year the student is encouraged into being creative.

Pragmatic design is based on design for energy conservation, the tapping of ambient energy out of the environment, that which requires a very large measure of expertise. It certainly is not a matter of designing strange forms for their own sake.

Le Corbusier developed alternatives toward the end of his life when he saw that his concepts from the 1920's were not working. New building will be needed for certain future purposes.

Architects and planners have particular responsibilities to look at humanity and the environment in which humanity finds itself. Architectural education of the future should be based, not on that current practice, but on appropriate research, including feedback studies of buildings to use, their successes, and their failures. Research in environmental control, into the fit of activities to spaces within buildings, and so on should give practical bases for architectural design decision. Architecture is too complex to have theories of the kind which are available, for instance, in the pure sciences. It would be of more importance to help the architectural students to equip themselves with the capacity to conceive new things than put the emphasis on criticizing their architectural forms.

A proper design education involves the exploration of alternatives. It really does not matter the creative come from, or even what relationship they have to the original problem. Very many problems in design, including problems of the relationship of the designer to the community, to users and so on can be resolved by taking a conjectures and Refutations mode of design (Popper, 1963) Conjectures is the generation of ideas, refutations, is the testing of them. The French poet, Paul Valery, obviously was describing the same thing when he wrote:

> "It takes two to invent anything. The one makes up combinations; the other one chooses, recognizes what is important to him in the mass of things, which the former has imparted to him… what we call genius is much less the work of the first one than the readiness of the second to grasp the value of what has been laid before him and choose it".

Valery seems to be indicating that some people will be good at making any combinations (conjecturing), others as choosing (refuting), but of course these skills maybe combined in one and the same person, designer or whatever.

These conjectures may or may not have grown out of the community's perceived and stated needs. Conjecturing seems to be based on mental processes.

A new pragmatics of building form is emerging out of the energy field, it is something which demands the attention of physicists and architects working in an integrated way; the ability to do that effectively needs a very sophisticated education in design.

Town Planning differs from other design activities since it is consisted of power group based on the chief executive and a small group of assistants. Individuals would not have a fixed place in a rigid hierarchy, but would have a general commitment to the success of the organization. The design of new technology or modification of existing technology involves a choice of ways and means, a prognostication of the future impacts upon a total society and its environment by that technology. With regard to such impacts, design is all too often narrowly based. In order to rectify this one is faced with the task of altering the decision-making / evaluative process-design of technology so that they reflect a greater sensitivity to their future consequences. The technology assessment concept developed in response to such problems. Perhaps the simplest way of defining technology assessment is to present a number of definitions by three of its foremost.

According to Emilio Daddario (1967), Technology Assessment supplies the need of:

> "Identifying the potentials of applied research and technology and promoting ways and means to accomplish their transfer into practical use, and identifying the undesirable by-products and side-effects of such applied research and technology in advance of their crystallization, and informing the public of their potential danger in

> order that appropriate steps may be taken to eliminate or minimize them".

Richard Carpenter argues (in Kasper 1972) that:

> "Technology assessment is the process of taking a purposeful look at the consequences of technological change. It includes the primary cost benefit analysis of short term localized maker place economics, but particularly goes beyond there to identify parties and unanticipated impacts is as broad and long-range fashion as is possible. It is neutral and objective, seeking to enrich the information for management decision. Technology assessment is a tool for the renewal of our basic decision-making the democratic political process and the free market economy".

Carpenter's explicit linking of technology assessment with the political status quo is significant attitude to which we all return.

Technology assessment ought, as Coates (1971) has forcefully argued, to be especially concerned with:

> "The secondary and tertiary effects of technology rather than the primary (intended) effect because:
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> 1. In the long run, the unintended and indirect effects maybe the most significant.
> 2. Undesirable secondary consequences often are unnecessary and maybe prevented by proper planning.
> 3. First order impacts usually are subject to extensive study in the planning stage (since they are)…the primary goal of the effort [and]..are generally explicitly planned for, and sorted out in the individual plan. Technology assessment focuses on the question of what else may happen when technology is introduced".

A typical technology assessment methodology is the use of a checklist of steps and tasks which face the assessment team (From Harry Rothman):

Step 1 Define the assessment task

Discuss relevant issues and any major problems Establish scope (breadth and depth) of enquiry Develop project ground rules.

Step 2 Describe relevant technologies.
Describe major technology being assessed.
Describe other technologies supporting the major technology.
Describe technologies competitive to the major and supporting one.

Step 3 Develop state of society assumptions identify and describe major non-technological factor influencing the application of the relevant technologies.

Step 4 Identify impact areas

Ascertain those societal characteristics that will be most influenced by the application of the assessed technology.

Step 5 Make preliminary impact analysis.

Trace and integrate the process by which the assessed technology makes its societal influence felt.

Step 6 Identify possible action options.

Develop and analyze various programs for obtaining maximum public advantage from the assessed technologies.

Step 7 complete impact analyses

Analyze the degree to which each action option would alter the specific societal impacts of the assessed technology discussed in step 5.

This list has to be seen as a formal guide, the steps of which are mostly followed in an interactive fashion, and not necessarily in sequence, utilizing all the analytic talents commanded by the assessment group.

Many aspects of the technology assessment will be familiar to those who have been concerned with planning, cost benefit analysis, operations research, research allocation, technology forecasting, etc.

Steps to be in view in cases of being confronted with technological assessments:

A- Program cost (Direct Costs).
B- Program objectives (Direct Benefit).
C- Desirable side effects (Indirect Benefits).
D- Undesirable side effects (Indirect Costs).
E- Elements of costs and Benefits:-
    1) Social effects.
    2) Physical Environmental effects.
    3) Egyptian Pounds and Other Economic Values.
    4) Political Effects.
    5) Institutional Effects (others).
    6) Total Benefits.

7) Total Costs.

This indicates how side effects feed into these benefits and costs, and that benefits and costs are composed of a number of elements.

What designers bring to design is largely knowledge, skill, and views good design shared by a design community. Aspects of this which shape what is designed maybe seem as the design community's, or design organization's paradigm. We see too in design a mix between conventional design problem solving and the more fundamentally innovative design, the result of a crisis, a fundamental change of direction. For example designing Sydney Opera House, a conjecture, the idea of sails in the sunset, formed this design but the conjecture does not have to be an image, it could for example be a functional idea.

An attempt to describe a similar sort of dichotomy between detailed and fundamental change-puzzles and crises has been made by Hillier and Leaman (1974) using biological analogies. These authors suggest that change occurs at two levels, the genotype (species / fundamental) and the phenotype (individual detail). The basic problem of this analogy is how literally it should be taken, for change in fundamentals (the genotype) is long term and evolutionary whereas in design it is possible also to have relatively short term, revolutionary change in fundamentals; biology has no real parallel to this.

It is possible to conceive of change in science, and the analogy is design, without such sharp dichotomy.

Modeling of design should be both of the individual and the community to which he belongs. The community is very influential in promoting or inhibiting change. Recognizing a core of ideas (the paradigm), and methodologies which unite the community, is also important. Movement or schools of thought have a similar flavor.

Clearly, understanding of a community at work is needed to show what promotes and inhibits change. This social view of design has come a long way from the disembodied information processing.

An idea may change. Furthermore, if we look at significant paradigm shifts, the innovations in science, we see that they often need to go against or ignore consensus. Consensus is a handicap that traps us in the past. Any method and any contradictory, rival hypothesis are valuable. But it is a useful emphasis in reminding us that change requires some rejection of the past. However, the dichotomy of normal science with its puzzles and crises is replaced by the idea of progressive and degenerative problem shifts. The scientific community which supports and works on a particular program of research has various rules for defending the core of the program. When things go well there is a progressive problem shift, that is, the core ideas are developed.

Future modeling will look to the social sciences and to literature, where understanding of community is much better developed. The role of metaphor sheds light on the nature of creative thought. He suggests that new ideas are metaphors which are sometimes primarily visual, but links can be made to other areas of design by seeing such metaphor as fundamental as existing ideas, and design as transferring them to fit the new problem. We do not need two types of creativity, the conventional and the innovative.

Systems theory is concerned with process efficiency and sees man as information – process machine.

Two new scientific fields were also being developed: cybernetics and information theory. They form the basis of a great many areas of knowledge such as computer science, systems theory in its different applications, and operational research. These became the direct auxiliary sciences in the development of new design methods, to the point that one cannot refer to typical starting points without an original stage characterized by transfer and application of this borrowed knowledge almost without criticism.

A strong climate of optimism in an improvement of the world by means of technical progress increased the belief in the systematic handling of problems.

The first applications of the new design methods were in the area of systems engineering, to design problems in the largest sense. The design process is seen mainly as a problem solving activity. Basic to this is the analyzing the structure of the complex systems as stable in order to discover the structural laws underlying a particular design problem. The design result itself is seen as the particular design problem. In this sense the design activity is to be understood as a series of essentially structuring activities combined into an explicit linear process. Creativity is nothing more than the ultimately perfect and rational design decision in a given analyzed situation.

Brainstorming synaptic is used as means for exploring and opening the design situation. It is a powerful instrument to investigate the thinking behavior of the designer himself.

It is supposed then that a comparative study between different input signals and the according output give the decisive answer to the question about the behavior of the designer’s insight.

Designing is not a problem of reduction, as Broadbent states, but of a transformation from the life – factual to the design – factual. The designer always structures the facts in a specific way, namely towards the possibility of being able to carry out, within this arrangement, his design activity from and towards his own design models.

Order cannot be understood as being constructed in and by the theory and subsequently applied in practice, but should be understood as being constructed in practice.

Systems theoretical thinking, underlying the modern design methods, was limited up till now to the physical facts that could be observed objectively and scientifically and subsequently quantified.

Strategic choice approach to design decision-making

In design, the traditional response to the feeling of a need to be more rational has been to adopt a process based on scientific method. In this, the view of scientific method which had been adopted most often is one of a linear process, which can be characterized by the sequence: a) Information, b) Analysis, c) Alternatives, d) Evaluation, e) Decision.

Information is taken into the process from the environment. The lack of information means that there will be uncertainty. Any piece of information must have two things added to it before it can be used. The first thing is another piece of information, with which the information we have already can be compared. The second thing which is needed is a value which has to be attached to the difference between the two pieces of information. Only then does it become useful.

The practice of making lists of uncertainties, assumptions, criteria, and constraints during the early phases of the process is a typical example. However, the principle which comes into its own when formulating alternative solutions using options labeled with have not thought out yet can be very helpful.

In order to acquire the process of strategic choice it has been found helpful to analyze the approach in terms of the process, the technology, and the organization which together form its constituent parts.

The Process

The process is based on the following:

1) Planning is a learning process to make a good decision.
2) Planning is also a process of choice, in which analytical techniques are adapted and used selectively.
3) The fundamental cyclic nature of learning cannot be incorporated without serious loss into linear models of the planning process.
4) To be effective, planning must be continuous, allowing the organization to adapt rationally to changes in the environment.

The Organization

Organization is based on recognition of the following:

1) The socio-technical aspects of the approach are vitally important in that technology (the system of social relationships among those involved in its operation).

Inductivism

Inductivism can be expressed according to three general principles (Harre' 1977):

1) The principle of accumulation, that scientific knowledge grows by the addition of facts, and that each new fact leaves all previous facts unaltered.
2) The principle of induction, that one can infer true laws from true facts (observations, experimental results).
3) The principle of instance, confirmation, which the more frequently an observation is made the truer it is.

Regarding the first principle that science grows by the accumulation of facts this is just not true. History shows the growth of science to be a leapfrog process of fact accumulation and theoretical advance. A change in theory can turn seeming facts overnight into falsehoods. At least for science, there are no brute facts. There are no facts which other facts may not change. There is no knowledge altogether independent of theory (Harre, 1972).

Other difficulties plaque the remaining two principles. With the principle of induction there is the major problem of indeterminacy of the results of trying to use the principle to infer a law. Infinitely many laws can be inferred using the principle of induction. This problem is hardly solved as the inductivists attempt to do by selecting the simplest laws.

Some of the main problems of design reside in the failure to go beyond the satisfaction of quantifiable requirements and take account of matters which depend on value and subjective judgments. Since such matters seem to be closely linked with meaning, one plausible way to overcome the problem, partially at least, would appear to consist in providing the designer with an additional set of techniques, which would enable him to deal with meaning, to encode convenient meanings into the final result of design, so that it may achieve a better fit within its context of use. And it is here where the semiotician, with his purported technical ability for the analysis of meaning, is expected to provide his share.

Any theory which merely seeks to develop the pure logical form of such a conception of design without taking into account its historical background is bound to fall into a number of traps and paradoxes. The danger lies in the confusion between the logical form of the definition, which can be traced back to a tautology; instruments are teleological, and the condition for its application to the products of man. Natural processes can be considered as determined by goals, but it is our mind that endows them with such a relational property. Furthermore, human behavior and its material products can be seen as self-reflectively teleological, but even then it is possible to distinguish between the conceptual or logical and the material aspects of self-conscious, goal oriented behavior. And logical properties, such as the relationship between means and goals, are properties of concepts, not of natural objects.

The idea of fit fostered by the ideology utilitarianism associated with growing capitalism, also gained strength as a general idea, this caused to two different versions, construction fit and use, or more precisely, to be taken as equally valid instances of a general principle, functionalism, ruling the activity of design is the fields of architecture and industrial design, borrowed from objects associated with industrial processes, the image of construction fit as a token for fit in general. When the tide of design methods overflowed from the field of engineering into that of architecture, it took the lead from the Modern Movement, aiming again towards unified theory of artifacts and assuming that construction fit. In doing this the tradition of design methods has often engaged in giving concrete expression to ideas that the pioneers of the Modern Movement had expressed in vague and metaphoric terms. To take an example of this, the notion of path or route as the determinant of the internal organization of a building which was in Le Corbusier of a rather symbolic nature, was given a sort of literal illustration in Alexander's well known design for an Indian village.

Theorists and researchers involved in design methods seem largely ignorant or indifferent to the historical development of the concept of fit, especially to the fact that it was provided with a concrete sense, in each period. Design theorists have attempted to build upon it a whole systematic construction; a science of design endowed by the principle of logical consistency, made out of grafts and transfers from other sciences, and aiming at a normative-content, ready to be imposed upon the actual practice of design. Such a science of design has to face two paradoxes.

1) The attempt to abstract, for the sake of generality, objectivity, and amenability to systematic treatment, the essence of instrumental facts, as such, from the complexity of their particular occurrences carries with it an increasing difficulty in contrasting the instrument with its use.
2) In a sense, the idea of design is linked, to the idea of change to something different and better. In the Renaissance the whole concept of architectural design was permeated, given sense and glamour, by the neo-Platonic myth of the Golden Age. With the development of utilitarianism the Golden Age jumped from unattainable Past, through the domains of Utopia into the Future; it became the driving force of Progress. The paradox, here, appears to be that the more concrete the image of the future becomes, the more the change seems to dissolve into thin air.

In order to be able to understand how it is that concepts change, we must therefore find a place for the role of human language in the evolution of ideas. In this respect, the so called metaphorical view of innovation commands our special attention. We begin our examination of the uses of metaphor in the generation of new ideas with a few definitions of the more familiar uses of metaphor derive from Aristotle, who says “Metaphor consists in giving the thing a name that belongs to something else”.

But there was another side to Aristotle’s thought. Aristotle also says, “Metaphor, moreover gives style, clearness, charm and distinction as another". Our own focus of interest, however, is not in poet, but in architecture. Let us take first the textural metaphor, made familiar to architects through the medium of architectural criticism. Here the use to which metaphor is put is similar to that in other forms of writing, particularly poetry, whereas Hester (1967) explains; the intent is to make full use of the images that words can arouse so as to enrich the description.

The writings of Vincent Scully (1961) describing Frank Lloyd Wright's Unitarian Church, Scully writes:

> "So his Unitarian Church at Madison, Wisconsin, of 1947, is both plow and ship, hitting into the prairie like something moving forward. Its choir is raised up behind the glass and under the praying hands of the roof, like the suspended pulpit, reached by a rope ladder drawn up behind, in which Melville's New Bedford parson preached of whales" (Scully 1961)

The reference to Melville's book Moby Dick, underscores the very literary, non-literal and non-scientific, use to which Scully puts language so effectively in arousing such powerful images in the mind of the reader.

It is evident that the role of metaphor in conveying meaning in architecture has been acknowledged, either implicitly as in architecture criticism of the past or explicitly, as in more recent semiotic theories of architecture.

It is essentially dynamic role to see one thing in terms of another in a new manner.

Donald Schon (1963) introduces his dynamic conception of metaphor by first illustrating the basically static interpretation of metaphor underlying the analogical point of view. Schon quotes a representative passage from Brown (1927), one of the principal writers of the analogical school;

> "The metaphor in a word lives when the word brings to mind more than a single reference and the several references are seen to have something in common. Sometime in the past someone or other noticed that the foot of a man bears the same relation to his body as does the base of a mountain to the whole mountain. He thought of extending the word foot to the mountain's base. The word foot then referred to two categories. These categories share a relational attribute which makes them one category. Within this superordinate category, which we might name the foundations or lower parts of things, are two subordinate categories – the man's foot and the mountains' base. These two remain distinct within the larger category because the members of each subordinate category share attributes that are not shared with the members of the other subordinate category …. Metaphor differs from other subordinate is not given a name of its own. Instead the name of one subordinate is extended to the other and this …has the effect of calling both references to mind with their differences as well as their similarities" (Brown 1927).

The second point is Schon's emphasis on the intimate relation between new and old ways of looking at a thing. Schon states;

> "New concepts do not spring from nothing or from mysterious external sources. They come from old ones…New concept emerge out of the interaction of old concepts and new situations where the old concept is not simply reapplied unchanged to a new instance but that in terms of which the new instance is seen. This is what we described as the displacement of concepts – a process in which old concepts, in order to function as projective

> models for new situations, come themselves to be seen in new ways" (Schon 1963).

New architectural concepts do not emerge independent of past associations, as the founders of the Modern Movement believed or liked to pretend, as some form of direct expression of that time. Nor are they independent of the language through which our experience as individuals and members of a shared culture is mediated. On the contrary, new ideas come into being by virtue of our being able to see the new in terms of the old, and it is our unique human language which makes the generation of such ideas possible at all, and which carries the history of such ideas in its forms.