Multisensoriality in Contemporary Architectural Pedagogy: A Neuroscientific Critique

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Abstract:

The way architecture was conceived by the architect, the tools that aided him in first recording and then realising it has underwent a lot of changes in the last few decades. Significant changes came in the way architectural product was perceived, where now it's designed not only for the inhabitants, users and onlookers, but also for those who look at it from continents apart as printed or as displayed in digital displays. Also now we have a lot of recent results from studies in neuroscience, cognitive science and psychology, which negate or ascertain many of the intuitive (or at times dogmatic) positions we usually base the design process upon. In this situation, this paper analyses the design process as happening and as understood (and as liked to be understood) in architecture school studios in India now and seeks identification of its gaps which many times fails it in creation of a rich 'multisensory' architectural experience when realised, in the light of recent researches mentioned before. It also look forward at need of pedagogic strategies which can reinstate the conception of architecture in its complete multisensory form, which can eventually make architecture that can be more engagingly heard, touched, smelled, and viewed (or may be even tasted, who have seen the future !).

For Referring this Paper:

Keywords:

Multisensoriality of space, Design methodology, Pedagogy, Synesthesia,Architecture

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INTRODUCTION

The recent advancements in neuroscience and cognitive theory, throws light upon many aspects on the way human brain perceives relates and respond to sensory perception. This has also drawn attention of the scholars who work on explaining man's response to art architecture, music and other creative domains. While we have this fresh and new information on how architecture is perceived (by common man, an expert critique, as well as the architect himself) the need arises to relook at the way we see, think and create architecture. Such a relook, for that matter will obviously have many things to tell us, on the refinement of the design methodology, of the supporting knowledge sets and hence, on the pedagogic apparatus by which such an expertise is trained to a student of architecture. This will include a reverse tracing of the perceptive process and the way the human brain perceives and responds to the stimuli, with its associative and nonlinear process. There has been a lot of scholarly debate in the last decade on the way the visual sense dominates and subjugates other senses in contemporary architectural *imag-ination*, creation and discourse, while we know that perception is essentially a multisensory activity. The holistic multisensory charm of the space may be felt only when the design is the product of a process which aims and aspires at more than just rendering 'pretty pictures'. For that it is essential to first glance at the history of Design methodology and representation in architecture.

DESIGN THINKING: THE ORIGINS

The origins of design thinking must be traced from prehistory, where design and making where inseparable and simultaneous processes. There upon every time a particular design solution was required the maker constantly improvised by the trial and error wisdom which accumulated and transferred over generations. Thus the beauty and exactness of the so-called traditional solutions is the result of the judgements and collective wisdom of *making* of generations, where the solution gets optimised by an iterative process very similar to the natural selection in Darwin's theory of evolution. Drawing at many times was a part of this making process, in making marks in the material like as an aid to delineate where to cut in a block of stone or wooden piece. Eventually upon evolution of measurement units and dimensioning systems, copies of this delineations over material could be preserved for later use of making the same parts. Hence the first design drawings where drawn as over the building/making material. Here the distance between the designer and the maker was less (many times it was the same person.)

DESCRIPTIVE GEOMETRY AND DESIGN DRAFTING

Where in the earlier situation, design and making were simultaneous processes, increasing complexity of design problems addressed necessitated design communication between the designer and the makers. While the initial drawing or sketching is a way of graphical thinking, a second process of drawing for

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communicating the idea and structure of the design solution in a self-explainable manner was developed. Thus the era of design drafting began. While the first drafted design drawings were based on the independent conventions of the designers, it was Gaspard Monge who systematised the later globally adopted system of descriptive geometry (Monge & Heather, 1851). This was the beginning of expressing design in the mode of descriptive geometry as orthogonal projections of plans, sections and elevations. While the system of orthogonal projections enabled smoother design communication through drafted drawings and added clarity to design representations it also indirectly resulted in distancing the designer from the actual making of the design. It also resulted in making design a more explicit and logical process. Over the years it has proved its merit as an efficient system of design representation that clearly describe the design and thus ensure the accuracy of execution as a communication tool but with limitations also.

IMPACTS OF DESCRIPTIVE GEOMETRY IN DESIGN THINKING

While sketching and diagramming are excellent ways of graphical thinking, orthogonal geometric visualisation, especially in the initial stages of any design process has the following disadvantages.

- In orthogonal projection the primary focus is on the visual geometry, where architectural product, is much more than just a good visual. It needs to be a symphony of the multisensory stimulations it can induce on the experiencer. He/she is an experience and not just an *onlooker.*

- The orthogonal imagination is a fairly logical and explicit process. Here the designer has to think in a geometrically structured, analytical and mostly linear sequence, which will in turn limit the intuitive faculties of human brain which operates in a totally nonlinear associative manner as we will discuss later. In sketching the paper helps as a temporary repository of geometric information partly unburdening the brain, than fishing for the form with closed eyes.

- In a vague scribble, diagram or sketch the gestalt (Merriam-Webster, 2014)functionality of brain that fills in the gaps of perception can act by finding unexpected correlations and design breakthroughs. But it more difficult have this advantage of possibility of a sudden improvisation while drafting the same.

For an architect until the last decade the descriptive geometry didn't give much of a logicalising cripple in design thought as he always triggered his design process from his scribbles and sketches and he could have an intuitive sense of the spacial geometry by virtues of scaled down models. Even today all this possibilities of sketching, diagramming and model making exist in design school studios, in varying degrees, as ideals, practiced by some, and less by others. The danger is not in the use or non-use of old tools or new tools, but in the approach to design process, and on how the tools shape our design thinking.

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TOOLS SHAPING THOUGHT

"We shape our dwellings, and afterwards our dwellings shape us."

- Winston Churchill
(House of Commons on October 28, 1944)

The impact of tools in the design process is very much like the quote above on how buildings shape human life. We invent and adopt tools to ease and accelerate our design process. But many times the implication of their use on the evolution of our design thinking is not addressed, or maybe it is now that such a feedback impact has grown to serious proportions. More than the Cartesian mathematics or orthogonal projection based visualisation methods, it is emergence of computer as a tool with associated spectrum of software pertaining to design drafting and manufacturing (CADD/CAM) entering the arena of design that changed the whole way in which design process was understood practiced and the design product was created. The architecture community and the industry successfully adapted this toolsets. But that were people who got trained in architecture design in the pre-digital or early digital era.

The actual impact of the new tools in design thinking can be seen in the generation of design students/designers who are still at design schools and those just finished out of then and entered practice. Two of the major pitfalls are fascination with the architecture of image making and at many times the misuse of

emerging paradigms and toolsets like parametric design and generative modelling, (which require considerable logical and coding skills and specialised training in addition to design skills) mostly just for making shallow architectures with fabulous looking images which are ironically represented as 'great architecture' of today. The intentions behind hyping such aesthetics, as unattached to any cultural context include its acceptance and sell-ability in the pan-global market ranging all the way to subtle and calculated annihilation of cultural heterogeneity. But why should the independent architect pledge his creative freedom and cultural affiliations to such sweeping propaganda of one-world-market consumer sharks. Tools may come methods may come, but it's not the tool that is to decide what to make, but the architect who is trained for developing his sensitivity and efficiency of design. The effects of tool on the mental development of the designer is alarmingly significant which we will discuss later on.

DOMINANCE OF THE IMAGE

Dominance of the visual sense in architecture had been widely discussed in the context of architecture by philosophers like Maurice Merleau Ponty (Merleau-Ponty, 1996) and later by architects like Juhani Pallasma (Pallasmaa, 2013) Steven Holle etc. (Holl, Pallasmaa, & Gómez, 1994) through multiple works. Independent researchers like Steen Rasmussen with diverse backgrounds from physics to art history have contributed to the literature on how architecture is experienced (Rasmussen, 1964). Merleau Ponty Pallasma

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etc. discussed in detail on how the balance of the architectural experience is so biased towards visual. It is argued that even memory sensations of other senses are also synesthetically[1] evoked by the visual sense as a gaze over the grainy rock will evoke the textural haptic sensation as simulated in the viewer's mind as associated with the memory of haptic sensations linked with similar visual sensation.

Vision thus is supposed to act as a basic sensory realm on to which other senses can correlate their sensations to weave the full multisensory experience of the world. But unfortunately the visual sense is today dominating our experience of the world hegemonising and suppressing other senses (Pallasmaa, 2013), by its nature and by vested interests.

The post globalisation media has elevated the visual aspect of architecture to such a height that it doubles the already existing dominance the visual sense has on experiencing architecture. This era made shallow and egoistic architecture that creates pretty pictures when photographed or digitally rendered, as dazzling out-of-the-world sequences of imagery that matches the pro-consumerist world view, which at times even numbing the viewers into a kind of visual insensitivity closely reminding the arguments by Neil Leach (Leach, 1999) .

The above discussed trends clearly exposes the forces that shape contemporary architectural taste. Like the products bought from market, the popular taste on architecture is also cultivated to cater to an international culture of sell-ability. The demand and the fad being the fantabulous imagery, the sophistication of computational geometry, and the celebrated monotony of machine fabricated

product and space, the architecture student gazing out of the studio derives all his reasons to choose to drift by the flow. This mindless and obsessive direction needs to be sensitised to create a humane architecture to which man can relate to belong to and engage with, by employing properly tailored pedagogic strategies. Before attempting to frame any such strategies, one must take a close look at the methodology as idealised and as happening in architecture school studios in Indian scenario now. The results from the new sciences of perception and brain, ie cognitive science and neuroscience expose the intricacies of the design process, which then can be looked upon to reflect on the pros and cons of the existing pedagogic apparatus.

DESIGN PEDAGOGY IN INDIA

In India the traditional and vernacular architectures vary in nature across the length and breadth of the country, owing to its diverse climatic zones and cultures. As typical to the gurukula system of traditional Indian education, the architects of early periods were apprentices to their teachers and learned from example and participation.

(1.*Synesthesia : neurological phenomenon where upon a particular sensation of one sense(say hearing of a sound) a corresponding sensation is triggered in another sense(say a particular fragrance is smelled) like a sensory crossover.*) *(Ramachandran, 2004)*

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The modern era of systematic architectural education started with the history of Department of Architecture at Sir J. J. College of Art where the program was tried to be matched with that of RIBA standards from its beginnings at 1913 (Sir.J.J.COA, 2014). Post-Independence the presence of architects trained from the western schools and the invited projects of international architects like Chandigarh city of le-Corbusier Louis Khan's IIM Ahmedabad etc. defined the immediate architectural tastes of the young nation with a substantial architectural heritage. These influences eventually moulded the curriculum and pedagogic pattern of the newer schools that came in post-independence India, many of which struggle to establish their needs and methods as different from typical engineering education, having been associated to Technical Universities.

LEARNING ARCHITECTURE IN 1960's

Dr Sanjoy Mazumdar in his paper has auto-ethnographically stated his own personal account of bachelors level architectural education in the 1960's, from one of the premium institutes offering architecture course in northern part of India, (Mazumdar, 1993) highlighting some of its limitations at that time. He starts with describing the lack of attention towards understanding of human nature, culture behaviour and also absence of any course on subject areas like psychology, anthropology, sociology etc., and also the business aspects of architecture which consequently making the students less aware and paying less regard on such aspects. Art also said to have been given a back seat, with attention merely in the initial years. He also points out a sort of

rigidity on establishing unquestionable supremacy of the underlying assumptions of the faculty and suppression of any parallel or alternate values. Also he mentions the negligence on cultural, social and contextual factors like religion, family structure, cultural relationships, tradition, gender roles, privacy, and power differences.

LEARNING ARCHITECTURE IN 2000's

Many of the issues in Dr. Mazumdar's statement still lie partially or fully unresolved in our pedagogic systems, which this author can assert (from a similar auto-ethnographic stance like the account of Dr Mazumdar), of having undergone bachelor's education in architecture in southern India in the first decade of the new millennium. In the institution, the first year included a design preparatory course with smaller exercise like measured drawings minor design problems like 'gate cabin design' etc. It also included a couple of courses on fine arts, courses on building materials and construction, structures, Engineering graphics which were conducted from a predominantly engineering approach, a combined and shallow course in psychology and sociology, etc. At many times the system was silent in explicitly defining its learning goals but taught design from an error correction iteration mode. The student in his early development was hardly aware of what kind of refinement he was seeking in design skills, for the error correction approach only installing inhibitions about ones limitations since the criticisms were rarely properly balanced. Subjected to this pressure, chaos, confusion and quest of survival ultimately

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helps a fraction of students in intuitively picking up the implicit aspects of design by doing and seeing. The rest escape the system, at times getting a degree or at times not, still far from becoming an architect in any true sense. In the curriculum design methodology was introduced as a linear sequence as like:

Data Collection >Site Study >Case Study >Design Brief >Concept>Proxemics and Zoning of spaces >Design Evolution >Sketch Scheme>… (… Iterative Refinement…)… Sketch Scheme>Final Design.

Many times this sequence is carried out religiously like a ritual and little iterative refinement or looking back. It is a hard fact that many times most of the steps and findings in the process will end up having hardly any role in the final design outcome. Over the later years of the course computer takes up the drafting process. Models were made towards the end of a project as presentation tools rather than as a way of early design optimisation and visualisation of space. Fortunately a large share of learning happens through informal modes, from seniors and exposure to design competitions, Student architects annual national conventions, from practicing offices during professional trainings etc. filling up the gaps in learning. The post professional training part of the course includes courses on housing urban design, town planning, professional practice etc. The program finishes up with the first half of the last year with a bachelors dissertation, preferably aligned along the thesis interest and the course ending by doing a full semester design thesis and its viva-voce. The dissertation and thesis will usually continue the ritualistic legacy of the course, far from any serious research

alignment other than rare and exceptional personal brilliances. Here neither the faculty nor the students can be said as sole responsible for the five year ritual. The only hope in revival is a full-scale restructuring of the syllabus and the course strategy with a courageous *'willing ness to adopt and assimilate the new'*, both in academic goals as well as in response to the demands and challenges upon a contemporary architect.

COMMON TRENDS PERSISTING IN ARCHITECTURAL EDUCATION

It's difficult to generalise the pedagogic pattern in architecture education across the country, though we can find trends pertaining to the region or nature of the institutes. The following are the observations out of the discussions and interviews the author had with experts and students in the discipline and academia as a part of his ongoing thesis. In India, in government sector, the premier institutions of architecture education includes the independent 'Schools of Planning and architecture' and few IIT's with architecture courses and then NIT's and there after colleges under state government. The private sector also has well-seasoned and equally competent institutions. Some common trends notable among student population are the excitement over computational tools and techniques, fascination over digital image making etc. Students many times give more than-actually-deserved priority for mastering the software tools than in polishing their design skills, though there are schools that differ from this trend. Another common trend is the rise in popularity of Photography and Graphic design as parallel interests/hobbies

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among architecture students where fine art is having a slow decline in its following. Research based attempts are seriously pursued, if at all, in masters level only except by exemplary undergraduate students and institutes. Most universities have a 'design based theses' but some encourages research theses also.   The distribution of undergraduate and master's level research is more towards computational design, Sustainable and energy efficient design and other Quantitative researches. Qualitative and theoretical researches are taken up lesser as many researchers find their comfort zone around the numerical certainties of quantitative methods. This is partially due to the way in which qualitative studies are faring low in logically defending their positions and also about the lack of openness towards challenging contentions to the existing norms. Now let us see these trends as against some results from cognitive science and neuroscience

DISCUSSION: MULTISENSORIALITY IN PEDAGOGY, A NEUROSCIENTIFIC CRITIQUE

Many of the recent experimental researches in neuroscience and cognitive sciences involves studies of perception, sensation and the ways in which human brain processes perceived stimuli into meaningful information through its most sophisticated hierarchical categorisation and associative process. Many of these researchers have addressed the nuances of complicated neural behaviour like Donald Hebb, John Onians in art history, Semir Zeki, on the micro neurology of perception of art, who even brought forth a new field of neuroaesthetics and most importantly H.F.Mallgrave, a noted theoretician, who has written considerably on how such researches, are justifying some of the traditional positions in architectural theory (Mallgrave, 2010).

Brain is in these disciplines is often referred to as a perpetual dream machine as by Rodolfo Llinás (Llinás, 2002). Something which is constantly engaged in weaving up an all-encompassing reality, engrossed in a relentless cycle of comparing, correlating and classifying the perceived cloud of multisensory stimuli to previously occurred perceptions and correlations (i.e. memory) every second. The most alarming revelation form this direction is that the external stimuli, of whichever sense is only sensed as in correlational process with a simultaneous multisensory model of the world one has constructed within and not in the straightforward way we may logically program an image sensing robot.

The pedagogic ramification of the above fact is that, a student of architecture, the more he is biased by the rigidities of any architectural theory as such, it will bias not only his theoretical understanding but also what his eyes will literally "see", register or notice at all in a real situation. This not only mental but perceptional conditioning is one of the many reasons for the dichotomy of how architects and non-architects see architecture. The former is not only theoretically conditioned in his understanding, but his visual apparatus and the very perceptional process is conditioned by his education. Close to this with the most far reaching ramifications to pedagogic design is Hebbs theory (Hebb, 2005) and the concept of neural plasticity. Hebbs theory is many times expressed

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roughly as "neurons that fire together wire together". This new mantra has profound implications in the way we design and teach design. It experimentally proves that nerve cells or areas of brain that are fired or excited preceded by and caused by another nerve cell develop a stronger connection every time this is repeated. It implies that our neural setup keeps continuously evolving forming new connections every moment, which strengthens upon repetition. This is against the theory of immutability of brain parts after 'critical period during early childhood (Rakic, 2002). The pedagogic ramification here is that, if trained and motivated properly any individual can attain any extent of design or graphical imagination or representation abilities as against the traditional view of these talents as random gifts by birth. It also suggests the possibility of the previously mentioned architect-non architect dichotomy as a result of the sculpting of brain (Mallgrave, 2010) that happens due to the rigorous spacial geometrical and graphical thinking one is subjected while learning in a design school or as apprentice, the architects brain will develop with maximum resources allocated to spacial processing. Dr. VS Ramachandran has postulated that in some sense *"that the various parts of the brain indulge in a zero-sum game"(Mallgrave, 2010),* i.e. the same net neurological processing power is shared from emotional response to complex graphical imagination that makes some emotionally challenged victims of autism to exhibit unmatched graphical illustration skills (Daily Mail, 2014).   At the same time, though its stretching the theory too far, it needs an experimental research in view of the above arguments, if its stands as a reason for why in architecture schools at many times have the most chaotically organised hostel rooms by its student occupants. It may also be studied that if it is this over allocation of brain power into spacial processing results in distorted sense of time, or even poor time keeping for many aspiring architects, while these failures can also be due to various other behavioural reasons also reasons.

Another phenomenon of interest from a pedagogic outlook is Synesthesia (Ramachandran, 2004), where hearing of a sound triggers the experience of a colour or a smell, like a sensory overlapping or crossover. In architecture this is expected to be achieved like feeling a touch of the texture of a wall on seeing it, or the coolness of water on seeing etc. The model based design explorations while provides a more intuitive and real synesthetic imagination, the digital design will achieve only a terminal achievement of many times a shallow effect through visual texturing of rendered digital model geometry. A multisensory spacial experience will synesthetically induce a higher mental arousal than a single sensory visual experience. The design process and representation of architects like Carlos Scarpa and Louis Barragan may be seen from this perspective. It can be seen that there are much more than discussed if a more detailed study be conducted to find results significant to the straight line development of contemporary architectural pedagogy and a critical revisit to many of its pedagogic conventions will create a better chance in training of more multisensorially sensitive architects through the system.

CONCLUSION

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The teaching of architecture is more of an implicit art than any set of logical directives. Even without any advanced research study, we have examples of teachers who were par excellence in triggering and nurturing the mysterious creative skill of design and its practical realities at the same time. But now having arrived at a time where the fixed neurological resources faces a dilemma of what exactly to master from the pursuit of architectural education, the teachers job is getting more complicated, where he has to ensure development of explicit logical concerns like structural feasibility, energy and space efficiency and related skill sets side by side with the subtle humane concerns of scale proportion and aesthetics, in his student. Hence there arises the need of a gradual restructuring of the current pedagogic system to ensure balance of the subtle sensorial, psychological and humane concerns with the more practical utilitarian concerns like energy sustainability etc. In the Indian scenario, one way to put design back in right place is to reduce talking and thinking aspects and emphasise the implicit and experiential learning processes of 'making' and drawing. This will need to update the toolset, significance and approach towards 'workshops' in architecture schools which needs a restructuring to escape the mould of a mere 'engineering tools workshop'.

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