Disruptive Practices in Architecture Design Studios

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Abstract
The rapid growth of computing technology has ushered in an era of collaborative services. The tech-friendly generation of students is keen to explore the usage of the digital tools in all periods— in and out of the studio classes. The elements and principles of teaching and learning in Architecture Schools are being reinvented with the aid of the tech-tools. Architecture Schools are required to shoulder the huge responsibility of developing students as professionals capable of building liveable environments for the society. The way the society shapes itself is inherent of the clients' perspective, the contextual parameters, the contemporary trends and the Architect's vision. The pedagogy plays an important role in delivering the requisite knowledge as well as in lending a sound pedestal to the young undergraduate, from where he can take off in his desired direction. While challenges are aplenty for a beginner to carve a niche, the aspirations to display his skills are also very high. Some of the key factors that ensure the successful implementation of the courses, include the questions like: how much a school can tutor in a curriculum; what fraction of the taught material, is relevant to the professional practice? Does the analogy of design taught in the studio with pencil as a tool and sketches as the medium, still hold ground in this age of digitalisation? This paper attempts to verify the dilemma of pencil vs stylus in the Design Studio through the investigation of the praxis of pedagogy of design related streams.

Keywords: Curriculum Development, Praxis of Learning, Digitalisation, Studio Pedagogy

INTRODUCTION
Computing skills have raised automation techniques to a platform of increased productivity, vividly spelled out projections and also enable time-bound progress. They have become the second nature to an individual. While change is an inevitable phenomenon, a society canmeet the changes happening in its immediate environment, only when men and machine work coherently. Such coherence needs to be propagated in an intrigued manner lest one of the members should fail to optimize the other. Formal education has been categorically listed into different streams like Humanities, Sciences, Technology, Finances and Creative Arts, vis-a-vis their temper and the functioning of the user’s mind. A student optsfor any of these streams according to his own inclinations, whether scientific or psychological. For cultivating thevocational or professionalskill-set, an undergraduate is exposed to a structuredtutelage. The skills he picks up in school, pave the course of his trade capabilities and employability. As such, he is required to put his best foot forward in the very first the moment, he faces the industry. The industry, being very competitive is constantly evolving and changing. And only those who understand this paradigm shift; and have the willingness to evolve accordingly, in continuum, succeed.

Architectural Education is a milieu of Techno-creative Scientific Arts. Since all Architectural products are required to meet the demand of the people who are going to live in the products called buildings; it is the peoples' changing aspirations that lead to a change in the demand. The Architectural products, therefore, have to be designed accordingly. Even if these products are far from being considered in the category of Fast Moving Consumer Goods, yet their performance is debatable vis-a-vis the consumers’ choices. Rising populations, faster industrial growth and unchecked use of chemicals or synthetic materials in our buildings, all have put an undue pressure on our environment. New Green Materials are being required to meet the concept of Sustainability. ‘Alternative Solutions’ are being accepted as the synonym to ‘Harmonious Living’. Although the present-day student has to begin with the pencil and the paper, yet he has to complete his education in a paperless environment. He is assumed to keep his designs free from any repetitive mistakes and from undue delays in schedules. He is expected to plug all gaps caused by any radical changes at site and to present cost effective solutions.

HISTORIC BACKGROUND
The earliest documented civilizations have witnessed man’s efforts to communicate graphically. e.g; the cave paintings. As the endeavour to utilize his intelligence in improving the quality of shelter, the paintings were developed a step further; to ‘Arts and Crafts’. The cultural exchange amongst the people of different regions and tribes, took shape with the help of barter system. And people learned more ways to build better habitats. The desire to imbibe the best from others’ and to put it to their own use, enabled the periodisation of civilizations. The master craftsmen/painters/sculptors/architects/builders like Vitruvius, Alberiti, Leonardo Da Vinci are some of the contributors to whom the world reveres as multi-skilled personalities. Architecture developed with the mathematical proportions of the early orders, the structural stability of the domes and the shikharas spanning large congregational spaces, the sculptural

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representations of the facades and the interiors etc. The generative reasoning of each building was a manual, laborious and time consuming task. Every stage underwent an animated reasoning based problem-solving technique. Hence the entire process behaved like a flow chart. or a manual algorithm.

CURRENT SCENARIO
The world has become a global village. Unification seen around us, is a product of collective wisdom of all the stakeholders. Computers, Digitalization and Electronic Communication have unified the world. Whether the analogic representation fits into the role of a design assistant in Architectural Design class, is the topic of inquiry. Or does it enable a teamwork between the specialized service providers like Architects, Interior Designers, Structural Engineers, Mechanical Electrical Plumbing Consultants, Construction Managers, and Contractors? The clients’ will, whims and fancies, and the advice of the consultants; all incorporated into one generative design, lends a workable solution. Architects are preparing to come up with computational set-up. Instead of being treated as mere drafting tools, the computers should be involved at the thinking level. Each design should be developed in such a way that both man and machine act complementarily to each other. The stylus can be the pencil for the initial stages of conceptual layout. And software skills need to be made more versatile so as to allow the pencil for the initial stages of conceptual layout. And machine act complementarily to each other. The stylus can be the pencil for the initial stages of conceptual layout. And software skills need to be made more versatile so as to allow alliance between the former two. ‘Reasoning, Regeneration and Representation’ can be referred to as the three ‘R’s of tutelage in Architectural subjects.

BUILDING INFORMATION MODELLING
Building Information Modelling is an innovative way to design, fabrication, pre and post construction and operations and management in comparison to the traditional way of drawing and views it as more of a human activity i.e. modelling, instead of seeing it as an object oriented approach or being a particular software (Eastman et al., 2008). BIM’s roots can be said to have evolved out of CAD, which itself has come a long way since its development from its predecessor PRONTO in 1957, the first numerical control programing tool. It then led to the development of Sketchpad in 1963 where for the first time the user was able to interact with the software (Tornincasa and Monaco, 2010). Stages of evolution are:

1. Tracing paper
2. CAD- Layered production
3. Object Oriented CAD
4. Building Information Modeling
5. Building Lifecycle management

In the construction industry of United Kingdom, the government has made the use of 3D collaborative BIM mandatory for all public sector construction contracts by 2016.

DIGITAL DESIGN
Architects build the communities; their habitats transcending their cultural ethos and the environmental conditions. The ecological impact, changing lifestyles through the life-cycle of the buildings putting extra burden on the spaces and services alike, shift the demand from stand-alone Architectural Designers to multi-disciplinary professionals. The fraternization of creativity and technology is required at the academic level itself lest the designers should find themselves lagging far behind. The students ought to be readied for the complex nature of Architectural practice today. Architectural Design depends on the variables like:

- Construction Technology,
- Building Types
- Climatic Conditions
- Sustainability

- The demand for research collaborations & inter-professional teamwork has carved a niche for industry-academia alliances.

- Choice Based Credit System is supportive of the multi-disciplinary skills being taken up by the students. The graduates are expected to be well-versed with computing skills and yet be their creative best.

- The time has come for the Academics to embrace Building Information Modelling, Scripting and Algorithms; as stated in the following statement:

“In order to change an existing paradigm you do not struggle to try and change the problematic model. You create a new model and make the old one obsolete. That, in essence, is the higher service to which we are all being called.” ~ Buckminster Fuller ~

The question arises that should we use Digital Media as a representation tool for visualization or as a generative tool for evolving Form?

Parametric Modeling is a multi-dimensional tool which models are sliced to conduct :

- 3-D modeling
- Costing & Scheduling
- Structural Analysis
- Energy Simulations

The present era belongs to ‘cloud studio’ where consultants are able to concurrently give their inputs.

LIQUID ARCHITECTURE
Marcos Novak in his essay titled “ Liquid Architectures in Cyberspace (1991)” has spelled out a new definition of Liquid Architecture. Viz; “ Liquid Architecture is an Architecture that breathes, pulses, leaps as one form and lands as another”. He started conceiving computer-generated Architectural
designs for a virtual world, way back in 1991. He developed conceptual tools for constructing territories in cyberspace to present immersive 3D creations. The transformability of these creations as per user expectations, led him to proclaim himself as trans-architect. He addresses cyberspace as “a habitat of imagination, a habitat for imagination”. The habitat stays afloat the principles of Euclidean geometry to interact with the inhabitant, by rotating, bending, and mutating itself around him.

METHODOLOGY

The researcher conducted a survey amongst the undergraduate students of Architecture to analyse their perspective towards the adaptation of technology and to verify if computing skills can substitute the pencil in the design studio. The respondents came from institutions of established repute in the North-West region of the country. Viz; CCA Chandigarh, IKGPTU Mohali, MRSPTU Bathinda, CSPA Rajpura, MASAD Baddi, GNDU Amritsar and CU Gharuan. A total of 96 student responses are presented here. The responses are summarised herewith:-

Q1. Of the 96 respondents, 57% have chosen Architecture as their first choice.

Q2. The trend of joining professional and vocational courses has been in place for more than two decades. As the industry got a boost from liberalisation in the ninety’s, the infra-structure demand, migration from rural to urban areas, employment generation, are some of the key mobilizers. People are motivated to flock to new settlements around such sources of employment. Consequently, more professionals are required to serve the demands of regional planning. Smart Measurable Attainable Reachable Time-bound (SMART) targets give a push to the student expectations. The students have given measurable skills a preference over the other objectives.

For a student, the objective of enrolling in a professional degree of B. Arch is:

![Graph showing the preferences of students for different objectives.]

16798
Q3. The present generation of students is brought up in the company of tech-tools and affiliates technology / computing skills as a basic educational activity, a design aid, a smart assistant, a collaborator and a cognitive science.

Q4. The students are in constant exposure to Virtual Reality and multi-media. Thus probing their affinity towards adopting them in design studio brought forth a positive inclination.

Q5. Architectural Design studios offer a peer group learning environment. These spaces have been acknowledged for sharing feed-backs and critical reviews from jury. The studios are the spaces where strong statements on AEC (Architectural Engineering and Construction) aspects of a project are made in joint sessions and scribbling lead to sketches, drawings are drawn, altered and debated before they are finalized. Many an environmental, structural, economic and operational concerns are deliberated here. Hence the concern that whether a monitor screen can provide a similar working environment to the user, was investigated. Collaborative web based solutions have found a yearning in the young minds of the students.

Do you agree that Technology driven Architecture can be:
Q6. The design development tools in the paperless work environment call for a shift in the studio pedagogy. Students have conformed their adaptability towards peer-group learning in digitally shared collaborative environment.

The timeline of development in design tools acknowledges the arrival of (Rank them in the order of priority):

![Graph showing the timeline of development in design tools]

**FINDINGS**

The findings of the survey assure a positive mind-set of the young students who have acknowledged that Virtual Reality (VR) is the future for architects. The benefits, viz-it helps in exploring more data and brings out precise outcomes; supersede the inhibitions towards the free-hand thinking ability. Many have reported that the profession is looking for students who are best in the digital skills. So the institutes and the students are united in their efforts to prepare accordingly. At the foundation level, Design development & cultivating creativity should be set with pencil and paper. And as the students` progress to senior years, technology-based tools and methods are desirable. It is time to strike a balance between the pencil and the stylus with so many apps around in the web world around us.

**RECOMMENDATIONS**

The arrival of Virtual Reality [VR], Augmented Reality [AR], Mixed Reality [MR], is here to stay with us in our daily lives and work. Nowadays the clients/promoters come to architects with both the references from their choice of designs seen on multi-media and with a demand to be served in a single window system. They are keen to join the shared communication between the Architecture, Engineering, Construction and Operations (AECO)- collaborators and to keep a tab of how and why of the developments at site. Applications like I-pad sketch and social media like Instagram have opened a virtual world of graphics, with stylus as a tool equivalent to pencil. It is for the academia to adapt to these tools and explore the pedagogical methods to instil the sense of scale and proportion on a 3” X 5” screen of the tablet.

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