

# An Adaptive and Experimental Approach towards Educating Aspiring Architects in the Subject of Construction Technology

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**Abstract:** *Today's Architectural education system is crammed with too many subjects within a short time, leaving very less time for hands on learning. It is an overview of the real world that the student will be facing once; he/she graduates from the Institution. The teacher therefore has to develop and come out with innovative solutions to overcome this problem and bridge the gap between the demand of the profession and the prevalent system. It has to give pointers to the students and equip them with the "F1" i.e. the help command in our profession. They, as individuals should be able to derive and adapt to the changing conditions and the plethora of varied situations that life will present them in their future, may it be new technology, or new materials or practices. This paper aims at finding different approaches towards education of Construction technology. The Objective of this paper is to formulate various approaches in teaching building construction technology subject and to find various experimentation methods to get the desired outcome. The Methodology for the proposed research shall be experimental exercises, 3D model generation and software interventions for understanding the subjects.*

**Keywords:** Building Construction, Adaptive and experimental education, demonstrative, teaching skills.

## I. Introduction

Teaching and learning processes have evolved over the years. There are different ways in which a student learns or so to say the information is transferred from the teacher to the student. Some students prefer to learn by experiencing, some by memorizing, some by hearing and observing, or by reflecting and acting, some by visualizing and drawing analogies, upon a given set of instructions or problems. It now becomes challenging for the teacher to make it a point that, the entire class is able to understand the subject, irrespective of the method each student prefers. Hence the teacher has to devise a pattern of teaching the subject or a combination of more patterns, most suited for a particular situation or problem. The teacher thus has to adapt and combine methods such as, demonstration, discussions, lecture with focus on principles and their applications, sometimes memorizing.

The methods of teaching a subject such as Building Construction have to be adaptive and experimental to keep the interest of the students and motivate them.

A few methodologies apart from the conventional blackboard teaching that we have experimented shall be discussed ahead.

## II. Methodology

Efficient graphic presentation and precise description framing skills and achieving a good dialogue are basic necessities of an

ideal guide, which include bridging the gap between theoretical knowledge and site practices by means of site visits planned for students.

Besides these basic methods, implementation of the following enlisted approaches can certainly enhance the quality of education in Construction technology which will result into a better understanding and a quick grasp of the concepts. Such methods will prove effective for the students to develop a vision in applications of the concepts to practical situations.

### Method 1

#### Demonstrative physical models

Explanation of most of the construction concepts can be demonstrated by the usage of simple physical models using materials in day to day life. To illustrate this method, the following examples are suitable.

Example 1: Understanding nature of forces in a truss.

To prepare a model of a truss consisting of a series of tension & compression members, bamboo cane can be used to simulate a compression member while, a simple thread for a tension member. It is easily observed that the member showing sagging should be a compression member.



**Fig.1-** Use of physical models to understand forces in a truss

Example 2: Understanding tensile & compressive stresses in a RCC member

A simple flexible object like a sponge/eraser with lines marked on it shows a pattern which explains the deformation of the member on account of some load, which helps to

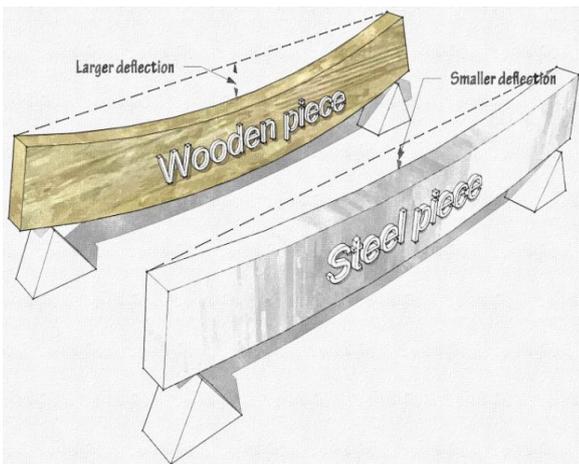
perceive the tensile / compressive tendencies in the member. Thus position of the steel reinforcement is clarified.



**Fig.2-** Use of physical models to understand forces in a beam

Example 3: Understanding deflection in a beam simulated using different materials.

It can be very well observed that change in the material results in varied deflections under same loading conditions. E.g. A wooden piece of a given cross section on the same span & load will show a larger deflection as compared to a steel piece with the same parameters.



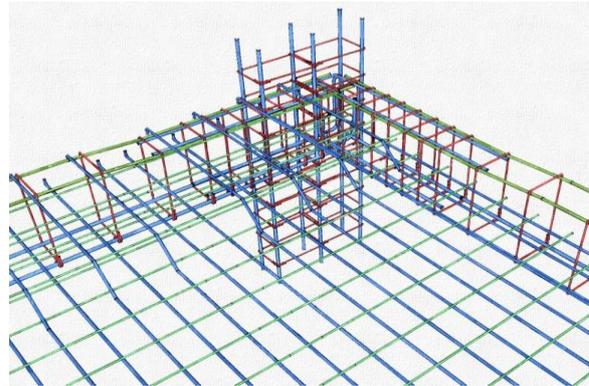
**Fig.3-** Use of physical models to understand deflection against material

### Method 2

Demonstrative digital models

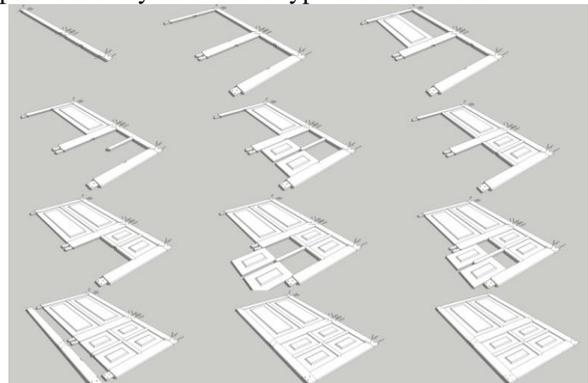
Digital models can be put to use to achieve mainly two objectives.

a. Visualization of a fixed assembly such as reinforcement in a typical column beam junction. This digital model can be animated from different viewing angles for clarity.



**Fig.4-** Use of digital models to visualize reinforcement junctions

b. Visualization of the sequence & process of a particular assembly of components such as, construction of structural timber flooring. This sequential visualization method need not be restricted to timber alone, but can be also explored for any material or type of construction.



**Fig.5-** Use of digital models to visualize a sequence of assembly

### Method 3

Audio visual mode of presentation

Most of the presentations involve visual medium of communication. Audio based presentations can be used for specific concepts such as experiencing the ringing sound of a good quality burnt brick, or the noise pollution caused during riveting process.



**Fig.6-** Snapshot of a video showing ringing sound of a brick

### Method 4

### Organization of a Quiz

This method generates a competitive spirit within the students which stimulates the urge to explore & acquire comprehensive knowledge of the concept.

### **Method 5**

#### Super-imposition analysis

It is somewhat difficult for some students to correlate drawings issued by various consultants on the same project. To overcome these hurdles, the Guide can play a major role by superimposing drawings from such consultants, especially those from MEP consultants. A good hold, over this analysis will add to the abilities of the students to tackle probable site situations for the entire tenure of their Architectural practice.



**Fig.7- Civil layout & MEP layouts superimposed for clarity**

### **Method 6**

#### Hands on workshop and lab testing

a. This method proves a very good tool for students to understand the concepts, procedure and the material. Moreover they learn the physical properties of the materials and the field tests that are very important in preliminary decision making. The students are exposed to the difficulties and the problems that arise during the actual working and thus their ability to foresee a situation and design for it is enhanced.



**Fig.8- Hands on Bamboo construction workshop for understanding material and construction technique.**

b. The Lab testing of materials such as cement, concrete etc. introduced the students to the testing equipments

and tools. They learned how various instruments are calibrated and used.



**Fig.9- Compression testing of concrete cube in Civil Lab**

### **IV. Conclusion**

Experimental approaches for teaching initially appear to be tedious & time consuming, but prove to be very effective to achieve long term goals. Based on the documentation of these experiments, we can maintain a database which serves as a reference guideline for further exploration. Thus, these adaptive & experimental approaches are a platform for continuous up gradation of the educational system.

### **Acknowledgement**

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