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The New Ways of Construction Teaching

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A construction tutor in a school of architecture faces a number of problems. The first problem is about how much to teach. There are vast number of construction methods and components in our days. How much of this vast knowledge should be taught? The mostly used construction methods and components should be taught in detail. However, some of the other methods which look promising should also be mentioned to cause attention of the students and to develop their creativity.

In addition to these, students should be guided on how and where to find additional knowledge. There are many sources of construction knowledge in our days. These can be listed as:

- Construction Textbooks,
- Construction Journals (Scientific and Professional),
- Construction Catalogues,
- Company advertisements and technical notes,
- Internet Sources,
- Building Research Establishments and their publications,
- Building Documentation Agencies (like CIB) and their publications.

Another problem faced by construction tutors is how to teach construction. Normally construction courses are given on the first two or three years of curriculum. Most of the construction textbooks are too dull. They contain information in a serious manner. A text book written by (REID, 1988) explain how structures stand up in a splendid way to freshman students. Construction textbooks should be written in the same manner. Another tool which can be used in teaching construction to the freshman students is the magic of color. It may be a good idea to have large, colored explanatory drawings on sheets, kept continuously in the drawing studios or classrooms. It is always possible to show the students pictures of these constructions by slide or LCD projections.

An alternative way of teaching students construction is allowing them to construct a building. This is what we call learning by doing. These exercises are very valuable. They give students insight to understand many construction problems. However, it is a costly teaching method and it is not possible to realize this for all types of structures.

We should also consider the difference between students of architecture and the students of architecture or building construction technicians. Architects are more interested in the best final solutions so that they can design them. Technicians are more interested in the way a building element is constructed. This is what they will manage in their occupation. Certainly, if in a country there is no difference between architect and the construction technician both should be taught.

Construction by computers is another possibility which we should start thinking today. However, there is still much research to be done in this field and possibly construction people should work together with the computer scientists.

At Eastern Mediterranean University, Dept of Architecture we have developed the expert system BES, for the selection of building elements in architectural design which can also be used in teaching construction (ALIBABA and OZDENIZ, 2004). Expert systems are computer programs which are composed of knowledge about a

special field and are used for solving the problems as human experts can solve. In the design of this expert system, we have considered on how architects select a building element. Firstly architect may have some preferences on the alternatives. Secondly, an architect may have some expectations from a building element. For example, the building element should be this much fire proof, or it should have this much sound insulation etc. Thirdly, some expectations may be more important than the others or some alternatives may be totally eliminated due to the conditions. For example, timber staircases may not be required. The outlined flowchart of BES is given in Fig 1.

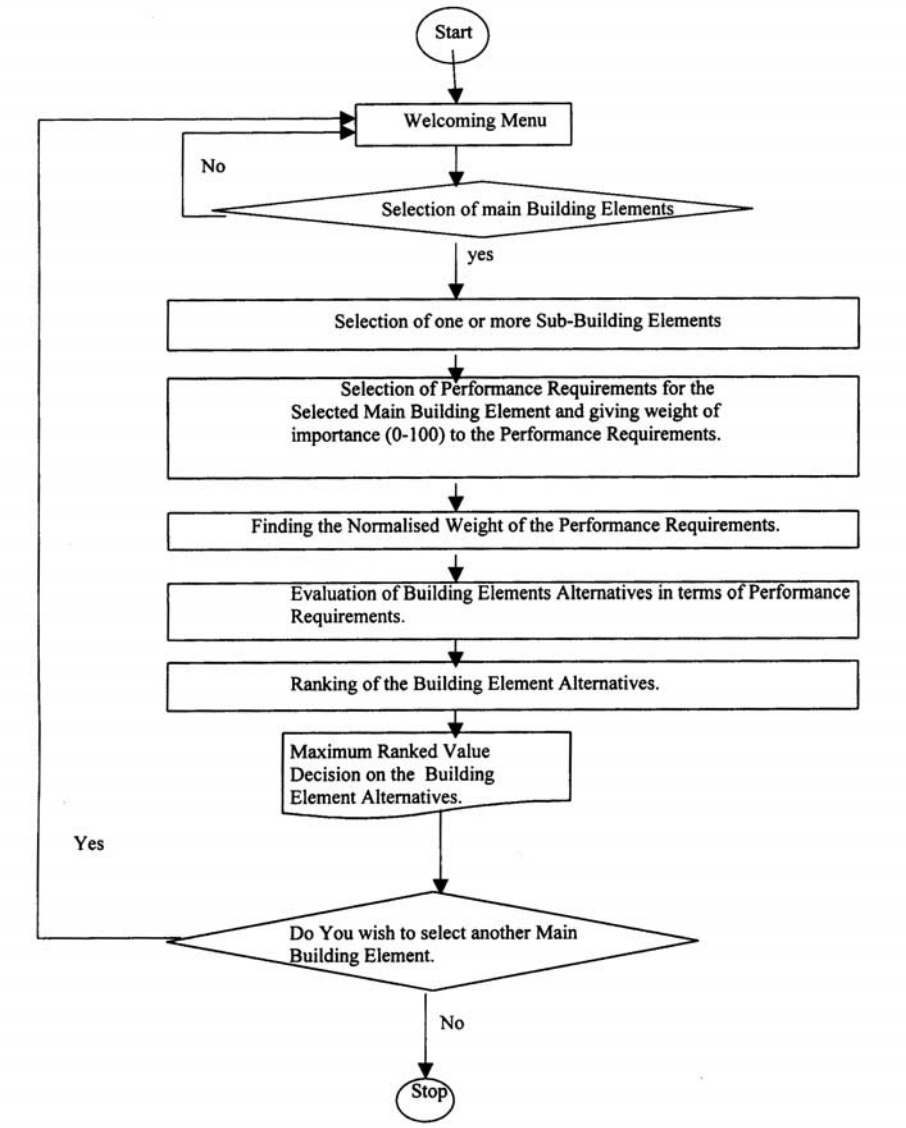

Figure 1.
Outline flowchart of BES.

All the construction knowledge available at the moment were included in BES. Behavior of the building elements is an expert knowledge this is also included in BES. It is also possible to add new knowledge to the model. When the designer inputs his/her preferences about the building elements and the performance requirements BES will rank the best possible building elements. It will also provide the technical information and cost data. This feature of the expert system and the possibility of using it through internet, makes it an international tool for construction education. User dialog boxes of BES are given in figures 2A-F and the data examples in figures 3 and 4.

Figure 2A.
User dialog boxes in BES. (Selection of wall from main building element list.)

Figure 2B.
User dialog boxes in BES. (Selection of wall function from building element type list.)

Figure 2C.
User dialog boxes in BES. (Selection of external walls from sub-building elements list.)

Figure 2D.
User dialog boxes in BES. (The list for the performance requirements of external walls with editable default values.)

Figure 2E.
User dialog boxes in BES. (The list for the expected performance grading of "stone solid wall" with editable default values.)

Figure 2F.
User dialog boxes in BES. (The final grading of the sub building elements in ranking order.)

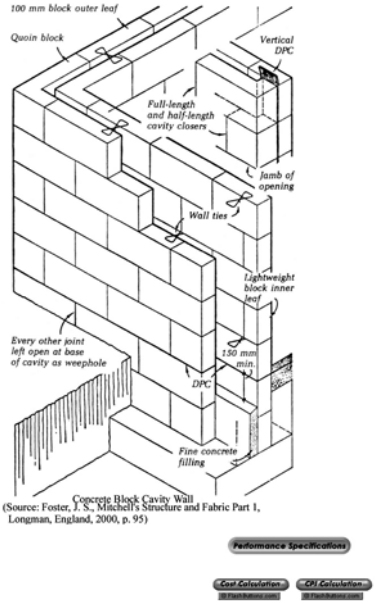

Figure 3.
An example of construction drawing BES gives for concrete block cavity wall.


Please write the amount of the items required at the intersection points shown as "0" of items and building elements.

Item	Description	Unit	Quantity: Mobilization etc	Ret.Wall	Found.	Walls & Partitions	Floor	Ceiling	Stair	Roof	Chimney	Window	Door	Sewage	El.,Mech.,Sanitary	TOTAL	U.Rate $	Total $	OH&P % (Overhead&Profit)	Total $
1	Mobilization	LPS	1													1		0.00 $	0	0.00 $
2	General site clearance	LPS	1													1	0.00 $	0.00 $	0	0.00 $
3	Excavation to reduce levels	m3	0													0	2.50 $	0.00 $	0	0.00 $
4	Excavation for foundations	m3		0	0				0							0	6.00 $	0.00 $	0	0.00 $
5	Excavation by hand	m3		0	0				0							0	10.00 $	0.00 $	0	0.00 $
6	Backfilling in layers and compaction	m3		0	0		0		0							0	4.00 $	0.00 $	0	0.00 $
7	Layer of sand 10 cm	m2		0	0		0		0							0	1.20 $	0.00 $	0	0.00 $
8	Hardcore 15 cm	m2		0	0	0	0		0							0	1.50 $	0.00 $	0	0.00 $
9	Lean Concrete - 200 dosage	m3		0	0	0	0		0							0	52.00 $	0.00 $	0	0.00 $
	Lean																			

Figure 4.
A sample for cost calculation.

The model is in the process of development and we also have some criticism on it. Firstly, the construction data on it are in the raw form. In other words we put all the data into BES as we found them. We are in the process of organizing them. Secondly, we are considering what else we should add to it, so that it can be used more practically as an educational tool. One possible thought is to make the drawings appear on the computer screen as though they are being constructed. Thirdly, how can we make it work for building elements with dual functions? For example a building element which is both external wall and roof. Fourthly, how can we make it work for the structural building elements? Lastly, how can we increase the creativity in selecting the building elements?

References

Alibaba, H.Z. and Ozdeniz, M.B., A Building Elements' Selection System for Architects. Building And Environment, Vol 39, No 3, March 2004. pp 307-316. March 2004.

Reid, E., Understanding Buildings. A Multidisciplinary Approach. Cambridge, Massachusetts The MIT Press, 1988.