ARCHITECTURAL EDUCATION TO SUIT COMPUTERS OR COMPUTERS TO SUIT ARCHITECTURAL EDUCATION?

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Do the thinking processes which generate architectural design contrast so sharply with the thinking processes generated by the computer that a question like this is asked ? Or is it because computer-integrated education is still missing from the agenda for architectural education that a question like this is rarely asked ?

Architectural education in our school is centred upon the activity of architectural design. The primary aims are to :

- develop an understanding of the meaning of form and space and its cultural interpretation as buildings that are built and places that are lived in,
- to he able to engage in a process of creation that enables us to retell and rewrite our experiences and values and
- to achieve this through applying strategies for formal and spatial composition through the generation, transformation and ordering of concepts within a synthesized contextual, social, economic and technological framework.

Architecture can no longer he said to he inspired from any one discipline, whether from art, from technology or from the social sciences. For at the root of architectural design lies the task of representation, interpretation, inquiry and judgement. Computers offer the power to support, direct and enhance this task of architectural design through their capability to represent and recreate models and processes of human thought and activity. It is within such a holistical structured design focused framework of architectural education that we have intended to develop the teaching of Information Technology in our school.

But the need to introduce computers did not arise from within architectural education - to enhance the making of architecture. We saw a weakening of the promises that gave rise to that vigorous sixties debate of the potential of the computer in analytical design and we soon realised that architectural design was not possible through rational methods. Instead computers entered the architectural scene from the computer industry and computer graphics arena catering more often for the architectural profession.

Architectural education exists indeed to produce architects, both practitioners and academics. Further, as architects interface with managers, historians, software developers or other building industry professionals, their role is refined. But the central activity of the architect remains design. Thus we claim that while providing the computing skills to meet the needs of the architect as practitioner is important, the central aim of computing in architectural education must be to support and enrich the role of the architect as designer.

Consequently. in the process of trying to integrate computers into an architectural education which fosters the culture of design, we have found ourselves in conflict with –

- the kinds of software and hardware we were faced with, designed with little sensitivity to how they could fulfil academic needs or how they could be implemented in a teaching environment.
- the IT policies of our parent institution, set within priorities of the broader IT scene and striving to economize resources through standardization of software and hardware and sharing of accommodation and staff.
- the expectations of students and staff formed from an attitude to the role of computers in architecture based on their experiences in practice and as propagated by the media and architectural journals under marginalised headings like 'technical'.

The issues which subsequently arose - curriculum integration, staffing and teaching delivery, hardware and software resourcing and locational policies and their impact on the evolution of IT policy in our school over the last four years will form the basis of the paper.

PHASE 1 1988-89

Resources

In 1988-89, CAD teaching was initiated using the Gable software on the polytechnic's Vax mainframe accessed through 15 Tektronix terminals available as a central facility shared with other departments. The facility was managed and supported by the central computer services department.

Teaching

Second year architecture degree students attended computer workshops one day/week for a term to employ CAD as an additional medium for their current studio project, a health centre. Design teaching took place using both traditional media and on computer screens. The brief requirements were flexible, the students being asked to use CAD as applicable to their own schemes. The project was mandatory and was presented and assessed at design crits. Most students successfully completed in spite of having to first acquire software skills. However the quality of designs had little relationship with the new medium used.

Outcome

We tried to adapt available software to architectural design teaching. Within the time available, students were not able to exploit the software to expand their creative potential, their achievements being limited to representation and visualisation of their schemes.

We attempted to suit open student centered learning and tutoring in a design studio to a formal computerized teaching environment and experienced problems of continuity due to restricted access, physical separation from the traditional environment and availability and functionality of software and hardware due to inadequate system management.

PHASE II 1989-90

Resources

We felt strongly that the department should develop its own IT policy, one that would support the design-based ethos of the school. We embarked on a policy of computerizing individual studios throughout the school. It was decided that Gable would be retained as the top-end software, comparable software at the time not being affordable. However the Apollo workstation was a more attractive platform to run Gable than the Vax. It was agreed that the need for an entry level system would be met through AutoCAD/AEC on the PC. Our desire to introduce Apple Macs as a user friendly machine was discouraged as it was contrary to current university hardware policy which centred on Pcs.

Following a successful bid from the polytechnic central IT funds, three Apollo+Gable workstations and three IBM compatible Pc+Autocad/AEC stations were obtained. One of each was installed in each of three studios on three floors and networked. These catered for the needs of Architecture degree, diploma and Interior Design students respectively and were available on an open access basis. A dedicated IT technician was employed by the department to manage these facilities. In addition, a 15 station Pc+Autocad/AEC classroom was also made available as a central facility shared with other departments and managed by the central computer services department.

Teaching

During 1989-90 IT teaching was offered in four different modes.
An introductory mandatory course was run for first year architecture degree and interior design students using Autocad on Pcs in groups of twenty on a rolling basis through the year. A typical project was three dimensional modelling of famous chairs.

Advanced level architecture degree and diploma students were offered the opportunity to use Gable or Autocad towards their studio projects.

Second year interior design students used Gable towards various analytical studies of the an existing bar e.g. structure, circulation, lighting, colour, etc. This served as a precedent study to the design project and was assessed as a studio component.

Third year architecture and interior design students got exposure to computers in practice through visits and case studies.

Outcome

The introductory IT course achieved little more than elementary drawing and modelling skills. Learning difficulties were propagated by unfamiliarity and resistance to the technology, inadequate technical backup and having to balance mass training with non user-friendly software and hardware.

The studio integrated CAD projects did not make any significant impact on the ability to design. Although software familiarization workshops were held, they were not integrated with design teaching- and work done was not formally assessed. Consequently there were variations in the time invested and quality of work produced, which in most cases depended on student motivation. It was only when the CAD brief was structured in integration with a design project as in the analytical study of the bar, that a notable outcome was evident.

We endeavoured to suit computer based instruction to traditional methods of design teaching by providing software skilling through formalized workshops prior to design application in studios. Thus resources were organized as Vax and Pc classrooms for group teaching and studio Apollos and Pcs for student centred learning.
The system worked, but there were problems of having to distribute support. Security became difficult and one Pc was stolen. As studio staff were not involved in CAD teaching, use of the studio computers became limited to confident students others preferring to use classroom facilities where teaching and support was more easily available.

PHASE III 1990-91

Resources
Session 1990-91 began with three additional Apollo+Gable workstations and five more Pc+Autocad/AEC stations following another successful bid by the department. The department was discouraged in wanting to introduce additionally Apple Macs as a user friendly machine, as this wascontrary to polytechnic IT policy. At this point, Gable support on the Vax was discontinued by the software manufacturer and consequently the Vax classroom was closed. The need for a classroom facility necessitated having to relocate the six Apollos as a networked group teaching setup. Expansion of the CAD area on the second floor meant having to relocate an adjacent seminar room. The Pc+Autocad/AEC stations were distributed in various staff and student rooms throughout the building.

Teaching
The first year introductory became for the first time a formally assessed course accounting for 5 % of the total marks. The course continued on a rolling basis for groups of 15 students with 3 hours/week for 4 weeks.

A CAD elective course run for second and fourth year architecture students offered an opportunity for interested students to test the application of Gable towards design thinking through studio projects. Although not assessed, either independently or within studio marks, motivation and achievement levels were high.

Outcome

A multitude of factors contributed to a high failure rate in the IT introductory course -high student teacher ratio, varying learning needs, inadequate technical support, imbalance between time available, course requirements and suitability and user friendliness of system. Students expected competence and marketable skills, while the course was aimed at understanding and applying principles.

The CAD elective, although not assessed independently or within studio marks, produced projects depicting creative use of the software. The reason could be the structuring of the course as a specific directed subject of study taken only by motivated students.

We experimented with running a range of computer based courses varying in content, level and degree of integration with studio based design. Although with teaching support, a number of motivated students did manage to integrate computers into their design projects, the time for computer integrated design to acquire a place within the design culture of the school had not yet come. CAD was not considered necessary, certainly not helpful and even harmful to the teaching of architectural design.

PHASE IV
1991-92

Resources
The department's staffing policy continued to keep the teaching of CAD separate from the teaching of design. The department's IT policy deviated from computerization of individual studios to centralized classrooms. Computers distributed in various rooms were centralized to minimise problems of access, control, security, support and teaching. The computer zone in the second floor containing the Apollo+Gable workstation setup was expanded to include an adjacent room containing Pcs + Autocad/AEC and four new Apple Macs + Modelshop/Macromind Director.

Teaching
This raised the profile of IT making it more visible. The first year foundation course was now more structured in content and timetabling. Autocad was used by architecture students to accurately model and redesign their computer studio and by interior design students to create abstract static and dynamic models of the human figure. The objective was as much to develop three dimensional thinking capability as to explore an alternative method of representation and transformation. Teaching took place in 3 groups of 20 students/group over a period of 6 consecutive weeks at 3 hours/week.

Workshops were held for a second and third year vertical studio unit, second year interior design and first year diploma in application of CAD towards their respective studio projects. Briefs for computer assignments were written to integrate with different phases of a project e.g. a particular group was asked to represent and interpret their sites, while a different group was asked to test alternative ideas and approaches to a design solution. Choice of software was left to the student.

Outcome
Specific strategies were adopted to improve and assimilate the IT introductory course - focusing of content, timetabling to take into consideration peak activity days like crits, more effective backup support. Attempts were made to form groups on basis of aptitude, but the process was too time-consuming.

The use of computers in studio projects, although being undertaken by a significant number of students in the school, was still valued only as an applicable skill rather than as a medium for design. Weak design students who were computer skilled tended to do worse than their computer illiterate colleagues, receiving little or no encouragement to apply their skills to further their designs. The recognition that strong design students who were computer skilled got during crits was limited to an appreciation of technique, rather than its implication on the design process. Low morale remained an obstacle, the only incentive often arising from the need to acquire a marketable skill in a competitive architectural employment market.

PHASE V into 1992-93

Resources

The department's centralized mixed hardware and software facility has evolved into three distinct specialized teaching rooms - an Apollo room, an Apple Mac room and a Pc room. It is envisaged that these rooms will he booked by teaching staff across the department for their respective needs. In addition to design teaching, this would apply to courses in environmental science, structures, management and general IT use.

Teaching

In spite of significant teaching hours being dedicated to the teaching of IT and CAD and a range of available hardware and software, the department was criticized at its course validation both by the RIBA and the university, for lack of seriousness in this area and insufficient integration with design studio teaching. During the last few months the architecture curriculum has been rewritten to adopt a modular framework.

This year we are offering Information Technology as a mandatory module for all first year architecture students. The module has a Design IT component aiming to introduce students to techniques of creating and composing form and space, and a Technology component aiming to equip students with computing skills in environmental science and structural analysis.

Second year architecture students are employing computer based strategies to investigate the design as a consequence of a decision making process. This is taken as an optional method of studying a building as precedent and forms a component of the Building Study module. Other options in the module are Technology and History based and the latter stage involves students taking different options undertaking a synthesized study of a building.
Its application in studio based design is also carefully structured as an alternative medium within the Design Development module which focuses on a range of techniques for making three-dimensional models.

First year diploma students take IT as an independent module with possibility of application in studio design, technology or practice. Advanced CAAD as a specialist area will also be offered as an option at diploma level with the aim of providing a theoretical framework to the exploration of the new computer aided design medium.

In the interior design course, we are attempting skilling through studio application and studio design through using computer skills through modelling human performances within the context of an exhibition space design.

Conclusions

We have built tip a rich mixed hardware and software environment. We have structured IT teaching within the curriculum to balance content, timing, Student and staff numbers and physical resources. We continue to experiment and refine the teaching of IT both as a formal subject area and in integration with architectural education.

Ours has been an architectural premise and our experiments with computer technology have been based on projects that address the study of architecture. It was not so long ago that we asked if computers could match what could he achieved through traditional means. Today we ask if computers are not capable of achieving what is the same, but through alternative means. Then perhaps, we should ask tomorrow if computers are not capable of achieving what is different, of altering our understanding of architecture of the past, present and future.

Four years on, the software and hardware scene has changed. Computers have come a lone, way from representing numbers and mechanized calculation to being a powerful medium for expression, communication and thinking. Architectural education is ready to take on a new challenge - the discip-

line of CAAD or Computer-aided-architectural-design, perhaps the bridge between human architectural thinking and computer generated architectural thinking?

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