Less is More - Enhancing CAD instruction by enabling student centred Learning, a Case Study for Learning 2000

Alison Murison

This paper describes a structured programme of instruction in the use and application of CAD to architectural design, where programmed lectures and seminars were abandoned to be replaced by student centred learning and appropriate support. The Third Year CAD course at Edinburgh College of Art was reshaped completely. Only one lecture was given to outline the course, thereafter all attendance was optional, and a variety of learning methods were offered. Student reaction was recorded and the learning outcome assessed. Final student marks showed a definite improvement.

Keywords*: Learning, CAAD, Student centred.*

Introduction

For some time now studies have shown that students learn in diverse ways. While some learn well in seminar situations, others are much better at acquiring information from books. Lectures can result in very poor learning [A]. Disciplines with very large numbers of students, many of whom must be taught basic skills, e.g. in Maths or Languages have been addressing the problem of how to improve the transfer of information and skills. While in many cases Computer Assisted Learning has been embraced with blind enthusiasm, some have examined more carefully the integration of Learning Technology [B] . With increasing numbers in our school of Architecture, and with students with a diverse range of skills and experience, an attempt has been made to restructure the CAD course using some ideas from other disciplines..

Mathematics – an example

In Heriot-Watt University the Maths department must service a number of courses where basic mathematics is needed, but is not necessarily the primary interest of the students. In addition it has been found that the standard of maths of many first year students is poorer than it was some years ago. Many Engineering students were being taught in groups of 200-300 and an unacceptable proportion were either failing the end of year exams or obtaining very low marks. While the CALM [C] project was producing Computer Assisted Learning materials to provide teaching materials which could be used as drill and practice or remedial exercises for students, a method of integrating the CAL materials was sought.

The previous timetable had consisted of the traditional two hours of lectures and two workshops (practical sessions) per week. This was reduced by half and the students were told that all attendance was optional. CAL materials and some printed materials were made available. Attendance at the lectures dropped to about 30% of the class. Similarly with the workshops. At the exam, although about 10% still failed the exam abysmally, 85% passed, and the **average** mark improved by 15%.

The staff time was reduced, but the quality of learning was greatly improved. The students could

choose how and when to study. The responsibility for learning was thrust into their hands, becoming an active instead of a passive process. With adequate support for students who sought it, an excellent outcome was obtained.

The benefits of alternative ways of teaching maths are being used across the Scottish Metropolitan Area Networks (MANs) in the Mathpool project, and in the Clyde Virtual University [D]. Similar methods have been applied to other subjects, notably Modern Languages, Physics, Biological Sciences and Medicine [E].

Application to architecture

The students on our course study for three years, then go out for at least one year for Professional Practice experience. They receive short courses each of about 8 hours length in First and Second Years. These both use 3D modelling to explore particular problems in design.

In Third Year various ways of preparing students for the Year Out have been tried – weekly classes, block courses (eg two weeks in the holidays), but all of them were staff intensive, and divorced from design teaching. The majority of students emerged from this regime with very basic skills, apart from those who enjoyed using computers and would have learned to use them independently. It was possible to avoid learning CAD skills altogether. Now Third Year students realise that they will require CAD skills to obtain jobs, and demand training.

There are about 40 students in Third year, of which at least five are in Edinburgh on exchange, or direct entry from abroad, and a further two or three who have returned to College after some time out due to resit exams etc. Thus almost one quarter will have had a different experience of CAD than the rest. In addition, by Third Year an increasing number of students own their own computer, or have access to a computer in their term-time residence, although it has not reached more than 25%. (Numbers with "home access" are higher after the Year Out.)

Our department has its own Computer Rooms with 15 CAD stations running AutoCAD, 3DStudio, PhotoShop etc, and a part-time technician. It is occupied by classes for about 10 hours per week. Otherwise students may get access during the remaining 16hrs per day when the college is open. There are other unmanned computer rooms for e-mailing, word-processing and simple image manipulation.

The aim then, was:

- to ensure that **all** students reached a level of skill suitable for work placement
- not to increase academic staff contact time beyond two hours per week to apply CAD skills to enhance design presentation

The programme

Our academic year has three terms of eleven weeks. In the Third Year students complete two design projects. The first project reaches its conclusion not quite mid-way through Term 2. The CAD course commences at the beginning of Term 2. Final hand-in of CAD work is scheduled for the end of week 5 in the Term 3. Each student is required to make a CAD presentation of one of their designs, the first, but there is enough flexibility for them to choose to do the second one.

Attendance at the first and only lecture was timetabled and the students were expected to attend it. The numbers attending Term 2 Classes can be seen in table 1.

At the lecture the learning resources were outlined:-

- The weekly computer room 2 hour classes were to be optional.
- One paper-based self-teaching text would be available, which teaches students to model a small building in 3D.
- A detail drawing exercise was handed out
- Step-by-step handouts on various aspects are

	Number of Students	Lecture	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6	Class 7	Class 8	Class 9	Class 10
1997-98	42	38	25	5	5	4	0	3	6	12	12	14
1998-99	37	34	10	6	8	*	7	10	*	*	14	17

* Class cancelled due to staff illness. One further class was given in Term3.

made available eg how to plot one model to different scales.
- The commercial multi-media tutorials and on-line help were pointed out
- Staff e-mail addresses were listed

The students were given two deadlines for particular pieces of work.

- In Term2, week 6, they were required to submit a print to scale of the detail given as an exercise, and also a scale drawing of the footprint of their building.
- In Term 3, week 5, they were to produce an A1 sheet presenting their design. This had to include floor plans to scale, annotated, and a perspective of either a simple model of the whole building or a more detailed model of part of the interior. This work was to be marked as part of their design mark. The numbers attending classes were noted.

Session 1997-98

The first week was very well attended because we had just received an upgrade to the software (AutoCAD) and so a demonstration of the new features was given. Thereafter the students coming to class were almost all exchange students, who that year happened to be people who had not previously used computers for drafting or drawing.

The extent to which students modelled their building in 3D was entirely up to them. As some students began producing more highly finished rendered images, pressure to achieve a higher standard led to a higher attendance for help at the classes. (Table 1) At the final CAD assessment - two students failed to produce adequate work. Every other student achieved a grade of over 55%. The average mark was 63%.

While this was deeply satisfying, the fact that all these students had a well drawn up CAD drawing of **their own project** in their portfolio, with no extra staff time devoted to obtaining this, was even more pleasing.

Session 1998-99

Student comments from 1997-98 were on the whole positive. One recurring comment in the feedback was a wish that more packages could be covered so that a greater expertise in presentation could be achieved. While bearing in mind that the original aim was to provide quality training in **drafting** this request was taken on board in the design of the programme for 1998-99.

In January 1999 at the lecture, a programme was agreed with the students for a series of topics to be covered each week. One hour only was devoted to a demonstration, leaving time for students with problems with which they needed help. Topics covered included, Digital Imaging, Digital Terrain Modelling, Page Layout in PageMaker, Rendering in 3Dstudio, PhotoShop, Making & Using Libraries of Objects, File Management. Unfortunately there was a severe flu epidemic and for once classes had to be cancelled. A class was given in Term 3 to compensate.

The final marks obtained were roughly similar to the previous year, although this time there were four students whose work was not considered adequate. The body of students seemed to have a different approach. They seemed just as motivated as the previous year, but much more relaxed about it. While the students of 1997-98 had in some cases seemed

grimly determined to master the techniques required, a larger number in 1998-99 were more willing to experiment and go beyond the minimum requirements of the brief.

How the Students Choose to Learn

It was interesting to find that as Laurillard and Rowntree keep pointing out, students approach learning in different ways. We found that some students would much rather attend a tutor-led session (Table 1) while a large number used the self-teaching materials, both electronic and paper-based. Some students, including most of those whose first language was not English seemed happy to work at their own rate through printed material, on which they could write additional notes. One student even went through the same tutorial three times in order to master it completely. He produced one of the best presentations.

A small number of students used e-mail to make an appointment to solve a particular problem. This was not quite the on-line help I had had in mind, but it was useful.

To some extent the students formed self-help groups. This had not been suggested to them, but it was noticed that groups of three to five would appear at the same time, with the apparent intention of acting as a support to each other. It seemed to function very well.

The Future

It will be interesting to follow up the students from 1997-98 who are now due back after their year in practice. A questionnaire is planned to find out how many have been using CAD and to what extent. Even more interesting will be to see to what extent these students apply their skills to their design work in session 1999-2000. There is no formal teaching and no formal requirement to use CAD in that year. It will be entirely up to them.

References

Hewer, S and Mogey, N (eds) (1997) Case Studies, Implementing Learning Technology, Learning Technology Dissemination Initiative, Edinburgh

Laurillard, D (1993) Rethinking University Teaching, Routledge, London

Rowntree, D (1982) Educational Technology in Curriculum Development, Harper Education, London

Rowntree, D (1990) Teaching through Self-Instruction Kogan Page, London

Stoner, G (ed) (1996) Implementing Learning Technology, Learning Technology Dissemination Initiative, Edinburgh

Notes

[A] See Laurillard 1993
[B] See Sotner, 1996
[C] See Computer Aided Learning for Maths http://www.ma.hw.ac.uk/maths.html
[D] Slater, N in Hewer and Mogey 1997
[E] http://www.ltc.hw.ac.uk/ or Stoner 1996

Alison Murison
Edinburgh College of Art,
Heriot-Watt University.
a.murison@eca.ac.uk