

LabCAD: A CAD Laboratory for Undergraduate Students

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ABSTRACT

The LabCAD has been created as part of REENGE, a national programme to re-structure the Engineering Courses in Brazil. This programme is being sponsored by CNPq, a federal institute which promotes research in that country.

The main aim of the Lab is to provide a modern infrastructure for undergraduate disciplines related to drafting, CAD and Computer Graphics within the technological courses of PUC-Rio. This initiative has provoked a radical change in the manner in which the disciplines have to be taught, since the traditional teaching techniques are being substituted by microcomputers. This article presents the main changes caused by the lab creation.

INTRODUCTION

Until recently, the federal institutes that sponsor research in Brazil, such as CNPq, Capes, Finep etc, had used all their resources to graduate courses. It has been noted a gradual change in that situation with an increasing attention to undergraduate courses. As an example of this change is the REENGE, a programme, sponsored by CNPq and Capes, which aims to modernize the Brazilian engineering courses.

This article has the objective to describe the impacts, both positive and negative, brought by the LabCAD - CAD Laboratory for Undergraduate Students, which has been set up within REENGE and is being coordinated by the Department of Mechanical Engineering of PUC-Rio.

THE LABCAD

The aim of LabCAD is to provide a modern computational infrastructure to teach undergraduate disciplines that deal with Drafting, Computer Graphics, CAD, etc. In order to maintain the hardware and software of the Lab it is necessary a full time system

analyst. This person has been paid with REENGE resources.

The LabCAD general architecture may be seen in figure 1. It consists of a 200 MHz Pentium server and an IBM 486 66 MHz, for administrative purposes, a 166 MHz Pentium to the instructor and 17 150 MHz Pentiums and 20 IBM 486 66 MHz, to the students. The microcomputers are networked, running Windows NT software, with Internet access.

The University has allocated to the lab one of its biggest classrooms as a proof that a microcomputer lab for undergraduate courses is highly welcome. Since its inauguration, in March 1997, many departments are willing to make use of its facilities. It is clear for us that other labs are to come.

Among the many disciplines being taught in the lab, Technical Drafting, Mechanical Drafting, Introduction to Solid Modeling [1] and Computer Animation are the most benefited. Other disciplines, not related to CAD/Drafting, are also using the lab premises.

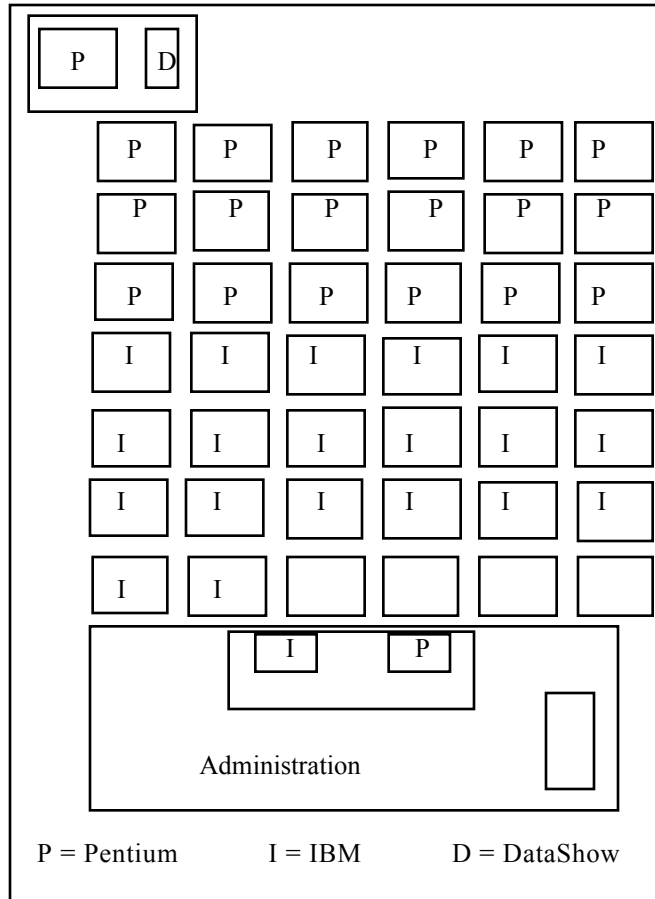


Figure 1 - Lay-out of LabCAD.

THE MAIN IMPACTS

Technical Drafting and Mechanical Drafting are currently occupying around 70% of the lab time and undoubtedly are the disciplines which underwent the biggest change in their syllabi and in the manner they are being taught.

As a first impact, the total number of students per class has to be reduced to match the number of available computers. Technical Drafting is a first term discipline, which has to be offered to around 500 freshmen. It substantially increases the number of classes, and thus the number of lecturers, for this discipline.

The usual drawing techniques had to be substituted by the use of computers and modern software. The lecturers had to attend training courses to adapt to this new situation and the discipline syllabus have been greatly modified.

AutoCAD [2], from Autodesk, is the software being utilized, since it is the most popular CAD software, both in the industry and in universities. It has been noticed that cleaner and more complex objects can be generated faster than when using the traditional

drawing techniques. An example of an AutoCAD object is illustrated in figure 2, which happens to be a first assessment from the Technical Drafting discipline. Around a quarter of the lectures are now devoted to teaching the software. It does not impact the amount of drawing techniques being taught since the use of the software, as said earlier, speeds up the learning time.

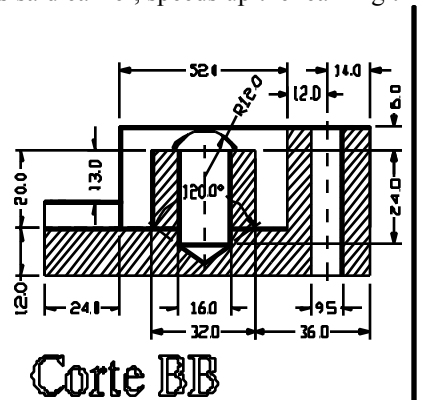


Figure 2 - A section of an object generated using AutoCAD.

Mechanical Drafting is a second term discipline which has Technical Drafting as pre-requisite. It assumes that the students already have the AutoCAD knowledge. Some students, however, attended the Technical Drafting discipline still in the traditional way and faced the Mechanical Drafting course already adapted to the use of the software. It caused a big impact since the lecturers had to spend some time teaching AutoCAD. We believe that this fact will happen in other linked disciplines.

The lecturer has to have in mind that the future engineer will need to know how to produce a hand made drawing and have to spend sometime practicing it. However, it is difficult to judge the amount of time that should be devoted to it.

More information about the modifications in the Technical and Mechanical Drafting syllabi may be seen in [3].

The major problem a microcomputer lab presents is concerned with the hardware and software maintenance and update. As already mentioned, it needs a full time system analyst to deal with it and a considerable amount of money has to be spent.

As we all know, it is not unusual to happen some hardware problems. This is a greater problem if it happens during an exam. The lecturer should be prepared to deal with such situations and the students should save their job from time to time in order to minimize the damage caused.

It is still not clear whether Internet access should be allowed in all classes. If in one hand it helps the student to explore the useful web information, on the other hand it could turn the student attention away from the main class subject.

CONCLUSION

It has been presented some of the experiences faced after the establishment of LabCAD, a CAD Laboratory for Undergraduate Students, at PUC-Rio.

The necessary money to set up a microcomputer lab usually comes from federal or private sponsors. The hard part, however is to maintain it. It is necessary to have a full time system analyst to keep the hardware and software in working conditions, to maintain them updated, to make periodic backups and any other minor problem that may happen during class hours. All the mentioned tasks involve some kind of expense which has to be included in the University budget.

It has been already noticed that the students get a higher motivation when they are in contact with computers during the lectures. They tend to pay more attention and to learn faster. It is clear that other labs

like LabCAD should gradually be set up. We believe that it has been a very successful initiative.

ACKNOWLEDGEMENTS

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REFERENCES

- [1] AutoCAD release 13, AutoDesk, 1995.
- [2] Macedo, O., *Aplicação de Programas Gráficos no Ensino de Desenho para Engenheiros*, Anais do XXV Congresso Brasileiro de Ensino de Engenharia, Salvador, outubro de 1997, volume 1, pp 391-401 (in Portuguese).
- [3] Tavares, G., *Software Multimidia*, Departamento de Matemática, 1997.