Assessing The Effectiveness of CAAD Education:
A value-added approach

Neander F. Silva, Ecilamar M. Lima

Faculdade de Arquitetura e Urbanismo,Universidade de Brasília, Brazil
http://www.unb.br/fau/pos_graduacao/especializacao/

Abstract. We have developed and implemented in our school a post-graduate CAAD course, over the last five years, which has been structured according to some problem-based learning features, with the emphasis falling on the needs of the design process involved rather than on software categories. The development and implementation of such curriculum has been described in our early work. We describe in this paper part of the process of assessing the effectiveness of such approach, particularly through the use of value-added methods.

Keywords. CAAD; Post-grad Education; Assessment; Value-added, Problem-based learning.

Introduction

Over the last five years, we have designed, implemented and consolidated a CAAD post-grad course at the School of Architecture and Urban Design of the University of Brasília, Brazil (Silva, 2001a, 2001b; Silva and Lima, 2002).

The design of the course's curriculum and its pedagogy have been driven by the preoccupation with adopting, at least in the major part of it, a flexible problem-based learning approach. We recognize that the task of defining such approach with precision is not an easy one, since there are different strands and the boundaries with other approaches are often blurred. However, we adopted a pragmatic point of view in the design and implementation of our CAAD course and just elected one of the PBL features as essential, that is, promoting learning in the context of simulating professional design tasks (Boud and Feletti, 1997:2; Maitland, 1997, Bridges, 1994).

Since its first edition, in 1998, the course's design has evolved considerably in the process of searching for a model that would result in the implementation of such essential feature. This process and the resulting curriculum model, a hybrid one, have been described in detail in our previous publications on the subject (Silva, 2001a, 2001b; Silva and Lima, 2002). In this paper we will concentrate on the assessment of the effectiveness of such approach.

Assessment precedents

In the sessions of 1998-1999 and 2000-2001, we adopted, in the CAAD Post-grad course, an assessment method based solely on surveys of students opinion. These have been in use at our University, for practical, cultural and political reasons, both at undergraduate as well as at graduate level, for a number of years. Peer review was planned to be used at a later stage of our project.

It soon became evident the limitations of such students surveys. The grading system which mostly required the students to grade certain aspects of teachers performance purely based on subjective scales, the students limitations derived from their rule in learning process, their misunderstanding of the purposes of the survey and the difficulty in verifying the collected data, render

this method very unreliable.

A value-added approach of assessment

In the session of 2001-2002 we adopted and implemented a method for assessing the performance of the learning approach that was based on value-added (Fitz-Gibbon, 1996; Cave et all, 1997).

The students learning was monitored through three exams that were based on the same criteria. A comprehensive written exam was applied at the outset of the course, at the end of the first term, and at the end of the second term. The period of time between the first exam and the second was composed mostly by a part of the course that adopts a fairly traditional curriculum structure and by the very beginning of its fully PBL oriented stage. Therefore, it is fair to assume that the period between Exam 1 and Exam 2 is mostly traditional, whist the period between Exam 2 and Exam 3 is fully PBL driven. The data collected from these exams was consolidated according to the scope of progress: overall, general computing, computer graphics, multimedia e web design, artificial intelligence and design methods with computing. A sample of 9 students was used for the data consolidation. We recognize that is a small sample and that further research with larger samples must be carried out. However, given the characteristics of a post-grad course, with a small demand if compared with those of undergraduate courses, we thought it would be fair to start with the data we have right now. Figure 1 bellow illustrates a comparison of the individual progress of the students in the sample which shows a reasonably clear trend upwards.

Figure 1. Comparison of the overall individual progress of students

Figure 2 bellow shows the students individual progress in the subject area of general computing that included: fundamentals of computing, hardware and software. Again, a reasonably clear trend upwards is show though not as steep as the previous graph.

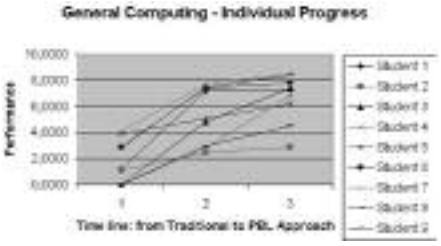

Figure 2. Comparison of the individual progress of students in general computing subject

Figure 3 bellow shows the students individual progress in the subject area of computer graphics that included: fundamentals, images, drafting, modeling, rendering and animation. Once more, a reasonably clear trend upwards is show.

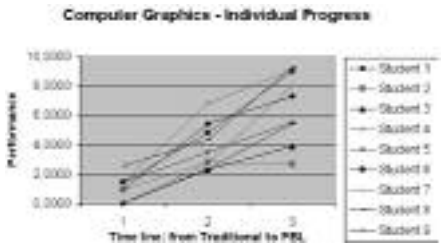

Figure 3. Comparison of the individual progress of students in computer graphics subject

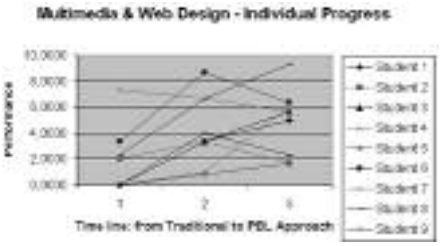

Figure 4. Comparison of the individual progress of students in multimedia and web design subject

Figure 4 bellow shows the students individual progress in the subject area of multimedia and web design. In this case a clear trend is not very visible. This might be explained by the fact this subject has not played a central part in our course and therefore needs a better treatment.

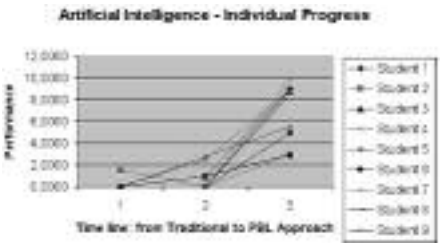

Figure 5. Comparison of the individual progress of students in artificial intelligence subject

Figure 5 bellow shows the students individual progress in the subject area of artificial intelligence. Once more, a reasonably clear trend upwards is show particularly in the second half of the course. We believe that this is a consequence of the emphasis we have given to the subject at the end of the course.

Figure 6 bellow shows the students individual progress in their understanding of the potential and implications of using computers in the architectural design process and product. Once more, a trend upwards is blurred by the presence of outliers represented by two students that actually failed some tests.

Figure 6. Comparison of the individual progress of students in their understanding of design methods with computing, its potential and implications

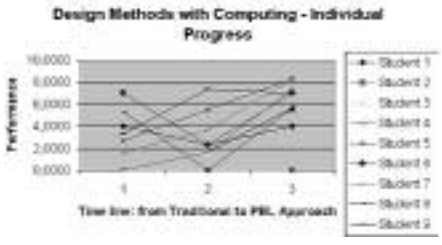

Figure 7 bellow shows, however, that the students average progress in their understanding of the potential and implications of using computers in the architectural design process and product was significantly greater during the full PBL oriented period of the course. This observation is very important in the process of validating the model of structuring the curriculum and promoting learning.

Figure 7. Average progress of students in their understanding of design methods with computing, its potential and implications

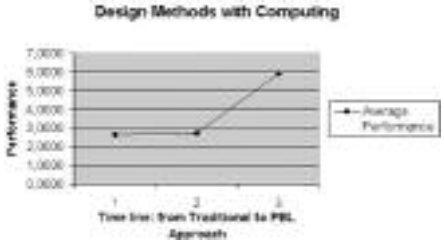

Figure 8. Comparison of the consolidate averages of students progress in each subject area

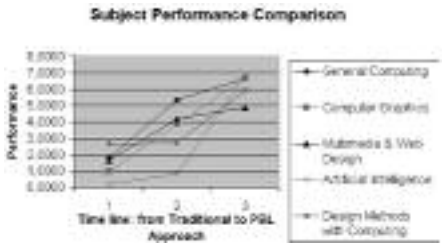

Figure 8 bellow shows a comparison of the students average progress in each of the above subjects. A clear trend upwards is noticeable.

Conclusions

We do recognize that much needs to be done. The exams, as they were implemented measure mostly knowledge. There is a need of developing similar assessment tools to measure also skills and we are working on it. We also recognize that the subject areas of assessment mentioned above are, in most cases, based on computing issues rather than on design issues. This problem also needs to be tackled in order to have greater coherence with the course's overall approach itself.

Finally, the statistical analysis also needs further work to include greater samples of students and to involve more sophisticated methods.

The results, however, are promising as shown above, with students showing, throughout the process, a substantial relative progress, even in the case of those considered to be of poorer performance. It was of our particular interest the students progress in their understanding of the computer's potential in enhancing the design process and product. It was also interesting to notice the students progress in their perception and capability of modifying their previous ways of designing in order to better take advantage of that computer's potential.

References

Boud, D. and Feletti, G. (ed.): 1997, The Challenge of Problem-Based Learning, Kogan Page Ltd, London, UK.

Brigdes, A.: 1992, Computing and Problem Based Learning at Delft University of Technology Faculty of Architecture, in Maver, T. and Petric, J. (eds.) The Virtual Studio, proceedings of the eCAADe 1994, University of Strathclyde, Glasgow, UK.

Cave, M., Hanney, S., Henkel, M., and Kogan, M..: 1997, The Use of Performance Indicators in Higher Education, Jessica Kingsley Publishers, London, UK.

Maitland, B.: 1997, Problem-based Learning for Architecture and Construction Management, in Boud, D. and Feletti, G. (eds.) The Challenge of Problem-Based Learning, Kogan Page Ltd, London, UK.

Silva, N.: 2001, Design Computing Education: Developing a Post-Grad CAAD Curriculum Based on Specific Design Project, in Gero, John; Chase, Scott; and Rosenman, Mike (eds.), 6th International Conference on Computer-Aided Architectural Design Research in Asia, CAADRIA 2001, Key Centre for Design Computing and Cognition, University of Sydney, Austrália, pp. 315-318.

Silva, N.: 2001, The Structure of a CAAD Curriculum and the Nature of Design Process - An Experience Handling Contradictions, in Penttilä, Hannu (ed.) Architectural Information Management, 19th International Conference on Education in Computer-Aided Architectural Design in Europe, eCAADe 2001, Helsinki University of Technology, Finland, pp. 352-357.

Silva, N., Lima, E.: 2002, Simulating the Design Process in a Problem-Based Learning Curriculum: the evolution and assessment of an experiment in teaching design computing, in ANZASCA 2002 Architectural Education: from pedagogy to androgogy, Deakin University, Geelong, Australia, v. 2.