**ABSTRACT**

This paper is the result of a research project that began in 2007 – 2008 in the Faculty of Architecture of Porto University (FAUP), which had as aim to adopt a blended learning approach integrating the Centre for Spatial Communication and Representation (CCRE) (http://web.ccre.arq.up.pt) for teaching CAAD to students of Architecture Graduation course in the 3rd year. The objective is first to evaluate critically how the use of the collaborative platform CCRE worked as a catalyst for engaging the students with their own learning process and for approaching the students and teachers.

Second, to understand how this technology has helped to create a new teacher/student interaction, making communication much easier and giving to the students a more active role in the learning process. The paper begins with a short introduction of the program and pedagogical strategy in CAAD and then describes the strategy and model applied in the case study for teaching, referring also the type of digital material and learning tools that were used. Finally, the most significant results for each case study are discussed and a set of conclusions will be drawn in the light of last case study.

The results, besides other things, highlight how the learning process that rises from the creative use of an open collaborative platform as CCRE and facebook with a blended learning approach strengthens the teacher’s capacity to work as a team and helps to open the university to its city and people.

**Introduction**

The CAAD course in FAUP (3rd year), which takes place in a collaborative environment where the interchange of ideas and the students’ communication projects are considered key factors for obtaining an efficient learning environment, has been using and exploring since 2007, within a blended learning approach, several collaborative and educational platforms – WebCT, Moodle and CCRE\(^1\) – as well as other type of applications and social-network software – Facebook and Google Groups / Google Docs –, with the aim of facilitating the creation of a collaborative architectural design studio atmosphere.

In the first semester the students start to work on a design exercise that has as program a Learning Centre as will be described in more detail more ahead. During the first stage of the design exercise they are guided to focus on the principles of geometric composition in both 2D and 3D space and to explore diverse architectural ideas using intuitive modelling software. The objective is to make students develop an architectural design project using, simultaneously, CAAD technologies along with traditional design methods for representing, exploring and communicating architectural spaces and forms. In this way we want to achieve a balanced use of digital and analogue tools within the architectural design process.

In the proposal for an exercise of a Learning Centre design students are challenged to create a new dynamic learning space that integrates social and study activities and may constitute a strategic relational dimension for all

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\(^1\) CCRE is an open project that aims to hold the interest of different people and research coming from various institutions and fields of study. The work is focused on using Digital Media Technologies on the web for collaborative work and for communicating public spaces, as well as any proposed design for them. Its website constitutes the main medium where all these different collaborative studies take place. We have been exploring the potential of this platform for learning in Architecture and want to extend it to Art and Design courses.
the academic people. Its an pioneering architectural program and its innovative spatial configuration will encourage several forms of group interaction, for both socialising and studying activities, thus promoting the interdisciplinary exchange of knowledge and experience. Some key ideas for this design program include: anticipation, imagination and versatility of functions, learning communities and other related concepts. Another key aspect of this design of a new Learning Centre is the integration of digital artefacts in its spaces, which will encourage communication, socialisation and students interaction. The program of an Learning Centre and set of interactive artefacts has as support the idea that technology has revolutionised our perception of space and of ourselves, assuming a central role in how we understand and relate with the world around us (McCullough, 2004; Bullivant, 2005).

The program and pedagogical strategy in CAAD has also the important objective of guiding students to the use of CAAD software as a design tool able to complement, in a balanced way, other design instruments and working methods that they have learned and developed in previous years: the efficient articulation between conceptual and exploratory sketching and geometric design.

Within this context, it was no surprise that several collaborative and educational platforms, as well as other types of applications and social-net-work software, were used, since it was important to adopt a set of teaching methods and communication techniques and to explore and work with software that allowed the courses to evolve in a collaborative architectural design studio atmosphere. This meant using an approach that allowed students to be active participants in the learning process, which is best suited for design course studio work, which is an idea supported by many authors (Shao 1997; Broadfoot 2003; Salman 2008) that acknowledge the learning, reflection and change theory of Donald Schon (Schon 1988) and take advantage of the Web 2.0 potentialities for collaborative work. This had as result, besides other things, the creation of a learning environment that encouraged students to exchange ideas and that made them adopt an active role in the learning process.

It can be seen in our course how computer is the medium through which architectural representations can become connected to collaborative networks, allowing different levels of interaction. In fact, we’ve adopted free of charge and friendly CAAD software for the earlier conceptual stages of the design process, allowing students to integrate sketching, modelling and image synthesis throughout all the design stages. The collaborative networks have allowed the flow and interchange of the diverse information within this process, thus we have been using WebCT and CCRE, in earlier years, and, at the present, Moodle and Facebook, the on-line sharing and discussion platform, as well as Google Groups and Google Docs sharing capabilities. We believe that in this way we are answering positively to the need for a global change of our past teaching/learning processes in Design Studio work (Penttilä 2003), which was more based on a memory centred technology and culture. The objective here is to embrace the new processing and collaborative potential of computers for Design Studio intelligence, knowledge and collaborative work.

It is significant to refer that it was much important for us to test a set of collaborative and educational software and examine the results obtained in the light of our RD&T project ARC+D (http://ARC+D.pontopr.com). This is so because this RD&T project aims, on the one hand, to create a set of computer interactive visual applications through Internet that allow structuring, representing, and promoting architecture, city spaces and design. Thus, on the other hand, to offer a platform focused on collaborative design projects for E-Learning and for team work in professional architectural and engineering offices allowing the use of different types of image, sound and spatial or architectural models that can be interrelated in several ways and linked to alpha-numeric data.

In our specific case of 3rd Year CAAD course, the interest was to gain critical information in relation to the potential use of the collaborative ARC+D software on an E-Learning platform such as Moodle to support a blended learning approach for teaching in Architecture and Arts courses. For this to happen, all the studies and experience obtained until now, coupled with a critical review on all significant collaborative platforms that could be used in architectural and art courses, were analysed with the aim of better understanding and pinpointing the set of interactive computer visualisation operators that would interest most for design collaborative group work and communication. This means functional operators that allow to create a user-friendly collaborative and interactive platform in Internet focused on the use of digital representation methods, visualisation techniques and interactive digital models for E-Learning and blended learning courses related to Architecture and Art.
Objectives

The global objective, as can be inferred in the former introduction, was to explore and test the collaborative applications and social network software to complement the use of Moodle for supporting design studio courses related to Architecture and Arts. We wanted in this way to open our University to society, approaching the students and teachers towards the emergent problems of their city and to encourage a new way of teaching, easing the process of creating a community of inquiry. Our objectives were to:

- Encourage critical awareness and make students question the use of different representation methods – digital and non-digital;
- Allow the exchange of ideas and provide significant autonomy for students to develop their empirical work, encouraging the additional contact of students with teachers beyond classes;
- Facilitate the publishing of stimulating didactic material, the exchange of ideas and interactive tasks;
- Facilitate the access to different types of information with some interactive capabilities.

Strategy and Model

The pedagogical strategy and adopted methodology have as fundamental pillars, as was already mentioned, the learning process of design studio work that takes advantage of the Web 2.0 potentialities for collaborative work. This means encouraging and facilitating the communication and exchange of ideas between teacher and students; making possible for students to have an active role in the whole pedagogical process. In this way, their interest for the course’s content is sharpened, group work and interaction are promoted and their autonomy and responsibility towards developing and finalising their empirical work is strengthened.

Accordingly, in a first stage, the aspects related with the structure and function of the CAAD course – objectives, methodology, program, bibliography and online course library – were described to the students. Some tutoring was given to them on how to use the software and applications related with the collaborative work and communication as WebCT, CCRE and Moodle platforms. The sequential hierarchy structure of some of the course’s content, as well as other type of information, were accessible online through several links and it was explained how the students should upload, download and manipulate their communication projects and visual narratives in these software and also in Facebook and ISSUU web applications.

In this way the students were led to use the collaborative platform for accessing the didactic materials and theoretical content of the course, which facilitated the linking of all those different but integrated domains. We were also leading students to adopt an active role in the learning process i.e. exploring various types of information placed collaborative considered information for the given exercises.
Structuring of content: some of the specific uses of digital platforms and Facebook

As was already explained, the potential of the Faculty’s internal network and the Internet for students to communicate and share information was an integral part of how the course was taught and of how the design empirical work was developed. An important objective to reach, also implied in the adopted pedagogical strategy for practical classes, was to guide students in developing simultaneously design projects with an individual and collective authorship. All this was made possible and reinforced mainly by the balanced and inter-related use of the CCRE platform, Moodle and Facebook. In fact, it was important to know if the combined use of CCRE, Moodle and Facebook platforms had, in fact, influenced positively the students learning process and if they had a positive opinion about its use in classes. As will be seen next, different types of digital material in diverse platforms were employed to support theoretical and practical classes.

The Moodle platform was mainly used as a repository of information, as had happened in previous years and it proved capable of storing diverse information and multimedia resources. This means it was used to maintain a database of relevant information for the practical classes, having kept a structured set of information on several key theoretical and practical contents of the course. Being more specific, it is important to say that even though the relationship between calendars, announcements and resources proved to work, it revealed itself a very time consuming and repetitive process for the teachers needs. Automatic notifications were “non-existent”, it was unable to handle large files and the students did not thought of it as a very intuitive platform. Then, it was unable to produce significant visual environments, comments and annotations synchronously or asynchronously. Finally, we obtained some interesting results from testing the Moodle platform for an intermediate exercise that consisted on the development of a small design project integrated in the global project and its completion at a certain date. This was so because, on one hand, it made the groups adhere and comply enthusiastically to this intermediate
exercise and its completion, since they placed and used the Moodle platform with diverse content that they produced and that they considered essential for the significant discussion of the design exercise that took place. On the other hand, it proved that students adopted the collaborative platforms in periods outside the classroom, as well as explored both Moodle and Facebook simultaneously. Finally, even though the logic of how information was structured in Moodle seemed to be clear, the use of various kinds of resources - Questionnaires / Feedback with Resources, Design work, Forums, etc. - caused some difficulty to students for perceiving the organization of information and of how they should submit it. On the other hand, it proved that students adopted the collaborative platforms in periods outside the classroom, as well as explored both Moodle and Facebook simultaneously.

A different functionality, which is also of great importance, was the creation of an online content library and for this the operator Links in CCRE, with the possibility of using it also through Moodle, was utilised, allowing students to research content pages and sites related with the course as well as other information and links.

The Facebook social network, which is a very comprehensive and popular application that offers powerful and intuitive operators for communication and allows for the intuitive publishing of much multimedia content, was used for the first time. The enthusiastic adoption of Facebook by the students was clear: in three months, about 85 publications were placed in groups I and II of CAAD Facebook. Different levels of interaction and communication were recorded between students, teachers and other faculty members. Most of them were formal and related to the CAAD program, but there was also much informal interactions, which had the important function of “breaking the ice” between students and teachers.

In fact, the use of Facebook proved to be very positive since, in no time, the students got involved in various discussions related to the course. There were, however, some limitations in regard to its capacity for structuring information related to design and architecture, which lead us to the use of ISSUU.
The use of both the social network Facebook and ISSUU publishing platform has allowed the publication of diverse multimedia content, links, design project works, screenshots, videos, help tutorials, chat communications between teacher and students, and the communication of images that revealed, for example, a fundamental change in the design project, allowing the teachers feedback still in time before the completion of the work. As a matter of fact, the ISSUU and Vimeo have also revealed themselves interesting, intuitive and appealing applications for creating diverse publications and digital portfolios and were embedded in Moodle and Facebook CAAD group, showing how these platforms are becoming interconnected.

The results form an inquiring where students were challenged to answer about their own experience with Moodle and Facebook platforms for the CAAD course it's clear that Facebook is the preferred platform. In student's opinion the Facebook strengths for assist Architectural courses are: as a tool for being informed about all the CAAD news (assignments, bibliography, relevant information about architecture and CAAD softwares), ss communication tool for clarifying doubts about CAAD and other courses in fast and easy way and be able to see and try to help each other on their difficulties.

Almost students refer no weakness in Facebook to assist architectural courses (98%) and others (2%) indicated the impossibility for store files.
Conclusions

As can be inferred by our brief explanation of ARC+D project in the Introduction, this collaborative platform, more specifically its module for teaching and E-Learning, is trying to fill the gap that software as, for example, Moodle LMS show in relation to the particular markets of Architecture and Arts. We believe that we can answer this quest by providing an enriched collaborative workspace where students and teachers can work on the communication of architectural and art designs by means of different layouts, allowing for several types of content and image/video/audio formats and integrating it with already established operators on the market such as Moodle. We also intend to integrate this specific ARC+D module with the other in-development modules (that cover the markets of professional architecture design, architectural competitions, and communication of city spaces, events and culture) thus reinforcing the intent to create a diverse but connected community – we cannot forget that the students of today will be the professionals of tomorrow, some still related with the academic world, and that – healthy – competition is present in both worlds. As we have already explained, ARC+D is still under development, thus we are using, for the meantime, other collaborative platforms, and this experience, in a real learning scenario, has provided to be highly informative for the product that we are developing, as will be seen next.

In global terms, the results of the students’ work that we have obtained were very encouraging and show higher quality than in the previous year, which can be explained by:

1. The good momentum established between the teacher and students group, which may have been a decisive factor for an increased involvement of all the work of the discipline; the particular student’s profile can also explain a better involvement this year;
2. The particular morphology of the design location, which allowed for a more differentiated and “free” intervention than last year’s;
3. The return to the usage of Sketchup as a working tool, which enabled a digital exploration of the models in a more intuitive and free way.

As in the previous year, in this year, it was also clear that the new generation knows well and is familiarised with technology and that the learning process through collaborative platforms as Moodle, CCRE and Facebook, when
used efficiently, strengthens our capacities for working as a team and functions as a real catalyst for a new relation and interaction teacher/student(s). All this has showed, besides other things, that it is possible to adopt with success a blended learning approach in a Design Studio Work with these technologies, having the objective of creating a significant community of inquiry, not forgetting the importance of face to face interaction of students and teachers (Broadfoot 2003).

It was possible, through the use of a combined use of platforms (Moodle, Facebook, ISSUU, Vimeo), to develop a learning strategy that (a) facilitated the learning process (b) motivated the students to work (c) promoted communication and interaction between students and teachers. In fact, after analysing the results and the experiences taken in earlier years with use of collaborative platforms in the CAAD course, it is possible to forward the following ideas and conclusions:

• an online structure was created that allowed students to have a greater autonomy, flexibility and responsibility in the learning process: they played a new active role in this process;

• the results also support this thought: the majority of students said that consulting and accessing the didactic material of the course was encouraged by the use of the Moodle and Facebook and that its structure and interactive possibilities helped them learning;

• the use of the digital platforms in CAAD course also helped to achieve a significant blend between the learning objectives and the pedagogical methods.

Then, trying to identify some conclusions related with a few of the applications and collaborative platforms that were used until now, we can start by saying that the most significant of them was Facebook. This has been so because of the new dynamic that it has created between students and teachers and for the significant functioning of the discipline that it has encouraged. Its qualities of speed, proximity, enthusiasm, exchange of ideas, potential for answering questions by teachers or students, for the publication of various multimedia, links, student work, publishing possibilities and videos are really powerful and surprising. To ask questions about procedures through the exchange of software screenshots, to use chat communication between teacher and students, publishing images and other functionalities have proven to make a fundamental change on how students and teachers can relate and enormously potentiate the design studio environment. Some disadvantages about Facebook that students pointed out were the fact that not all of them had an account on that social network, although the vast majority had. Some students also had some privacy concerns but their number was rather small. Thus, while Moodle LMS was used to promote some communication between students and teachers, specially with the use of forum questions and questionnaires / feedback and it was generally felt that Moodle did not present itself as the most intuitive and appealing platform for our students. In fact, it showed some significant weaknesses by a certain lack of flexibility of these operators. Nevertheless, I has proved itself as a valid platform for working as an important repository of information, storing diverse information and multimedia resources. To sum up, Facebook printed a new dynamic to the whole learning process and functioning of the discipline - speed, proximity, enthusiasm, and exchange ideas, answer questions by teachers but also by the students themselves and served, as expected, as an important case study and as a significant complement to the institutional platform of Moodle.

Taking into account the experience of earlier years by the use of CCRE platform and in this year the combined use of Moodle, Facebook, ISSUU, Vimeo, it is also relevant to point out that these new applications were explored and analysed critically having in mind the scientific and pedagogical objectives of the course and not the other way around. This assured no falling into a kind of technological tyranny in this CAAD course and that it was possible to give important steps in order to develop a community of inquiry in a Design Studio atmosphere within a blended learning. This meant, besides other things:

• encouraging and facilitating communication and exchange of ideas between students and teachers through the platform and in classes;

• making it possible for the student to have an active role in the learning process, encouraging them to develop group projects and to debate ideas;

• monitoring the communication projects, helping to integrate in a critical way the technical component and the artistic and the practice with the theory: analysing critically the works with students,
analysing the best ways to use the software tools for achieving the objectives of each communication exercise.

It is intended during the next school year to promote the use of Google Groups in order to solve the problem of connecting Moodle with the personal e-mails of students/teachers and to provide a more effective forum for discussion: for that, it is intended to collect, at the beginning of the school year, the personal email addresses of the students, create a google group based on them, explain its basic operations; messages can be easily exchanged between all of the group members by email, as well as opening and responding to created topics, and at the same time the conversations will be automatically structured in the Google’s forum. Facebook will be used for its interactivity and communication tool between teachers and students, while Moodle will handle the classes more formal contents and documents, as it serves well as a repository of information. The existing Facebook group will remain active, allowing former students to still keep in touch with the teachers.

It seems clear that the pedagogical model behind the subject matter of the CAAD course and the learning modes adopted are more linked to the idea of making students an active part of that process and on strategies to foster student-to-student and student-to-teacher interaction within a blended learning approach. This means that the learning process efficiency is also the result of the rich cognitive and emotional context created and that quantified tests and evaluation scales should also reflect this richness: the result of an interactive process between students and teachers.

In fact, there was a significant concern in trying to explore and use an interactive learning process focused on the groups, encouraging critical analysis and feedback and leading students to gain autonomy and play an active role in the learning process. All this is not new because CAAD and Design teaching in many institutions show us that computers can and must be used as means of expression and not as ends by themselves (Schon 1988; Shao 1997; Engeli 2001; Rudd 2006; Salman 2008). It can also be seen how the creative work is enriched if the right conditions for communication and interaction between the main players of the learning process – students and teachers – are achieved (Neuckermans 1999).

Thus we believe that our teaching context reflects an attitude in which process is as important as outcome. It promotes a heuristic design process based in approximation to solution, following a non standard path based on intuition, participation, permanent interrogation and intelligent processing featuring knowledge birth. Rather than a tool, integrated in networks, a CAAD course can be a creative environment pointing to collaborative design, promoting multi and inter-disciplinarity, stimulating the raise and exchange of ideas, increasing the autonomy and responsibility of the student in the learning process, setting CAAD as a heuristic learning approach itself . This means a heuristic learning approach that supports a heuristic design research.

The University of Porto is currently upgrading the Moodle U. Porto introducing a host of new features and new concepts of use, giving an overall improvement over previous versions of the platform: community hubs, repository support, portfolio support, conditional activities, improvements to existing core features like backup and restore, blogs, messaging, My Moodle page, Modules where is now export their data to external systems, (particularly useful for portfolios where snapshots of forums), new blocks (Comments block), my private files. In addition to new features, Moodle U.PORTO 2 also presents a series of custom, of which we highlight the new layout, the integration of Turnitin tool for detection of originality in academic work and a new mobile interface for moodle. The layout aims to provide the user U.PORTO easier use and intuitive platform.

http://docs.moodle.org/dev/Moodle_2.0_release_notes#Major_new_features
Another innovative platform to support U.Porto academic every day life is the eCUP.Mobile that was designed to facilitate access to information on U.Porto constituting an application that encapsulates the dispersed information about different sites of the University of Porto. This application facilitate access to information about events the University of Porto, as well as maps of fields and locations of the various Units, or canteens University Residences. eCUP.Mobile is an additional tool linked to Moodle that aims to connect students with the University, enhancing the online presence of the University of Porto.

To finalize, it can be said that all the significant characteristics that have been structured and pointed out in this paper have been informing the module for teaching and E-Learning for Architecture and Arts of our RD&T project ARC+D where U. Porto participate. Our intent is to propose, in a near future, a set of software operators committed with the specificity of teaching and learning in Architectural and design courses. It is intended that those operators may be integrated with already established platforms in the market, such as Moodle, allowing the
creation of an enriched collaborative workspace where students and teachers can work within a design studio environment.

References