Is there a place for CAAD ‘upstream’?

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We are especially interested in the use of Computer Aided Architectural design during the initial stages of the design process. We are looking for the added value of CAAD for architecture. Within this context we will give the main ideas behind the educational system of the Institute and we will describe the place of CAAD in the curriculum. We will also describe the global concept of the project AVOCAAD (Added Value of Computer Aided Architectural Design).

1. Introduction

As part of it’s general policy, the Institute of Architecture Sint-Lucas is during courses and projects especially concentrating on the expression of architectural ideas and concepts. To encourage students constantly to improve and explore this expression, the Institute strives to create a specific educational environment: a spirit of investigation in thinking and handling, a spirit of openness and tolerance; a sustained effort to look for critical insight and openings to new horizons. It is clear this gives a maximal potential to creativity. Hence, one of the main questions related to computers and architecture is: how can we stimulate the creative use of CAAD as much as possible?

Related courses at our Institute are grouped together in clusters. One of these is called ‘presentation techniques’. The main goal of the courses in this cluster is to teach the necessary techniques to present and communicate forms and ideas. Additionally, we try to create a maximal insight in space. Techniques as sketching, projection techniques, Computer Aided Architectural Design, video, … are grouped together in this cluster. We try to learn the students the advantages and drawbacks of the different media and help them to choose the medium which is most appropriate for particular situations or problems.

It is unreasonable to expect that every student should become an expert in every possible medium. E.g. some will consider the computer as a nice tool to improve efficiency or to create better architecture, while others will be unable to comprehend or even accept the possibilities offered by CAAD. For these students, our Institute provides basic obligatory computer and CAAD literacy which gives them basic background for future needs. The same is true for the other techniques. After their basic education in the different techniques, students can choose to study one technique more in-depth.

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The CAAD courses at our Institute only start in the second year. Due to the large number of first year students and the limited number of equipment and teachers, it is for the moment impossible to start CAAD education in the first year. We are not interested in teaching computer skills but hope to prepare the students for the future evolution of computer media, giving them a general perception of the possibilities of the use of the computer and make them think about the potential of added value of CAAD for architecture and architectural communication. Therefore it is essential for us to use the 3D computer space during teaching. During discussions we always try to stimulate thinking about the added value of the use of computers for architecture. From the fourth year on, CAAD is integrated in the design studio. Normally, the design studio teachers and the CAAD teachers, combine teaching with a architectural practice. The exchange of ideas between the Institute and the design office is of fundamental interest.

2. Current Curriculum

Basic CAAD education starts in the second year and continues in the third year (of a total of five years). The education consists of formal teaching (in an auditorium for large groups) alternated with exercise sessions (in small groups). Students are free to use the equipment during the normal opening hours to continue the exercises. According to a fixed schedule, a software-trainer is present to help and to solve problems.
During the fourth and the fifth year, there is no formal CAAD-teaching anymore. Students have to make one mandatory exercise which is normally related to their studio work. In this way the Institute hopes to stimulate the use of CAAD in the design studio, the main component of architectural education. During the year, students will also be invited to follow several lectures related to CAAD. In this way we hope to continue to stimulate the critical analysis about the possibilities, actual evolution and future of the use of computers in architecture.

We opted to use a CAAD-software-package which forces the student to work in 3D from the first action on. Architecture is going on in space, not on a flat drawing table. A 3D model is therefore much closer to the thinking of the architect and to the real build environment. By using a 3D-model, students - the later architects - are forced to think three-dimensional and to solve the problems related to this third dimension. This is essential for their later practice. After defining the 3D-model in all its aspects, other documents like, plans, sections, perspectives and all other needed drawings are computed out of the 3D model. After a first 3D model is created, all possible changes and actions can be taken in order to change the design and let it evolve.

The higher difficulty for manipulating 3D-models is in great extend solved by an adapted software package and a specific and evolutionary curriculum. The first lesson in the second year for instance gives the necessary information to start creating and viewing two intersecting cubes in space (see appendix 1). This viewing and working in computer space, enhances the students insight and experience in real 3D space. They are not creating faces in computer space, but immediately start working with ‘real’ 3D objects (walls, …), which they later on manipulate and change.

For only few students this causes some troubles. The main difficulty with building 3D models in computer space, comes from the operations necessary to create all needed 2D drawings. Only after several examples and some exercises the way of working becomes clear.
In the beginning of the third year, students have to create a piece of furniture in 3D computer space. During this exercise they encounter most of the problems they will encounter when designing a building, but on a smaller scale. In this way the necessary experience will be gained in order to use the computer for larger designing problems, later on.

We are convinced it is in the long term, more important to learn the students and future architects to think about the use of the computer and other media in architecture, and, having the current possibilities in mind, to make them explore new ways to communicate the concept of the design in an appropriate way.

Although there is some relation between the used software and the education of students in CAAD, we try to minimise the impact of a specific software on the educational content. Every exercise requires a certain technical understanding of the software used. However, during the exercises we always try to concentrate of the fundamental understanding and working of CAAD and also try to develop the spatial insight of the students.

The examination of CAAD and of the cluster ‘presentation techniques’ takes place on the day immediately after the lessons and before the normal examination period. The reason is, we hope to reduce stress for these more practical parts of the curriculum for which experience and understanding is very important. Students have to make a ‘synthesis exercise’. This mean that they are posed some spatial problem (e.g. put a cube in a certain room) which they have to solve with the different techniques (CAAD, sketching, projection techniques, …). In this way students need to show their experience and insight in the possibilities, advantages and drawbacks of the different media. At a certain moment, they even have to choose between the two media which fit them the most.

Moreover, since last year, we try to stimulate the use of computers outside our normal CAAD-courses, i.e. we encourage the use of CAAD during projects in the design studio and construction and analysis courses. In this way we hope to realise a maximal integration of CAAD in the curriculum.
3. AVOCAAD

Out of our concern to look for the Added Value of Computer Aided Architectural Design and to try using the computer ‘upstream’ (i.e. during the initial phases of the design process), grew spontaneously a group of people with different backgrounds thinking and working around these topics. The formal project AVOCAAD is for the moment starting up and we strive to create a forum to have these topics discussed from an academic point of view as well as through the glasses of professional designers in practice. In this way we hope to combine practical experience and new academic insights.

The project AVOCAAD (see appendix 2) aims, in a first phase, to develop new training methods, new course contents and new training materials out of the previous mentioned discussion and interaction between the academic and professional fields. The material needs to underline the added value of CAAD in architecture and in the curriculum. For the moment we are extending our contacts and students are doing practical training in design offices. After this period we will start developing course material, which will be developed in such a way it will also be possible to use it in design offices. As ‘Life Long Learning’ and ‘Education in Practice’ are two important parts of the European Community policy, we believe there is a gap in the field of CAAD to be filled in. More information is available on request.

4. Conclusions

In general, we believe we do not need to teach our students practical and technical skills. On the contrary, we think we have to stimulate them to develop a general and critical perception of the benefits of the use of computers within the architectural practice and especially during the design process. Students have to be prepared for the future evolution of the new technologies. Moreover, involving their design project from the design studio enhances their motivation and gives the opportunity for the CAAD group to become some sort of catalyst for different research projects.

5. References


Verbeke J., Nys K., Verleye J. (1996) AVOCAAD Newsletter 1, Brussels
6. Appendix 1: BASIC OBJECTS AND TOOLS to CREATE a 3D-MODEL

*Extract from BASIC COURSE 2e year*

6.1 Introduction

As we described above, conceptual and architectural work is mainly oriented 3-dimensional. Therefore, we opt to use immediately a 3D-environment from the first CAAD-course on. The software used is a building oriented solid modeller, with the parallelepiped as basic primitive. On the following pages, you can find the description of an exercise to introduce students to the 3D computer space. It is in fact their first CAAD-exercise.

During this exercise, students learn about basics of CAAD-packages, like layers, objects-attributes, solids, primitives, grids, … . But of far more importance, by practising in this way students also learn about composition in space, about representing solid objects, about the 3D-environment, … .

6.2 Creating the first elements

By mean of creating a very simple object we will explore the possibilities of the 3D-environment and learn about the basic-objects. These basic-objects are 3D-elements, like walls and openings, and the 2D-elements, like lines, circles, segments, surfaces, texts, dimensioning, etceteras. We need all of these objects to define a building, a piece of furniture, a urban project, … .

To be able to place and to manipulate these basic-objects properly in space the user has a range of tools at his disposition. These tools permit for example to filter the visualised information on screen, to define a reference level, a camera and a target for perspective viewpoints, the composition of the screen, the accuracy, etceteras.

The object that we will build step by step is a piece of furniture that is basically composed by two cubes partial grabbing in each other.
6.3 Creating the first objects

The basic primitives are two cubes. They are both identical, but constructed by other commands. The cubes are shifted slightly relatively to one another and form the base for the composition.

The cubes are themselves composed of different graphical objects, in this case 6 surrounding walls.

6.4 Computing Intersections

In both cubes the intersecting parts are being removed as to obtain two "open" cubes.

6.5 New compositions

This basic composition is repeated several times in spaces, using general commands like rotation and moving commands.

This simple exercise introduces students maximally. They learn about the virtual architectural space as well as get acquainted with the software environment.

The exercise is continued afterwards in a less strict way. Students can experiment freely with other commands to add irregular forms as to explore the virtual computer space maximally during their first contact with the software environment.
7. Appendix 2: AVOCADA project description

Normally, a long and tedious design process proceeds the realisation of an architectural object. During this design process, the initial ideas and concepts of the architect crystallise out in a realisable form.

The recent new technologies, the availability of computers and software which become cheaper and more user friendly, imply that (even small and medium) design offices start using CAAD (Computer Aided Architectural Design). This has an important impact on the design process which is currently under major change. CAAD offers a lot of new possibilities and there is an increasing number of examples showing us this new technologies support and change the design process in a positive way. Nevertheless, we see an important part of the design offices is not using these new possibilities. They are using CAAD only for producing plans. Acting in this way, these offices do not gain any added value of CAAD. Although the new technologies offer a lot of new techniques and can have a positive impact on the design process, we see a lot of architects who get confronted with these new media, react in a negative way. So, it is clear new impulses are needed in order to develop the added value of CAAD to the design process and to make this positive impact clear to the architects.

In order to realise the previous goal and to react to the rapid changes in the field, it is necessary to develop new training methods, new course contents and new training material. This material has to underline the added value of CAAD to the design process. This will augment training quality and the meaning and position of CAAD in the curriculum. It will also give maximal chances to CAAD in the future. In a second phase we see a positive impact of the designing offices and the architectural Institutes on the further development of CAAD. The new training methods, new course contents and new training materials will make the anticipation to future developments and faster innovations possible.

This can be realised in the following way. The project will benefit from the practical training program AVOCADA-stage. The experiences will be brought together in order to develop a new vision on the creative use of CAAD. New course material will be the concrete result. This will be the start of new training and in-service training oriented towards the added value of CAAD. As a final period we see training periods in design offices during which the new developed vision and training material will be confronted with the design practice.

By incorporating this new material in the curriculum and by making it available as a short intensive course (as part of the continuous education as young architects who finished their studies in the near past have not yet gained this knowledge), we hope to reach a maximal effect. Moreover we will experiment with training-on-the-job and video-courses.

Because of the complexity and the fast evolution, it is clear this project can only be realised by a co-operation of different partners all over Europe: design offices, software specialists and universities. We want to bring together the variety of experiences and ideas in Europe in order to incorporate the added value of CAAD as well as possible.
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