The "Digital year for Architects" – Experiences with an Integrated Teaching Concept

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The "digital year for architects" is an integrated course for graduate architecture students that has been running since 1997, at Stuttgart University. Its concept is to link together traditional design teaching and working with computers. Three seminar classes and one design project form the framework of the course. In it the students are taught the design of, for example, image and space composition, typography, video, and using virtual reality. Additionally we cover theoretical basics for the final design project, such as information management or working environments. The course takes in approximately a dozen software packages and ends with a visionary design project.

The products have shown the advantage of an integrated course compared to separate courses. The course proves to be more intensive in dealing with the project as well as achieving better skills when learning the associated new digital media. An important feature is that because the project topics are different from conventional architectural schemes, and tend to be more abstract, a key effect is to widen the students' way of thinking about designing.

1. Introduction

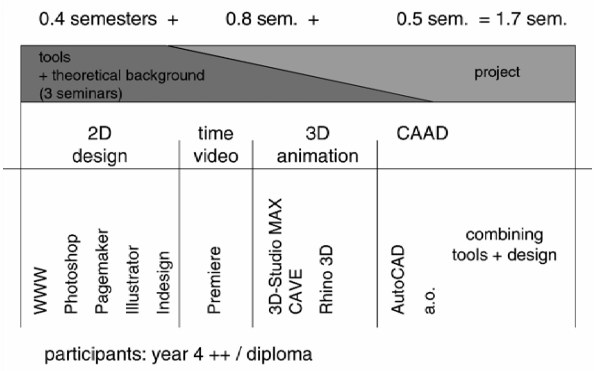
Integrated design projects have a long tradition at the architecture faculty at Stuttgart University. They are mainly held in the second year in the field of building construction, structural engineering and building engineering. Their positive results and the observation of the gap between the traditional techniques for architecture and computer based work led to the concept of the "Digital year for architects"; a course held for students in their final years and as diploma.

It was first set up by the authors in 1997 and since then has continuously evolved, to increase the quality of the course, and to respond to the continuously changing interests of the students.

Due to the limited, or non-existent, software experience of the students in the first years of the course, teaching the software covered about 60 percent of the teaching time. This is now reduced to about 25 percent, and the focus has moved more onto morphology, theoretical work and discussions as preparation for the visionary project. As the concept is based on these three items, the changes affected the way of teaching but not the concept of the course.

2. Course structure

The digital year consists of three seminars (part 1) and one design project (part 2). These two parts again are divided, into seven phases. They lead from computer supported design exercises covering theoretical basics [1, pp. 23-38] to the final design project, in which all of the acquired skills are integrated.



► Figure 1: The integration of seminars and project and timeframe for learning the required software.

The seminars are used to make the students familiar with the digital tools, to make them aware of the advantages and disadvantages when

working with digital media, to discuss and exercise morphology and spatial aspects, and to provide them with the necessary theoretical background for their project.

As soon as there is sufficient basis for discussions, the project starts. The work in the seminars is reduced and the work on the project is, in turn, increased, until approximately two thirds of the course-time focuses on the project.

2.1. Basis 1: the process chain

The software shown in figure 1 is used in the course and should simply be seen as a tool to fulfil the task. The actual products can be replaced, and some already have been.

The way of working, of transferring data from software A to B to C and so on is best described as an "open process chain." Whereas working with a single make of software means that data does not necessarily have to be transferred between different packages. This can be referred to a "closed process chain."

Using the open process chain is one specific intended outcome of the course, since this should prepare the students for their future profession. The consequence is that they might work with different software, with data from partners from different professions, or on a different operating system.

Due to the large number of packages that are integral to the process, the students cannot simply focus on a certain product or manufacturer. They are forced to concentrate more on "What result do I want to achieve?" than on "Which software do I want to use?" Feedback from the participants has shown, that the burden of software to be learnt is quite taxing and sometimes frustrating in the beginning of an architectural education. However, one can say that, because the students are not taught (there is not the time) to handle just one specific piece of software but to learn the general modus operandi, in their future career they appear to be better prepared, and are more confident about learning additional, new software packages.

2.2. Basis 2: linking digital and analogous media

When focusing on the three items mentioned above, there should be a maximum degree of freedom to work combined by hand or with digital media. Ideally, every step should be possible in any available way and easily transferred into one of the other contexts. In order to achieve this goal, to reduce the borders and frictions between working with digital and parallel media, in two dimensions (2D) and three dimensions (3D) an integrated configuration was developed and appropriate devices bought.

Sketches and drawings (2D) are scanned on a large scale scanner, and are then analysed with image processing software. Images are then vectorized (i.e. transferred from pixel-information to vector-information). They are then worked on in CAD or animation software and finally plotted out again to continue the cycle.

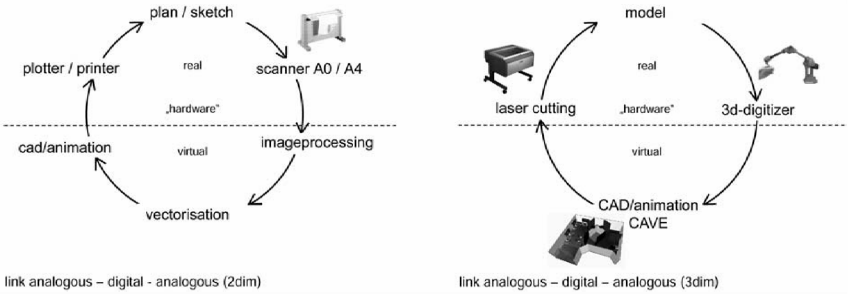


Figure 2: Linking of analogous and digital working (two-dimensional and three-dimensional).

Similarly models (3D) are digitized with a 3D-digitizer, worked on in CAD or animation software in the CAVE environment and again transferred into hard output, this time with a laser cutter.

Experience with this system has shown, that the 2D-transition is adopted by nearly all students very quickly, whereas it still takes a certain time to convince the participants to use the 3D-cycle in order to take advantage of both "worlds" and thereby achieve a high degree of flexibility.

2.3. Didactic concept

The didactic concept is based on the potential of the human perception, from seeing the environment as a flat image to perceiving it as a spatial composition. In the early stages of design development the students are working with image composition (analytically and synthetically). Stemming from that spatial, sculptural exercises and finally video are introduced as describing processes to cover a wide range of media. Switching between flat and spatial representation techniques enables the students to learn flexible working and to make explicit how their thinking and imagination works when alternating between these different representations.

Many exercises are first made by hand to introduce the student to traditional processes, and to develop skills in the sensitive perception by hand and eye. At a later state the exercises, like 3D modelling, become computer based.

3. COURSE PARTS AND PHASES

The digital year for architects is held as a joint course by two chairs of the faculty. One of the chairs is focused on representation techniques (visualization and morphology), the other on planning theory (theory and technology). This fact gives and indication of the wide range of the course. All exercises and the final design project are prepared and also marked in collaboration by both chairs.

3.1. Analysis, theory and skills: part 1

Part 1 is the preparation phase for the final project. It is intended to supply the students with the necessary technical skills, design principles and theoretical background. During the seven months of this phase, in the theoretical area, the students have to prepare two papers on themes that are focused on the final project.

Technical skills and design principles are taught with 2D-exercises (such as image making and typography). This is followed by adding the dimension of time in the form of moving images (video). As soon as these basics are learned, the course continues with work on 3D. This takes a longer time, since the students have to learn working with different CAAD modelers as well as using Virtual Reality in a CAVE setting. Not until the end of part 1 is CAD taught.

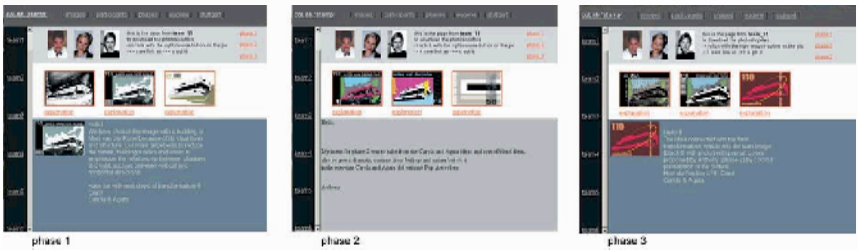
Based on some years of experience CAD has been shifted from being the first to being the last item in the sequence. This is because we found that introducing the digital media proved to be much easier with, for example, image processing software rather than classical CAD software. The learning curve, when teaching CAD in phase 1.5 compared to teaching CAD in phase 1.1 has proven to be much steeper.

In all exercises the stress is laid on design aspects, not onto technical skills. After an intensive period of introduction and assistance in every piece of software, the students are expected to acquire the further necessary skills on their own. A description of the teaching and learning intentions as well as some examples are presented in the sections below

3.1.1. Phase 1.1: 2D / design

Phase 1.1 is the general introduction into the topic. After getting familiar with the computer system and basic HTML-knowledge (coding a homepage, simple Java scripting and so on), the first exercise is image and color composition [2, p. 12] with Photoshop. In general the students have to analyze an image, describe and visualize the analysis and finally compose an re-interpreted image out of that.

▼ Figure 3: Colab stamp, a 6 days collaborative image interpreting and processing workshop; screenshots of webpage

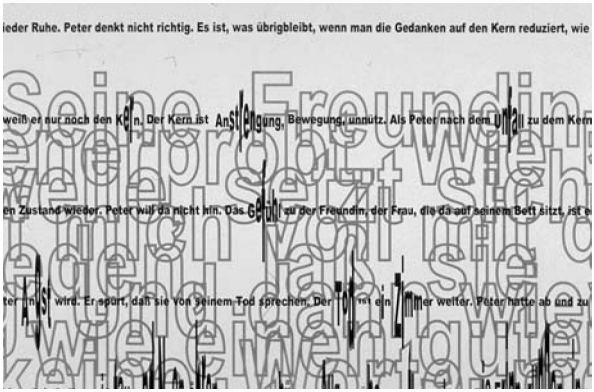


In 2000 a collaboration week was established with the University of Oregon [A] in which the students had to design stamps derived from images by artists (e.g. Rauschenberg) or architectural photographs (such as the Weissenhof project by Mies van der Rohe or Falling Water by F.L. Wright).

Each participant had 2 days to work on the idea, then the stamps were exchanged with the partners at the other university and after another 2 days they were exchanged again and the project finished in the last 2 days. Though this exercise seemed to be simple, the students learnt a great deal about computer mediated collaboration in design, including:

- How does one best describe an idea to transfer it to a person, who is located thousands of kilometers away.
- What it means to have to rely on a remote partner who lives and operates in another time zone.
- How to filter out the essentials of a project so that it can be communicated using an area of only approximately ten square centimeters.
- Realize the importance of image composition and colour choice to transfer ideas successfully.
- Getting to know that there are different levels of abstraction and each can be used effectively in different circumstances.

As a next step, students are taught to use lettering and typography. For this purpose the Illustrator and Indesign software is available. Students are taught the basics of typography which, opens their eyes to the wide range of possibilities of the new media.



► Figure 4: Example of the Typography exercise "text carpet": work by Carola Knoll.

[A] In collaboration with Prof. Nancy Cheng.

[B] The web page is located at http://www.igp.uni-stuttgart.de/ eugene-stuttgart.

In the exercise "text carpet," ideas have to be developed and represented just by using letters. The overlaying of letters and words and their meaning adds additional layers of complexity and ways of representation. It encourages students to think about their design in an alternative and deeper way.

3.1.2. Phase 1.2: time / video

In phase 1.2 with the phase covering still images completed, the next subject that is taught is how to use moving images and sound. This is used in the projects as an additional medium to represent an idea. As in phase 1.1, samples like advertisements or movies are analysed. Here the students study sequencing, image composition, and editing techniques. These basic skills are taught by video specialists.

As an exercise a 2 minutes "video design report" about phases 1.1 to 1.4 has to be presented at the end of phase 1.4. This shows how the student learned to compose and edit video segments and how to prepare them in an appropriate sequence.

▼ Figure 5: Images from a "video design report" of the typography exercise "water": work by Nicole Baumüller.

3.1.3. Phase 1.3: seminar paper 1

Seminar paper 1 is the first step into the project. In the paper themes, that the final project will deal with are prepared. The themes that were suggested were "visions," "working environment," and "architecture and information."

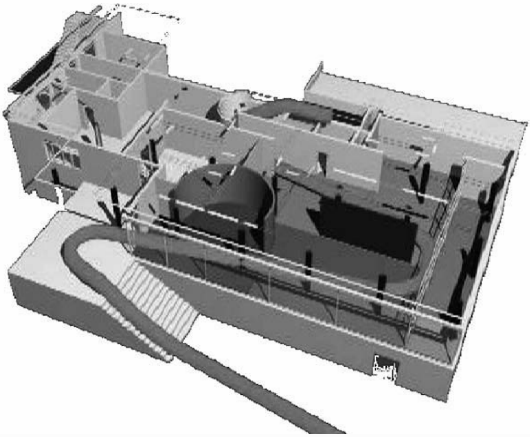
3.1.4. Phase 1.4: 3D / animation

Phase 1.4 takes the longest time of all phases in part 1. To become familiar with the software, again a first step is to construct and manipulate a particular example using a 3D modeler like 3D Studio MAX. This is done, for example, by interpreting a famous building and representing it in a video sequence. This part deals with understanding of the spatial compositions, their proportions and an estimation of the generating process that produced the designed object. It also encourages an understanding of the correlation between image and form/space [3, pp. 17, 4, pp. 27, 103].

After getting thorough experience with conventional software as well as important design and space principles, the next step is to apply that experience in a virtual reality environment; the CAVE-like CUBE of the High-Performance Computing Center.

Generally at this point the students begin to realize, that using the new media is not just an alternative vehicle for representing the real world but opens the wide field of virtuality. And at this point the experimental projects (part 2) are started.

► Figure 6: Study of Haus Tugendhat - Mies van der Rohe: work by Björn Schimpf.



In the virtual environment nearly all paradigms that apply in reality become irrelevant, and a new set of paradigms has to be established [5]. Shapes have to be redefined according to the changed needs such as the absence of gravity or wind. One of the only features that remain is the human perception.

▲ Figure 7: Spatial experiment – working environment for a radiologist: work by Sonja Nagel.

3.1.5. Phase 1.5: CAAD

Phase 1.5 is somewhat pragmatic. In it a CAD program is taught to give the students the basic software knowledge for their future work in architecture offices. As a small exercise the students have to draw elevations, sections and plans of buildings.

As part of this phase we show certain advantages of CAD versus manual drafting. For instance the drawings mentioned above are used to create a physical model with the laser cutter. In a group exercise, about 20 students design and draw plans, sections, elevations, details, perspective and others of the

same skyscraper – within 2 hours. This is supported by a shared collaboration, using the "external reference" technology embedded in the software.

3.1.6. Phase 1.6: seminar paper 2

Seminar paper 2 is, compared to paper 1, more focused on reflection about the digital media. Once the students have finished learning all the software packages we regard it as very important to teach the responsible and innovative use of the new media. Themes adopted in this phase are for example "material and tool," "CAAD and repetition," and "digital tools."

3.2. Synthesis – Part 2

Part 2 aims to accomplish a synthesis of what has been learnt in part 1 plus encouraging a visionary idea from the students.

3.2.1. Phase 2.1: design project

As the topics of the design project are different from conventional architecture, the students have to develop their own content as well as new canon of shapes. The project was constructed as a set of frames with titles such as "visions," "virtual enterprise," or "XXXXXL." For the ongoing work and final presentation nearly all media types are used: models, sketches, posters, video and virtual reality.

4. Conclusion and outlook

The concept of the "Digital year for architects," is to encourage and show the benefits of integrating a range of media and approaches. We believe that it has proven to work. The project connects two "worlds" (digital and analogous real) that, in the beginning of every course, students still seem to regard as separate. The focus of the students over the years has now shifted from mainly being interested in learning a lot of software to more using it in an innovative manner. They are becoming more interested in the results than in the technology that produces the results.

Though the software skills of the novice students increases each year, there is still a huge gap between their technical skills and their thinking. Their mental abilities outstrip their ability to apply the software in an innovative way. Part 1 of the 'Digital year' project is an important part of the course, and has the key pragmatic function of getting a group of students onto the same level. But we know that the course will continuously be changed to fit future demands and student skill levels.

The main intention is to widen the students' way of thinking about designing [6, 7, p. 73] and the way that designs can be developed and realised. They should become aware that the application of new techniques will have an effect on how they make architecture. With the constraint of software limitations lifted the only limit is our thinking. That is where we have to expand the horizons.

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