

# 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 held since 1997 at Stuttgart University. Its concept is to link together traditional design teaching and working with computers. Three seminars and one design project are the framework of the course, in which the students are taught in design of e.g. image and space composition, typography, video, using virtual reality, theoretical basics for the final design project like information management or working environments, approximately a dozen software packages and finally a visionary design project.*

*It has shown that the advantage of an integrated course compared to separate courses is the more intensive dealing with the project as well as achieving better skills when learning the new media. Not only because the project topics are different from usual architecture and more abstract, the main effect is to widen the students way of thinking and designing.*

***Keywords:** Integrated teaching; digital design education; design thinking; digital year; virtual reality.*

### **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 continuously changed to increase the quality of the course and to fit to the also continuously changing interests of the students.

Due to the limited or non existing software experience of the students in the first years of the course, teaching the software covered about 60 percent of the teaching time. It is now reduced to about 25 percent and the focus set even 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.

## Course structure

The digital year consists of three seminars (part 1) and one design project (part 2). These two parts again are divided into totally seven phases. They lead from computer supported design exercises over theoretical basics (Arnheim, 1977) to the final design project, which all learnt skills are integrated in.

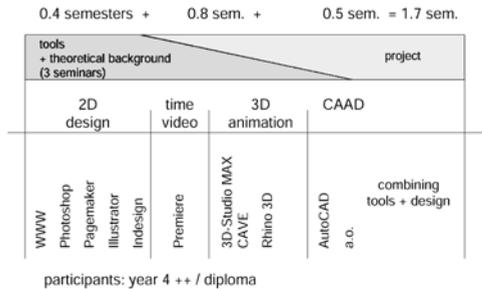


Figure 1. The integration of seminars and project and timeframe for learning the required software.

The seminars are used to make the students familiar with the digital tools, to sensitize them for 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 enough basis for discussions, the project starts. The same degree that the work in the seminars is reduced, the work on the project is increased, until approximately 2/3 of the courses time one just focuses on the project.

### Basis 1: The process chain

The software shown in the above figure is used in the course and should just be seen as a variable, as a tool to fulfill the task. The products can be replaced and some already have been.

The way of working, of transferring data from software A to software B to software C and so on is best described as “open process chain”.

Whereas working with the software of one supplier and therefore data not being necessarily transferred between different packages can be called a “closed process chain”.

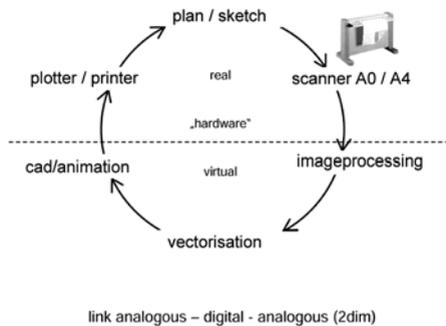
Using the open process chain is one intended topic, to prepare the students for their future profession. That they might work with a different software, with data from partners of different professions, on a different operating system.

Due to the large number of packages, the students just can't focus on a certain product or manufacturer. They are forced to concentrate more on “Which result to I want to achieve?” than on “Which software do I want to use?”. Feedback of the participants has shown, that the overload of software to be learnt is quite hard and sometimes frustrating at the beginning. However one can say that, because they are not taught (and especially don't have the time) to handle just one specific software but to learn the general handling, that in their future career they don't have any reservation, learning additional, necessary software packages.

### Basis 2: Linking digital and analogous media

When focusing on the three above mentioned items, 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 the other “world”. In order to achieve this goal, to reduce the borders and frictions between working with digital and analogous media, for two dimensions (2D) and three dimensions (3D) a circulation was developed and appropriate devices bought.

Sketches and drawings (2D) are scanned on a large scale scanner, processed with image processing, vectorised, that means transferred from pixel-information to vector-information, worked on in CAD/animation and finally plotted out again to continue the circle.



Similarly models (3D) are digitized with a 3D-digitizer, worked on in CAD/animation or the CAVE and again transferred into hardware with a laser cutter.

It has shown, that the 2D-transition is adopted by nearly all students very soon, whereas it still takes a certain time to convince the participants to use the 3D-circulation in order to use the advantages of both “worlds” and to achieve a high degree of flexibility.

## 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 is one aspect for the wide range of the course. All exercises and the final design project are prepared and also marked in collaboration by both chairs.

### Analysis, theory and skills: part 1

Part 1 is the preparation for the final project. It shall supply the students with the necessary technical skills, design principles and theoretical background. During these approximately seven months, 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 (e.g. images, typography), followed by adding time - moving images (video). As soon as these basics are learned, the course continues with 3D. This takes a longer time, since the students have to learn working with different modelers as well as using Virtual Reality (CAVE). Only at the end of part 1 CAD is taught. This has been shifted after some years from being the first to being the last item in the sequence, as getting into the digital media showed to be much easier with e.g. image processing software than classical CAD software. The learning curve, when teaching CAD in phase 5 compared to teaching CAD in phase 1 is much steeper.

In all exercises the stress is laid onto design aspects, not onto technical skills. After an intensive period of introduction and assistance for every software, the students are expected to acquire the necessary skills on their own.

A description of the teaching / learning intention as well as some samples are shown in the following paragraphs.

### Phase 1: 2D / Design

Phase 1 is the general introduction into the topic. After getting familiar with the computer system and basic HTML-knowledge (coding a homepage, simple javascripting, etc.), the first exercise is image and color composition (Arnheim, 2001) with Photoshop. In general the students have to analyze an image, describe and visualize the analysis and finally compose an interpreted image out of that.

In 2000 a collaboration week was made with the University of Oregon (Prof. Nancy Y-W. Cheng) where the students had to design stamps out of images of artists (e.g. Rauschenberg) or architecture photographs (e.g. of Weissenhof project, Mies van der Rohe; Falling water, F.L. Wright).

Each participant had 2 days to work on the idea, then the stamps were exchanged with the

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

Figure 3. Colab stamp, a 6 days collaborative image interpreting and processing workshop; screenshots of webpage (<http://www.igp.uni-stuttgart.de/leugene-stuttgart>).



partners at the other university and after another 2 days they were exchanged again to finish the work in the last 2 days. Though this exercise seemed to be simple, the students learnt a lot like:

- How does one have to 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 even lives in another timezone.
- How to filter out the essentials of a project to make it fit on approximately ten square centimeters.
- Realize the importance of image composition and color to transfer ideas.
- Getting to know different levels of abstraction like it is e.g. necessary for using CAD.

As a next step, students are taught to use letter-

ing, typography. For this Illustrator / Indesign is used. They are taught the basics of typography which, due to the many possibilities of the new media, is essential. In the exercise “text carpet”, ideas have to be developed and represented just by using letters. The overlaying of letters/words and their meaning adds additional layers of complexity and ways of representation.

## Phase 2: Time / Video

In phase 2 with the knowledge about still images, how to use moving images and sound is taught. This shall be used in the projects as an additional media to represent an idea. Like in phase 1 at the beginning samples like advertising spots or movies are analyzed, their dramaturgy, image composition and cutting techniques; basic skills are taught together with video specialists.

As an exercise a 2 minutes “video design report” about phases 1 to 4 has to be presented at the end of phase 4. This shows, how the student learned to add and join video segments and how to prepare them in an appropriate dramaturgy.

## Phase 3: Seminar paper 1

Seminar paper 1 is the first step into the project. It prepares themes, that the final project will deal about. Themes were e.g. “visions”, “working environment” or “architecture and information”.

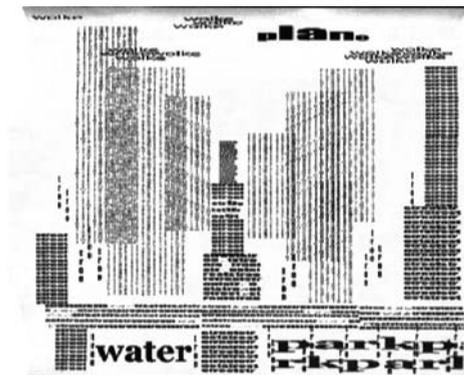


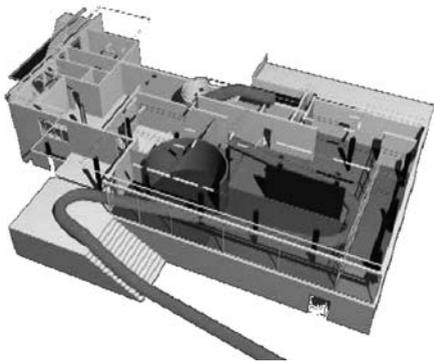
Figure 4. Typography exercise “text carpet”; Jochen Kern.



Figure 5. Images out of "video design report" of typography exercise "water"; Nicole Baumüller.

## Phase 4: 3D / Animation

Phase 4 takes the longest time of all phases in part 1. To become familiar with the software, again a first step is to analyze a sample by building it with a 3D modeler like 3D Studio MAX. This is e.g. interpreting a famous building and representing it in a video sequence. It is understanding of the spatial constellation, their proportions and an assumption of the generating process and also understanding the correlation of designing image



and space (Blum, 1991; Elger, 1992).

After getting through experience with conventional software as well as important design and space principles, the next step is to use virtual reality, the CAVE-like CUBE of the high-performance computing center.

Mostly at this point the students realize, that using the new media is not just for representing the real world but opens the wide field of virtuality. And at this point the experimental projects (part 2) are started. In the virtual environment nearly all paradigms of reality become irrelevant, a new set of paradigms has to be established (Kieferle and Wössner, 2001). Shapes have to be redefined according to the changed needs (no gravity, wind, etc.). One of the only paradigms that stay is the human perception.

## Phase 5: CAAD

In phase 5, 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.

To show certain advantages of CAD versus manual drafting, e.g. the above mentioned draw-

Figure 6. Composition of Haus Tugendhat, Mies van der Rohe; Björn Schimpf.



Figure 7. Spatial experiment: working environment for a radiologist; Sonja Nagel.

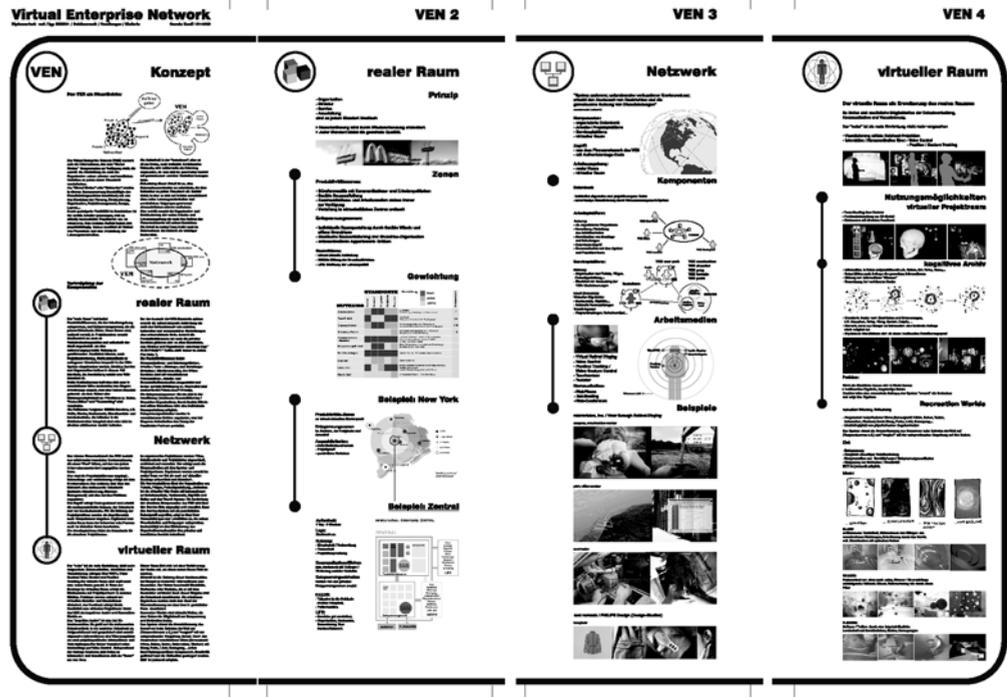


Figure 8. Poster “Virtual enterprise network”; Carola Knoll.

ings are used to create a lasered model with the laser cutter. In a group exercise, about 20 students design and draw plans, sections, elevations, details, perspective and others of one and the same skyscraper - within 2 hours. This is supported by a shared collaboration, using the “external reference” technology of the software.

### Phase 6: Seminar paper 2

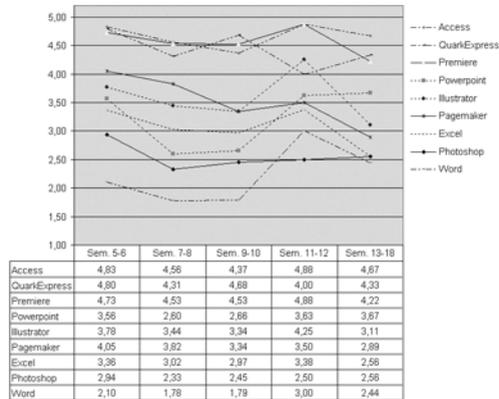
Seminar paper 2 is, compared to paper 1, more focused on reflection of the digital media. At the end of learning all the software packages the authors estimate it as very important to teach the responsible and innovative use of the new media. Themes are e.g. “material and tool”, “CAAD and repetition” and “digital tools”.

### Synthesis - Part 2

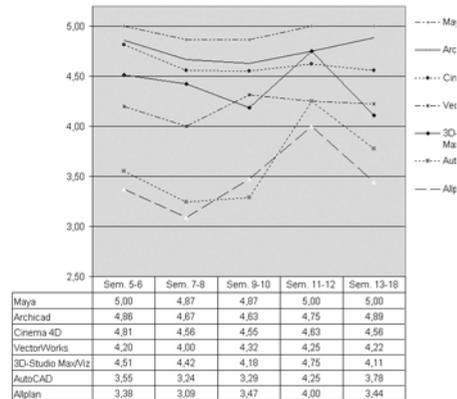
Part 2 is the synthesis of what has been learnt in part 1 plus a visionary idea.

### Phase 7: 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. Project frames were e.g. “visions”, “virtual enterprise” or “XXXXXL”. For the ongoing work and final presentation nearly all medias are used: models, sketches, posters, video and virtual reality. A typical poster shown below illustrates, that a huge part of the projects is defining and structuring of the idea.



standard applications



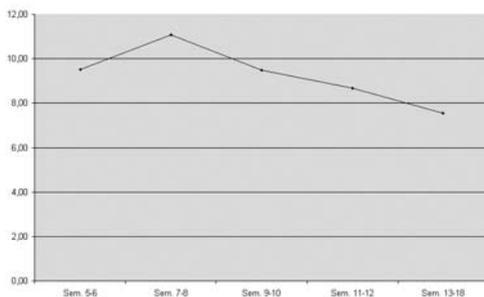
CAD / 3D / animation

Figure 9. Survey 04/2002 results: average knowledge to use software packages. 1 = very good, 2 = good, ... 5 = none.

## Statistic background

Several assumptions and observed trends over the last years are verified by a representative survey around 186 graduate students made by the authors in 04/2002 at the architecture faculty. As a trend it can be said, that there seems to be a “new generation” of students in semesters up to ten (fifth year), that have or at least estimate their knowledge in standard software as well as CAD / animation software better than the elder semesters.

Furthermore the willingness to learn (and use) software packages reduces as shown after a peak



with the number of semesters. The average is approximately 10 (9,51), a value also experienced from teaching the students.

## Conclusion and outlook

The concept of the “Digital year for architects”, the integrative concept, has proven to work. It connects two “worlds” (digital and analogous) that, still in the beginning of every course, seem to be separate. The focus of the students over the years already shifted from mainly being interested in learning a lot of software to more using it in an innovative project, becoming more interested in the results than in technology.

Though the software skills of the beginners increase each year, there is still a huge gap between their technical skills and their thinking, their mental abilities to apply the software in an innovative way. Part 1 is and will be an important part of the course, to get a group of students onto the same level. However, the course will continuously be changed to fit future demands.

The main intention, to widen the students way of thinking and designing (Elkins, 2000; Thürlemann, 1990) could be achieved and has an

Figure 10. Survey 04/2002 results: How many software packages altogether are you willing to learn?

effect on how they make architecture. The only limit is our thinking. That is where we have to step beyond.

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