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Research by Design – Research through Design

Abstract:

This paper is to be read in context with the paper of Uli Herres (next paper in this journal), since the two explain the handling of specific forms of knowledge in the Master of Arts in Architecture course at the Lucerne University of Applied Sciences and Arts and in the related Research Group Material Structure Energy in Architecture. Research by Design is established in the curricula of teaching as well as in research on different levels from regular teaching in architecture to the PhD program. The interaction is a two directional, meaning that teaching influences research as research influences teaching. The concept of combining theory and practice in the Master of Arts in Architecture course at the HSLU – T&A forms the basis of the concept of research by design as applied by the Research Group Material Structure Energy in Architecture.

The Master course in architecture is directly linked to the work of the Research Group, a request that has been stated by the governmental guidelines for the introduction of a master program in architecture at the universities of applied sciences in Switzerland.

The University of Applied sciences and Arts Lucerne took this opportunity to establish a model that introduces the interaction of design methods with scientific methods in three steps. The basis is set with a distinct content linked to the credo “building as

system” of the Department Technique and Architecture. This meant a clear focusing on issues directly linked to the design of buildings.

Keywords: architecture, research, spatial knowledge, design teaching

The concept of the Master of Arts in Architecture

It consists of 3 foci, which try to narrow down architectural issues on very specific but architecturally highly relevant topics. The key issue is to get insight into the design relevant aspects of the three foci:

- architecture and material
- architecture and structure
- architecture and energy

A regular semester in the course is organized in the following modules:

- focusproject – design and construction
- in depth study – research study with scientific approach
- focuslectures – lectures linked to the topics of the focusproject
- basiclectures – theory and history of architecture
- studytrip
- keynote lectures – workshop in related fields of architecture

The thesis semester is organized in only two parts

- thesis project
- thesis book, consists of theoretical research related to the project and a representation of the project in relation to the theoretical approach

Research Group – Material Structure Energy in Architecture

The Research Group – Material Structure Energy in Architecture is directly linked to the teaching in the Master Course in the field of architecture and takes on the challenge of combining theory and practice as well in teaching as in research.

The Research Group established a specific understanding of the question what research could mean in the field of architecture with its publication “Researching Architecture” (Gerber et al, 2010).

The title already emphasizes the issue that there is not a singular form of research in

architecture but instead there exist different aspects in architecture focused on the design process which include methods and especially fields of knowledge that are strongly related to research.

“Architecture as research generates cognition and knowledge that cannot *per se* be compared to other forms of knowledge. Architectural knowledge is achieved through action and the manipulation of space, and can only be communicated to a limited extent using language. Thus the designer is limited in using words to describe the process, which is a precondition for scientific traceability.

This consideration is confirmation for us in our attempt to establish a specific architectural knowledge. In discussing what is there described as spatial knowledge, a parallel can be drawn with the so-called knowledge of images.

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Like images, we believe that space must also be regarded as an independent form of knowledge, both in terms of its production and its communication.

...

Space and its production, including the instruments used for their creation form such knowledge resulting from architecture as research.” (Gerber et al, 2010).

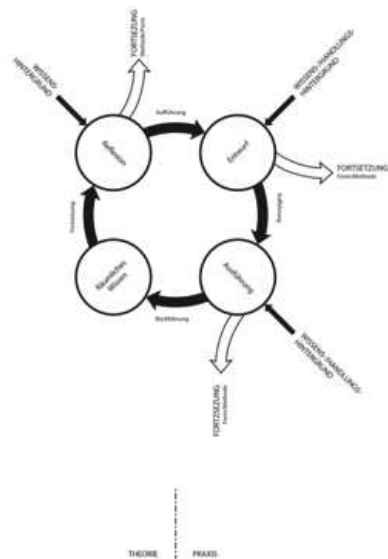


FIG.1. Researching Architecture

Organisation of Research

Research by Design connected with the teaching is therefore established in 4 phases with different methods.

- 1. Regular master semester – teaching design as priority, with the introduction of theoretical, scientific research. The outline is clearly based on the proposition that the design process is experimental and reflected.
- 2. Research – further development of topics partially generated in the design teaching or the theoretical research done in the regular semester.
- 3. Master thesis – interaction of design and research, focused on the theoretical impact on the design process. The primary goal of the thesis is to establish a strong relation between theoretical research and design work.
- 4. Research that is independent from teaching but that is thematically linked to the topics of the three foci. Establishing theories and general topics that are of interest for a scientific research geared towards PhD work.

Until now research topics and projects have been established in the fields of material and energy. In the following some results of the phase 1 and 2 will be presented to give some insight in the interaction and in the methods that are used to establish a distinct relation between design and research.

Phase 1: Regular Semester in the Master Course

Teaching modul: In Depth Study

In Depth Study of Cyrill Chrétien

University of Applied Sciences and Arts Lucerne, Master in Architecture

Amongst many

Regulation of Privacy in dense urban contexts

Actual Housing in a dense urban context needs a regulation of privacy through spatial solutions.

Research project "Privacy and Density"

Feasability study resulting in clarifying the topics and will lead to a larger researchproject with the following issues:

To direct urban planing in the future into more sustainable paths, the creation of an acceptance for more condensed forms of housing is a key intervention and at the same time a big challenge. At the basis of the project „Privacy and Density“ lays the thesis that this acceptance is significantly influenced by the possibility to regulate

the privacy in the living area. We emanate that specially the design and the modifiability of the building envelope – as an acting agent between interior and exterior – plays a central role. The main consideration is placed on the space of the facade as a structural element, that immediately creates a specific experience of the relation between the inside and the outside of a building.

State of the research project: application phase for a project that, on the basis of two to three actual development projects with high density in Switzerland, compares different planned solutions.

Modul Focus Project

Focus Material

The project is directed to a research process through design. Essential is the experimental approach, that means a search for solutions outside the conventional. The result is, at least in the successful contributions, not a research project but a project that generates research topics.

Starting point is the production process that is linked to a specific material, freely chosen by the student. The first outcome of the starting exercise, an object 60 x 60 x 180 cm, made solely by arranging the material was transformed by introducing the possibility to add a second supporting material into a primary constructive system. This system then set the rules for a spatial exploration and finally resulted in an architectural project.

Project: Lukas Hodel

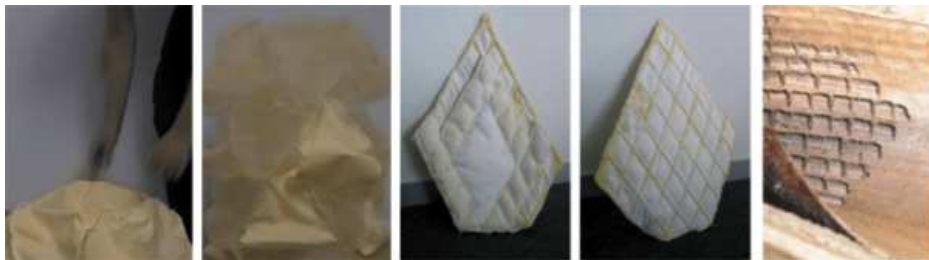


FIG.2. Project: Lukas Hodel

The outcome set the basis for a related research project and opened a research field of textile architecture beyond the common membrane constructions, establishing the outline of the constructive and formal potential of multilayered textile construction systems. The textiles establish a matrix to hold other materials with different physical qualities.

Inversion of the design process:
Textile as the starting material
The seem as constructive support
The three dimensional seem
The multilayered textile matrix with different fillings
A stiff membrane construction and its spatial potential



FIG.3. Project: Lukas Hodel

Phase 2: Transformation in research

Feasibility for a multilayered textile matrix as facade construction



FIG.4. TexFas

Stoffwechsel

Stoffwechsel is a research project which includes the development of a structural system for a non permanent building and wall systems for interior and exterior refurbishment constructions.

The project pursues the development of a multilayered construction system with textiles, that act as a structural matrix. The textiles take on constructive functions. The flexible and soft textile is the determining part of the construction and enriches architecture with a textile specific appearance and with new functional and technical possibilities. The superior goal of the project is a sustainable expansion of the application area of textiles in building construction. On a more concrete level the project delivers planning instruments and prototypes for an innovative use of textiles and various fillers.

The broader outcome leads to an establishing of competences that open the field. The research in this field is now going in several directions that are not directly linked to the student's project any longer.

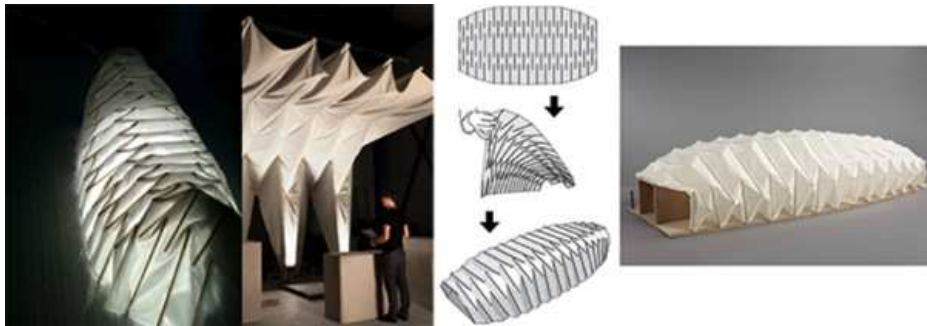


FIG.5. Stoffwechsel

Phase 3: Master Thesis

In the master thesis, students are obliged to hand in a practical design work as well as a theory part (“thesis book”), which goes beyond a pure project documentation. A theoretical thesis is proposed, developed and defended in the book by the respective student, while the project tries to challenge the same thesis on a design task. The parallel presentation of both the theoretical and practical in the book already leads to surprising insights. The parallel handling of both theoretical and practical work reflects the special status of architectural knowledge and improves both aspects.

Thesis project: Cyril Chrétien

A transit hotel in a quarry

Speculation on a typology, the impact of the program to design

The goal of the inquiry was to establish a new hotel typology, that allows in a strict manner to react to the needs of a specific type of tourists: the travellers in large groups with a short duration of the stay in one place. The typological speculation is based on a broad research in various fields like architecture, tourism or sociocultural issues. It is classified in three thematic fields:

Ordre / disordre

Global / local

Illusion / reality

Deep insights into these fields deliver a thematic basis for the design process. On the other hand the design process directs the theoretical approach especially on the issue of potential spatial solutions.



FIG.6. Project: Cyrill Chrétien



FIG.7. Project: Cyrill Chrétien

Thesis project: Anthony Frank

Stück zu vier und mehr Verfremdungen - Piece for fore or more Alienations

A new Theater for Lucerne

The estrangement effect by Bertold Brecht and Erwin Piscator as a performing arts concept is integrated and consequently transformed into the architectural design.

To increase the perception is the goal of Brecht and Šklovskijs. Both see in the technique of estrangement the necessary media. The Thesiswork as a whole asks for different principles which cause estrangement effects. It also asks where architecture grasps these principles. The analysis showed that estrangement interferes on many levels. The naming of the individual principals lead to a decided point of view. The architectural reception of theory and practice are stimulating the tangible assignment. The project takes the estangement effect as a tool to penetrate conventions in the context of theater as well as site.



FIG.8. Project: Anthony Frank

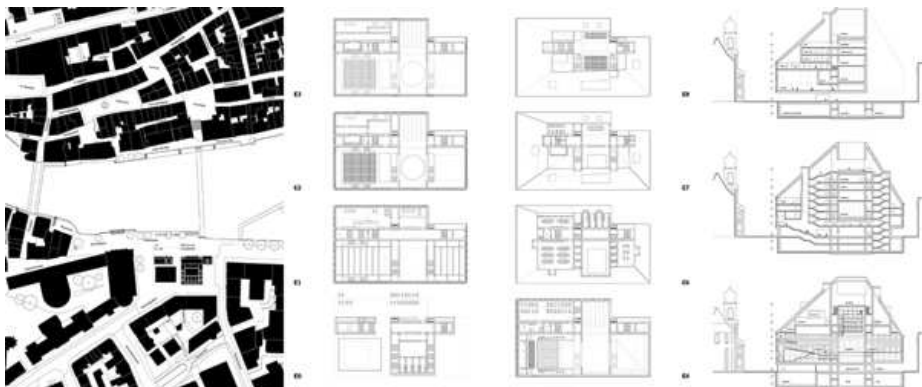


FIG.9. Project: Anthony Frank

The above mentioned three phases therefore lead to an open concept where the

relation of research and design can be characterized in four different ways:

- 1. Regular master semester – teaching design as priority, with the introduction of theoretical, scientific research. The outline is clearly based on the proposition that the design process is experimental and reflected.

Research initiated by design

The design process of the teaching presents relevant research topics. These topics already examine a certain plausibility and relevance of the topic for further research activities.

- 2. Research – further development of topics partially generated in the design teaching or the theoretical research done in the regular semester.

Research for design

Since the source of the research topics is design, the research uses design methods as scientific tools. This leads to knowledge which is clearly directed to design relevant insights.

- 3. Master thesis – interaction of design and research, focused on the theoretical impact on the design process. The primary goal of the thesis is to establish a strong relation between theoretical research and design work.

Research interacting with design

The parallelity of design and the related research process open up the possibility to introduce design as a distinct and relevant part of research. Such a design process becomes a relevant research method.

- 4. Research that is independent from teaching but that is thematically linked to the topics of the three foci. Establishing theories and general topics that are of interest for a scientific research geared towards PhD work.

Research and reverse design

The combination of the three first phases or modes of research lead to more theoretical topics that specifically take on design and the physical reality of construction as a field that delivers scientific insight. This is done with a method that could be named reverse design (taking up the idea of reverse engineering). The

following presentation of Uli Herres will present this issue with his PhD project. Research by Design, or more precise Research through Design, in the pursued model at the Research Group Material Structure Energy in Architecture takes on different modes. The combination of these methods establishes a background where design becomes part of a systematic and reproducible form of research. This establishes the core of the field of architecture, the comprehensive design process, as a scientific relevant method.