REFRAMING STRUCTURES, Framing Architectural Construction in Artistic Design Education

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Abstract

Over the last twenty years, framing and frame experimentation became popular in social sciences, politics and media studies. However, the use of these methods in design based studies is less frequent. Accordingly, framing and reframing artistic events holds great potential. On the one hand, older experiences can be studied in new situations. On the other hand, new situations can be understood in a classical environment.

This paper aims at the discussion of opportunities and challenges of using framing and frame experimentation in the reflective education of artistic construction. In this context, frame or framework can be briefly defined as a collection of stereotypes that one relies on to understand a certain given concept.

The research combines knowledge from two different fields, tectonics education and frame experimentation. A brief review of the two topics is made to describe their individual qualities, their relevance in contemporary education and their combined potential.

To be able to experiment with frames, in this paper a frame taxonomy of subtopic for artistic construction is introduced. The frame taxonomy joins the tectonics education and reframing taxonomy. In this context I will discuss two educational case studies I performed at two different academies. The workshops are based on the use of subtopics and the frame taxonomy. By framing the problems in pre-set exercises, students created designs of light elements and artistic sculptures.

KEYWORDS: Reframing, Framing, Tectonics, Education

1. Introduction

For several years, I have been involved in research and education at various academies and faculties of the arts and architecture in Belgium and the Netherlands. I have organized numerous craft and material orientated workshops over Europe. During these workshops a change in the student's attention is noticed. In time, architectural practices became more complex and students started to specialize themselves in certain areas in early phases of their education. Conceptual design, animation and rendering has become more and more important to them. While conceptual design can be described as the earliest phase in the architectural process, animation and rendering are more related to the final phases. Therefore, during these workshops, students have difficulties in bridging the gap between these focus areas. Attention to architectural detailing, material development, model making and hands-on physical workshops are suffering under the enthusiasm for digital computation.

In educational workshop environments a great amount of architectural students I worked with get frustrated with the reduced ability to think and act outside the digital field. With the absence of material reflection within the digital designing process, tacit knowledge to experiment with craft and production isn't generated and consequently hard to access.

Compared to the classically trained architect, the learning preference of this generation of students has changed. Known as generation Y (born between 1982 and 2002) (Paine, 2008), these students make decisions by a trial-and-error, active and often unstructured approach. With a more hands-on way of working, they value learning-in-action over studying by head-knowledge (Schön, 1984).

In this research, *"framing"* and *"frame experimentation"* is discussed as a potential method or approach in teaching to accompany this change in learning. In this light, framing is used as a "conceptual scaffolding". This scaffolding has already been used by Benford (2000) in a different context to organize experiences and guide the trial-and-error approach to meaningful tacit knowledge as well as head-knowledge. He found out that by framing, one can simplify and condense an event in order to make its understanding more efficient.

Motivated with these observations and facts, in this paper, I aim to discuss the opportunities and challenges of using frame experimentation in artistic construction and designerly making. In this context, I will start my study with a background study on tectonics (Section 2.1) and briefly review the concept of framing (Section 2.2). Then I will introduce my own frame for artistic construction (Section 3). Following, I will present two case studies as preliminary experiments for testing the introduced frame (Section 4). Finally I'll draw up conclusions, reflections and future prospects (Section 5).

This research discusses a wide field from engineering, structural design, materialization and craft to cognitive psychology, didactics, framing and frame experimentation. Since I'm not professionally educated in all described field, some topics are discussed more extensively than other.

2 Tectonics, the Structural Turn and how it relates to Frame Experimentation

As referenced in the introduction, this paper combines knowledge from two different fields, tectonics education and frame experimentation. Therefore, in this section, I will make a brief review of tectonics and education, and afterwards, I will link these topics with frame experimentation as introduced by Goffmann (1974).

2.1 Tectonics, the Structural Turn and Education

In the last two decennia, subjects like craft and tectonics have resurfaced in architectural discussion and education. The meaning of "craft" or "craftsmen" has been described quite clearly and consistently in a wide variety of literature (Sennett, 2008). The meaning of "tectonics", on the other hand, seems to evolve through time. With this, the message of tectonics has become somewhat ambiguous.

One of the first well known studies in tectonics was performed by Gottfried Semper, a German architect and art critic who lived during the 19th century. In his work he wrote extensively about the origins of architecture and technical arts through time. In his book "der Stil", Gottfried Semper describes a distinction between the "core schema" (i.e. core-form) and the "art schema" (i.e. art-form). In this dichotomy, the core-form represents the constructional principle of architecture, the art-form represents the ornamental principle. However, with a more contemporary point of view, Semper (2004) argued that, when a clear distinction between the two forms is made, the art-form is masking or dressing the core-form. When the distinction between the core-form and the art-form blurs or disappears, one can speak of tectonics. In this case, structure itself becomes both art-form as well as core-form (Semper, 2004).

In several artistic disciplines today, tectonics evolves differently. In contemporary architectural discussion, tectonics often expands to architecture as a technical craft (Frampton, 2001). In a more particular description, tectonics represents the unity of opposite pairs: representation and structure, art and technique (Kollhoff, 2001). With this broader conception of tectonics more qualities are incorporated into its meaning.

On the one hand, the broadening of the meaning of tectonics, as described in Semper's work, blurs its essence. On the other hand, this renewed interest in tectonics in the architectural discussion makes way for a new structural logic of buildings. Since, in this discussion, representation and structure are treated equally, architectural interests shift towards engineering and vice versa. In this so-called "structural turn", the traditional relationship between architect as a creator and a problem-solver engineer has changed (Leach, 2004). Engineers started to pay attention to the aesthetic qualities of structure; architects formulate concepts with structural qualities as a starting point. With a growing mutual respect, interdisciplinary practices emerge. In engineering architecture, normally a strictly technical profession, different parties negotiate and interact. With their own specific knowledge and interests, all participants contribute to a final design (Cross, 2011).

Within this structural turn, structural integrity of buildings is often studied digitally. In the book “Digital Tectonics” the seemingly contradiction of this title is discussed. For Semper, tectonics only resonate with the material world. According to Leach (2004), digital tectonics are supported by the immaterial world of scripts and algorithms. These two worlds seem total opposite, but strangely enough, it is this structural turn that make tectonics and craft valuable in education to bridge the gap between concept and digitalization. Where in traditional craft, precision and techniques are practiced and trained during a great part of the craftsmen’s existence, students are able to reproduce a great part of these techniques and precision by using programming and digital production.

To be able to design and work with craft digitally, the student has to be informed about the possibilities and master the ground principles physically. Acquiring and educating knowledge in arts in general en craft in specific differs greatly from more traditional research in sciences and humanities. Through physical exploration and experimentation in models and mock-ups, the understanding of material is extended. Just like a craftsman, the aspiring artist explores the dimensions of skill, commitment and judgment in a particular manner. By framing a problem and reframing multiple times, the artist is constantly reflecting on the process. In this process the immediate connection between hand and head is calibrated. In this reflective practice thinking is accompanied by doing. With this tacit knowledge, a gap is bridged between understanding and making, theory and the actual solution (Sennett, 2008) (Schön, 1983).

2.2 Reframing of Frameworks

Since halfway twentieth century scientific research as a base for professional practice has increased rapidly. Research with a positivist background supported practicing designer and engineers with applied mathematics and science-based technology to contribute to a science based society (Dorst, Dijkhuis, 1995).

In the positivist approach, research and design was practiced as a rational process. Design methodologies like the work of Herbert Simon (Simon, 1996), are more influenced by theory of technical systems rather than designers and design problems. Because of this non-emotional approach, this model won’t apply very well to research in arts and Generation Y education purposes.

In comparison to the positivist research, constructionist methods in research and design techniques fit the purpose and preferences better. Constructionist methods are based on reflection-in-action or learning-by-doing. These methods are heavily influenced by the work of John Dewey and Donald Schön (Schön, 1984) (Waks, 2001). In contrast to the positivist pre-defined approach, constructionist theories explore and describe how learning happens in action.

Constructionist theories define research problems as unique which make them very effective for arts, social sciences as well as Generation Y. (Dorst, Dijkhuis, 1995) (Paine, 2008).

With ill-structured, ill-defined or wicked problems, design research has developed differently from the scientific approach (Rittel, 1973) (Cross, 2007). The researchers learn by *assimilation* and *accommodation* instead by head-knowledge. In the constructivist theory, *assimilation* is used to fit new experiences into what one already knows. *Accommodation*, on the other hand, is the mechanism by which failure leads to learning. By using framing in solving ill-defined problems, we understand the experience at hand. With the applied framework, a solution space is defined and its content simplified and condensed. In some cases framing fails. In these cases, the experience conflicts with the existing frame; we fail to fit the experience within the contours of the frame applied. Like in computer games the player learns by failure and works a way through the different levels. Like gamers, positivist researchers reframe experiences into different frameworks until the contours fit the conflicting experience.

The frame and the concept of framing used in this procedure are of considerable importance in social sciences today. Frames in general and "Collective Action Frames" in specific help to render events, organize experiences and guide actions (Benford, 2000). In describing frames, the word "salience" is often used. By making something more *salient*, one makes information more noticeable, meaningful, or memorable for its user (Entman, 1993).

The frame and the conceptualization of framing originate from the work of Erving Goffmann. In his work "Frame Analysis" (Goffmann, 1974), Goffmann discusses the relevance of a condition in which a certain given is understood. By understanding within a "world" or "reality", selective attention organizes experiences and generates meaning within a certain event. In other words the frame can be used as "background", "setting" or "context".

The quality of using frames and the juxtaposition of frames existing today are discussed quite clearly in a wide variety of research and literature (Benford, 2000) (Goffmann, 1974). The systemization of manufacturing or selection of the frames themselves is often missing in these texts. Since frames vary in degree of organization, some are presented neatly and rigid while others tend to blur or change in interaction (Koening, 2004).

To provide the framework, used in this research, with a rigid structure but a possibility to change and interact, a taxonomy is used to describe its content.

3 Frame Design of Artistic Construction

In this section, I introduce a theoretical scaffolding together with a taxonomy of design problems for artistic construction which joins the tectonics education and framing topics. As a starting point for the frame construction, the cognitive abilities of the user as described in the work of George A. Miller (1956) is used. The content of the taxonomy is adopted from various material and construction literature.

According to the classical research of Miller (1956), the amount of items a person can store in the short-term memory is seven plus or minus two items. During the memorization of these items, the brain's recoding process can combine different bits of these items into chunks (Miller, 1956). Taking these limits into consideration, the frame taxonomy is divided into seven supertypes vertically. Every supertype is divided into a maximum of five subtypes horizontally.

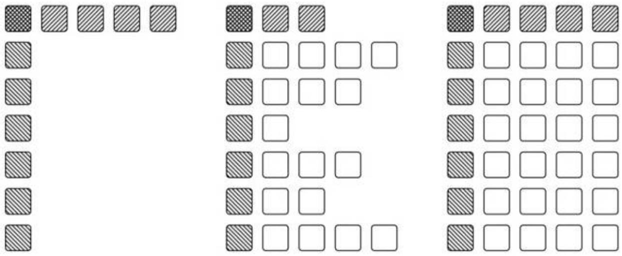

Figure 1 a, b, c (1a) Division of taxonomy in 5 parts and seven rows (1b) Inconsistent taxonomy (1c) Consistent taxonomy.

Every subtype is related in topic to the supertype it is a part of. In order to make remembering more easily, all rows are spread evenly in parts of five. In this case the student has to remember seven times five subtypes, she doesn't has to remember the amount of items per row itself. The choice to do so resulted in one subtypes being more condensed than the others.

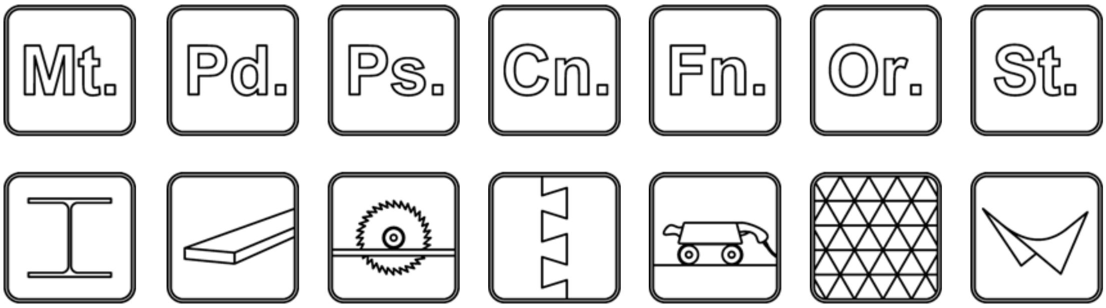

Figure 2 Supertypes as Abbreviation, Visual Subtypes as an Icon

While learning construction and materialization, the student has to possess or strengthen the ability to visualize something she cannot see directly. Materialization, for instance, requires the depiction of a joint of three axes to understand the influence it has on the difficulty of connection detailing. On the other hand, students are challenged to picture internal forces in a structure to understand the structural integrity of the system at hand. When comparing geometric reasoning of students in arts to students in psychology, the performance of students in arts is significantly higher. In specific, the higher, educated or improved visual and spatial skills of art students form a causal effect on these outcomes (Walker, 2011). In general, greater visual orientated stimuli of digital games, movies and programs can have an effect on the visual stimuli of the Generation Y cognitive system. By training and educating students more visually, one can improve upon these skills and educate more effectively concurrently.

To accompany this ability, the proposed frame taxonomy is designed visually where possible. Each subtype icon is depicted by a prominent part of its content. The consequence of using pictograms is the necessity of proper instruction. The user has to be informed about the content of the subtype the icon represents. The advantage of using icons is the ability to support thinking visually first and the reduction of information one has to share to communicate second.

The following figures (Figures 3-4) can be considered as an exercise communicated in the traditional text first and by icon second. Experience tells that artistic students start drawing immediately to make sense out of the written description. On the one side, this recoding by drawing can enhance the ability to understand written exercises. On the other side, parts of the exercise are often mistranslated or left out. As a result, the students end up with an incomplete project. By using icons, students are able to distinguish the multiple sub problems and incorporate them in the final design.

One has to design a shelter for 4 persons to wait for a bus connection. In this design one has to design with the qualities of surface active structures by using wooden strips in a triaxial orientation. One can manipulate the strips by cutting. The different parts have to be connected together with mechanical fasteners. The surface has to be smooth to avoid injury during use.

Figure 3 Textual Exercise Description

Figure 4 Visual Exercise Description

The frame taxonomy is divided into seven supertypes. For the icon of the supertypes an abbreviation is used. In practice it proved to be hard to find a general icon to describe the entire subtype effectively.

The following supertypes are distinguished:

- Mt. - Materials
- Pd. - Products
- Ps. - Processing
- Cn. - Connection
- Fn. - Finishing
- Or. - Orientation
- St. - Structure System

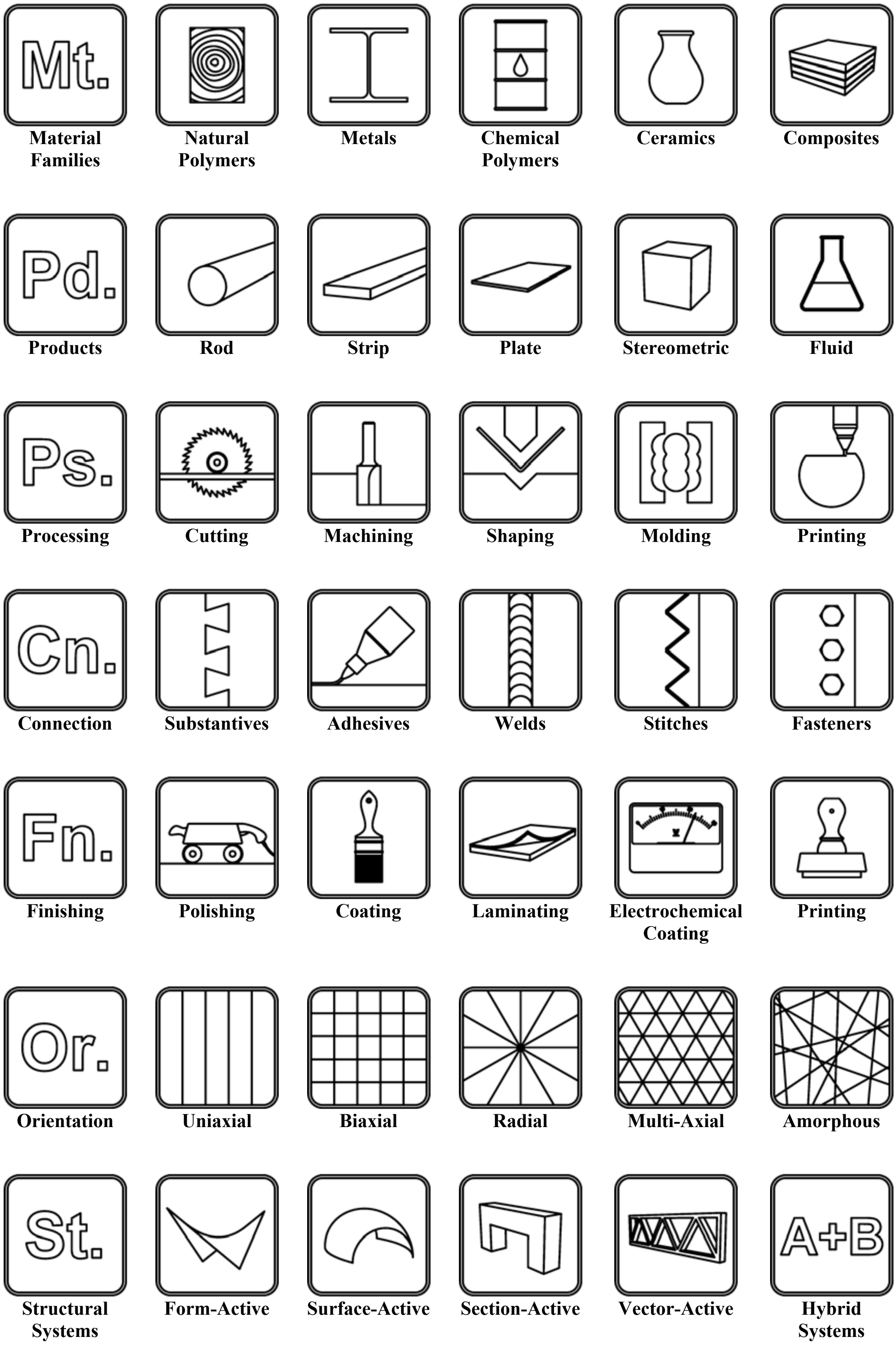

Figure 5 Supertypes and Subtypes Taxonomy; Material Families (Martin, 1996; Bucquoye, 2002; Ashby, 2007; Kula, 2009; Engel, 2007)

4 Preliminary Educational Experiments

I have made two preliminary workshop applications for testing framing in general and the former framework in specific. In this section, I am going to introduce these workshops in the form of case studies. In both of the studies, the students were provided with five subproblems from the frame taxonomy. Every subproblem had to be incorporated within a design. Both studies involved first year students. The students were not given any information on structure systems besides our frame.

4.1 Case Study of Workshop 1

This study was an exercise for first and second year students Spatial Design in the course TKO (Translated as Technical Knowledge Development). The whole group consisted of about 90 students. Because of the high number of students, the reviews were performed in groups of 6 to 8 persons. As a result, there was limited time to work with students individually.

Figure 6 Light Element Studies (An icon set illustrating the combination of subtypes used in workshop 1)

The students were asked to make a light object that spans between two points. In materialization, they were allowed to use any kind of non-standard model materials such as plastics and metals. By curving and folding they had to reinforce the material to be able to span the distance. The connection of the parts had to be detailed with mechanical fasteners.

Figure 7 Paper Geometrical Studies

To increase the difficulty of the exercise gradually, the students performed form studies in paper first. This was an open exploration of both the form and structural possibilities within the context.

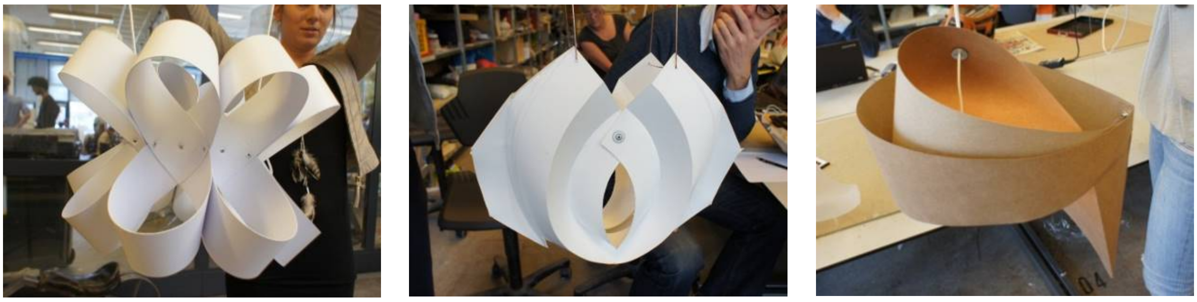

Figure 8 Light Elements, Final Models

At the final review the model was criticized on every subproblem. Most students were able to work with the non-standard model plate material. The reinforcement by curvature subproblem developed a wide variety of interesting forms. Both of these subproblems were discussed during the prior form study. The subproblems not addressed in the form study proved to be a challenge. Students were struggling with the dominant direction of the span and had difficulty to incorporate fastener details into the design.

4.2 Case Study Workshop 2

This study was an exercise for first year students Interior Design in the course Materials. The group consisted of about 70 people.

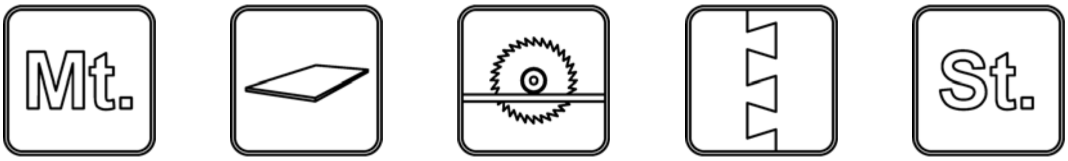

Figure 9 Artistic Sculpture Studies (An icon set illustrating the combination of subtypes used in workshop 2)

The students were asked to design a double curved sculpture using 3D modelling in the CAD program Rhino3D. By given procedures, the student had to pattern the curved surface next to be able to print it. Then the student was asked to assemble the patterns in paper first and rework the paper model into a different material next.

The students were allowed to use every non-standard model material. They were able to use every way of cutting. The connection of the parts had to be as substantive as possible.

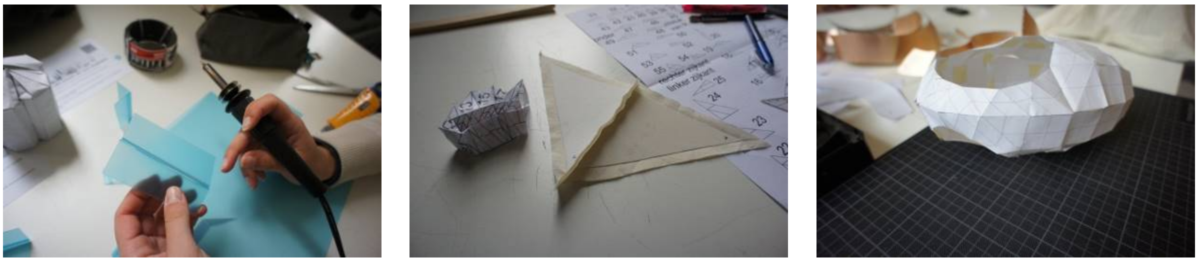

Figure 10 Geometrical and Connection Studies

By working on every subproblem first, the student acquired knowledge by doing. By working on connection details and cutting procedures, most problems were provided with a solution.

Figure 11 Patterned Sculptures, Final Objects

As a result of working on the sub-problems first and incorporating them into the design next the success rate of a complete exercise was higher than the previous discussed study. Most difficulty was experienced in the detailing. Some students worked on a detail in one angle, but failed applying them to others. Reworking their detail often resulted in less refined solutions.

4.3 The Comparative Evaluation of the Studies

By using framing in the workshop exercises, it was possible to cut up complex assignments into easy to assimilate components. By dividing chunks into smaller bits, problems were easier to pinpoint and by isolating specific knowledge it was less difficult to comprehend by the student.

I acquired research conclusions by comparing the two workshops case studies. The first data collection was generated by evaluating the results. For every design the amount of incorporated subproblems was add up. The results are presented in percentage of students to the specific subproblem in figure 12. The second data collection was generated by a combination of open-ended interviews and direct observations.

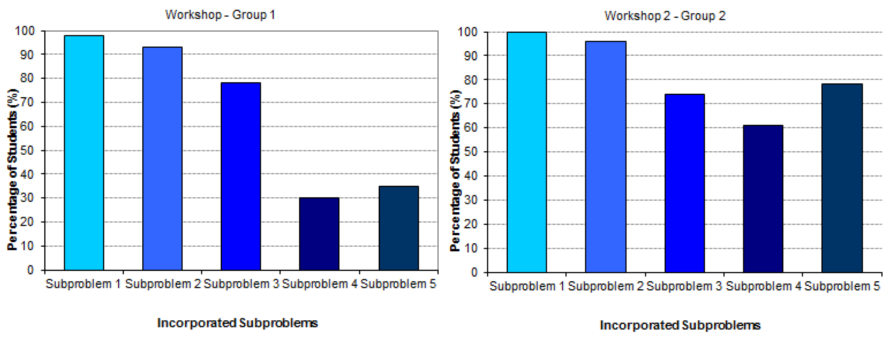

Figure 12 Comparison of the number of subproblems incorporated by the students in workshop 1 (on the left) and workshop 2 (on the right).

The suggested frame for artistic construction was successful in highlighting the subproblems of the design at hand. On the one hand, by dividing the abstract task into noticeable elements, design decisions become more meaningful and better contextualized. By addressing the problem within a context, the design solutions become easier to work on as well as more memorable. When we compare the second workshop to the first, the subproblems were approached individually first. By isolating the subproblem physically first, it becomes more salient than addressing it mere theoretical. In the second workshop, more subproblems were incorporated into the final design than the first one.

In conversations during both workshops, students were able to describe their problems better compared to other design workshops I attended. By a distinction in parts students were able to point out their strengths and the subproblems they have to progress on. By having design parts to work on, they describe a better oversight of the problem and showed a more efficient way of progression. Because the student sees the problem more clear, she understands the problem easier with a more efficient working process as a result.

In my observation, the results of the second workshops were more cohesive compared to the first. The student was better able to balance head-knowledge to describe its theoretical content, to the tacit knowledge used to answer the subproblems or build the design. Because of the structure by subproblems, students were able to learn from each other more easily. In dialogue they were able to ask the right question and look for the right solution. In reviewing the work, little discussion was necessary. By addressing criticism to the separate problems, students understood their strengths and weaknesses of the design.

5 Conclusions and future prospects

In this study I have introduced a novel frame for artistic construction. I presented 2 case studies and found that working with framing by addressing subproblems can help a student in the design progress and the teacher in construction and craft research, education, workshop and review. By framing general subproblems in a taxonomy, a conceptual scaffolding is provided. By using this frame taxonomy, experiences of the student can be organized and trial-and-error approaches can be guided into meaningful tacit knowledge as well as structured head-knowledge.

In general, framing in a taxonomy can provide an overview of the complete gamma at hand. In specific, the suggested taxonomy provides an interpretation for the student to understand the built environment and herewith successful in highlighting the subproblems of the construction of the design at hand. The effectiveness of the taxonomy is increased by using visual representations of its components. In the form of icons with a small description, the taxonomy content is presented.

In education, we can benefit by framing from lectures to workshops and research. In lectures it can provide an oversight of the topic by pinpointing its subcomponents in an organized order. By breaking chunks into bits, the content is easier to communicate for the teacher and more effective to comprehend by the student. By using framing taxonomies in workshops, students are able to evaluate their work more easily. By addressing one subproblem at the time, increases the focus of the problem at hand and makes discussion more effective.

In construction, students were able to describe their design problems better. By a distinction of the main problem into parts, students were able to point out their strengths and the points they have to progress on. By having design parts to work on, they described a more efficient way of progression.

As a future prospect qualities of frame experimentation and reframing are studied. The framework can be extended by reframing and frame amplification.

The educational method can be improved by pairwise integration methods. Accordingly, Bloom's taxonomy has great potential in cognitive qualities and reviewing techniques of the research.

The frame is promising in terms of teaching more efficient, helping students work effectively and making the design results more reliable. I believe including the added knowledge collected by rigorous testing and the suggested improvements, it can serve as a valid tool for tectonics learning in artistic and architectural design schools.

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