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FROM GESTALT TO EXPERIENCING – 2D/3D DESIGN FUNDAMENTALS EDUCATION IN DIFFERENT CONTEXTS

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ABSTRACT
Fundamentals of 2d/3d design have been taught since before (product) design curricula were developed in the early 20th century. Since then, design fundamentals education seems to have undergone major changes as design education in general. On the one hand, the theoretical and pedagogical basis of design fundamentals is based on traditional concepts, such as aesthetics, Gestalt psychology or the use of material.
On the other hand, concepts that have only recently become relevant for design are now also part of design fundamentals lectures: with regard to humans experiencing and interacting with products (product experience, UX etc.) tutorials in affordance theory ([7] and others) and narratives have been anchored besides traditional elements, such as aesthetics, proportions, and the like.
This paper outlines the historical roots and concurrent theoretical framework and provides selected examples of two different programs of design fundamentals. These are the relatively highly formalized and compressed design fundamentals in the specialization program of Industrial Design Engineering at Technische Universität Dresden as well as two- and three-dimensional design fundamentals in the slightly broader program of Integrated Design Studies at Anhalt University of Applied Sciences in Dessau.

Keywords: Design fundamentals, aesthetic judgment, industrial design education

1 INTRODUCTION

In Germany, design education – and thus education in design fundamentals – has its roots in applied arts schools, the Deutscher Werkbund, the Bauhaus and in the free arts. This is associated with a strong focus on the actual doing and experimenting with materials – today often associated with the "material-specific" workshops of the Bauhaus. One of its aims is to explore the design potential and also the limitations of the material and offer appropriate solutions. Historically, artistic, creative and perceptual fundamentals were established at many art schools, involving tutorials in color, 2d/3d shapes, sculpture and space (cf. [1] for a comprehensive overview of the development of design education in Germany). In addition, representation techniques (drawing, CAD, photography, etc.) play a significant role in design education as a basis for subsequent design projects. And at least since the Ulm School, methodological and scientific aspects of designing were increasingly anchored in the curricula of many universities.
Problem solving or developing innovative products and systems are moving more and more into the focus of design basic training. These developments raise the questions: which status does design fundamentals education have today and what role does aesthetics play. This paper aims to present two examples of quite different schools of design – the TU Dresden and the Anhalt University of Applied Sciences in Dessau – which offer historically rooted, yet contemporary design fundamentals.

2 THE DIVERSITY OF TEACHING DESIGN FUNDAMENTALS

Heinemann and Horning [6] described the objectives of the "design fundamentals education" (for their school) in 1983 as the communication of "knowledge of the most important laws of aesthetic perception of shapes and colours, [their] creative application [...] to endow students with the ability to

judge." (transl.) Today the conception of design fundamentals is broader. Birgit Gurtner [4] states in her analysis of current concepts of design fundamentals education that a single definition or content description cannot be found, yet she outlines three basic approaches:

- "formal syntacticx [...] elementary 'school of seeing'; often rational, methodical; historical roots" (ibid., p 31, transl.)
- (drawing) education focused on nature and perspective
- conceptual and recipient-oriented design fundamentals, "often with social and artistic implications" (ibid., transl.).

The "more scientific approach" to design at the Ulm School of Design led to a stronger methodological underpinning of the design fundamentals [2]. As a consequence, design schools in both German states more or less continued this approach. As part of this development, for example the study of design methodology and Gestalt psychology have been included in the design fundamentals education. Since these psychological perception effects will probably always rate high, they remain relevant even today. In addition to traditional aesthetics, semiotics became an essential part of design fundamentals. Phenomena of semantic qualities and pragmatics of designed artefacts may also be explained by perceptual psychology – and have a high priority for the design fundamentals education. This is confirmed by the accomplished paradigmatic shift from static design objects to the interaction between humans and designed artefacts. Semantic evaluation (and semantic design) is needed to let humans experience the inherent properties of artefacts – though subjective (~ly designed) but general (in reception). Is this drill press powerful? Is this car fast? Such questions are strongly linked to the pragmatic meaning of artefacts. As meaning in the application context and the object's environment, pragmatics also include the concept of affordance ([3], among others): Sit on it! Turn me! Click here!

Syntax, semantics and pragmatics are treated both individually and in their interdependence in design fundamentals education. The communication between an artefact and its (potential) users is also a subject of cognitive ergonomics and usability. Semiotics, usability and affordances are closely connected and form the main content of design fundamentals education today.

Following the experience paradigm (Product Experience, User Experience etc.), designers are even more faced with the need to tell stories. Viewing product experience and product interaction as a process, designing always involves narrating. Accordingly, Norman [7] claims that the ability to develop stories is a prerequisite for designers. If this requirement is taken seriously, narration must be part of the design fundamentals education. In terms of didactics, this can be implemented by interpreting experience and narration as complex applications of semiotics – from signs to stories.

3 AESTHETICS AND JUDGMENT

Still, aesthetics is the basis of all design fundamentals, at least as an evaluation criterion.

Following the etymological origin of "aesthetics" as "perception" and "sensation" (aesthesis), aesthetics can be understood as the science of how people perceive artefacts (cf. "aesthetics" as empirical aesthetics research in terms of the measurement of the perception of "beauty").

In contrast to this, traditional (German) philosophy and sociology deal with aesthetics as a theory of beauty and art – but again there are different readings. In the particular context of design, Kant's "Critique of Judgment" and its "aesthetic judgment of taste" is important [6]. Here aesthetics refers to the beautiful and the sublime. Kant's description of aesthetic judgments as made subjectively but being generalizable (the claim of universality which is not to be confused with the findings of today's empirical aesthetics research that empirically measures the assessment of "beauty", i. e. quasi-objectively). This is an important prerequisite that allows designers to decide subjectively how the aesthetic dimension of artefacts may be generally assessed. According to Kant, a judgment of taste is disinterested, so it is not connected with any purpose. In this sense, many artefacts developed within the design fundamentals education are without purpose. Accordingly, any (positive) evaluation of an artefact has nothing to do with purpose (e. g., social or technical function). Nevertheless, artefacts should not simply be judged as "beautiful" or "ugly" – rather than that it should be evaluated how an artefact incorporates various sensory dimensions in order to define its aesthetic position.

4 DESIGN FUNDAMENTALS AT TU DRESDEN

At TU Dresden, the Industrial Design curriculum is placed in so-called advanced modules as a specialization within a modularized diploma course in mechanical engineering. Industrial Design

shares its exotic status within the program and within the Faculty of Mechanical Engineering with other disciplines, such as ergonomics. Students of the Industrial Design program graduate with a degree in mechanical engineering (the degree Diplom-Ingenieur is regarded as the equivalent of the MSc or MEng), although nearly 100% of them later work as industrial designers in design divisions, design studios or as freelancers.

Högner developed his "basic training in visual-aesthetic designing" [8] at the art school in Berlin-Weißensee in the 1960s, his followers held on to this concept and established it at other design schools. Högner himself brought his approach to TU Dresden, initially as an additional qualification for engineers. Today, it is still the conceptual basis of the basic 2d/3d design training.

For organizational reasons, the major part of the design fundamentals education is carried out in the sixth and seventh semesters, after the extensive engineering and science courses (1st–4th semester) are completed. The short time frame of the remaining studies requires that the teaching of design and the theoretical foundations and the practical design projects overlap, at least partially. In this paper, the elementary fundamentals of 2d/3d design will be considered in more detail, because they are exemplary of the other design fundamentals courses.

The analysis and evaluation of shapes and artefacts is substantially based on concepts of semiotics, geometry as well as the aesthetic judgment of taste. While students at many design schools are confronted with aesthetics as a philosophical theory of perception or of art and design in theoretical courses, aesthetics is here reduced to a practical criterion. However, it is the central criterion in the design fundamentals and is taught as such, and the aesthetic judgment is developed forming an awareness of the aesthetic qualities of elementary design.

To address the tense interplay between the necessity to satisfy this criterion and to integrate the students' previous engineering education, a differentiated aesthetic assessment scheme was established. Students start applying it to shapes of low complexity (e. g., figure-ground contrast). As the students' design fundamentals education progresses, the complexity of shapes and objects increases, the assessment scheme is internalized and finally applied intuitively. Within the scheme, both objective "correctness" (e. g., via design rules or curve analysis) and subjective "appeal" (aesthetic judgment) are evaluated – initially explicitly and step-by-step, later on more fluently and intuitively. On the basis of this assessment, a particular change to the shape or object is defined and implemented. The result can then be re-assessed. Care is taken that the changes (e. g., angle, radius/curves) do not relate to too many properties at once. So on the one hand, their influence on the assessment can be better traced (and learned). On the other hand, the interdependence of different formal properties on each other can be recognized more explicitly, e. g., after strong rounds have been added to a designed shape, (previously) well-balanced angles must be re-optimized in order to obtain an aesthetically satisfactory result.

In the course of the semester, students work on increasingly complex tutorial problems of two- and three-dimensional design at the same time. Two-dimensional and three-dimensional tutorials complement each other in terms of content and are run in parallel. The tasks are built on content of upstream courses (as freehand drawing) and are continued and applied in later courses (such as the CAD modelling of aesthetic free-form geometry).

5 DESIGN FUNDAMENTALS AT HOCHSCHULE ANHALT IN DESSAU

The Department of Design at the Anhalt University of Applied Sciences in Dessau was founded in 1991. The seven-semester Bachelor program "Integrated Design" combines the classic design disciplines of product design, visual communication and time-based media. Following an interdisciplinary approach, all students accomplish all eight fundamental design subjects in their first year regardless of their (later) specialization. The design fundamental are certainly strongly influenced by the different backgrounds of the respective eight teachers, hence it can not be traced back to a single tradition. In this paper, the focus lies on the subject "2d/3d design fundamentals" which is a central element that links the fundamentals of product design with neighbouring disciplines. In the 3rd semester, orientation and elective modules are offered that increase the previously learned fundamentals and extend them experimentally before the students start to set their focus on visual communication, product design or time-based media in the 4th semester. The design fundamentals education in Dessau basically follows a classical approach incorporating various drawing techniques, material and technology studies and technology as well as artistic and design fundamentals.

Methodological approaches on designing aesthetical artefacts are primarily taught in “2d/3d design fundamentals” as presented in this paper.
Aesthetics play a central role in almost all tutorials of the design fundamentals in Dessau, they are accompanied by tutorials on perception and by developing sensitivity and an understanding of aesthetic shapes. Formal aesthetic studies and their analysis are part of the curriculum as well as tutorials on semiotics. The curriculum also includes tutorials that focus on the development of skills that allow students to analyze and evaluate existing design examples from an aesthetic point of view. At an advanced stage (beginning in the 3rd semester), narrative tutorials come into play. A particular focus lies on the ability to tell stories about their own designs or to encourage users to think. The concept of aesthetics is frequently used as evaluation criterion, however without a formal evaluation scheme as described above for TU Dresden.
Some of the tutorials are real ‘classics’ of design fundamentals, and were taught in one way or another at other schools decades ago. Others were developed at Anhalt University of Applied Sciences to respond to the specific requirements of integrated design studies in Dessau, or to embrace current design trends.

6 EXAMPLES OF BASIC DESIGN TUTORIALS

Many of the design fundamentals exercises at TU Dresden and Hochschule Anhalt aim at developing sensitivity and an understanding of aesthetic shapes, at designing material-adequate shapes and structures, and also at communicating semantic messages through form.
The design fundamentals education with its components is consistently aiming at producing aesthetic results (partly as a vital criterion of the task, partly as an implicit requirement). Below we discuss some of the practical 2d/3d basic design tasks offered at the two higher education institutions.
Early on during the design fundamentals education, students conduct a product analysis which is designed to exercise the (correct) use of (correct) terminology and also to offer access to understanding the aesthetics of elementary formal elements. At TU Dresden, the tutorial *Analysis* focuses on the semiotics of small consumer products. At Anhalt University of Applied Sciences, the analytical framework is broader: The tutorial on a blog about »bad« design – does not only teach students aesthetic and formal judgment of taste, it also aims to develop the students' ability to identify non-functional products, badly thought-out systems or ethically inappropriate designs. The analysis of the discussions shows that students independently and repeatedly refer to aesthetics as an evaluation criterion.
The tutorials *Paperlab* (Dessau) and *3d Freeform Interpretation* (TU Dresden) deal with the interpretation of a given object in a given material (paper or plaster) with the aim to make students sensitive for the aesthetic qualities of three-dimensional geometry and also for experiencing the handling of materials. These two skills are prerequisites for other tutorials and are further extended. Dealing with paper is subject of the basic tutorial *Package Arrangement* at TU Dresden and also as a possibility of rough prototyping in design workshops. The major content of the traditional design fundamentals exercises is taught in two-dimensional and three-dimensional semiotics of aesthetic forms (Figure 2). The semiotic categories are completed by pragmatics. The latter is part of a tutorial on designing the affordance character of simple objects. Students are required to develop a pragmatically refined design for given interaction forms for given volumes and – at the same time – to implement these forms aesthetically and using uniform design vocabulary (shared family identity). While working on a task, students will learn to understand the mutual influence of syntax, semantics and pragmatics of an object.
Narrative elements play an important role in the 2d/3d design foundation course in Dessau. For example, the tasks "Design Monster" and "Paper Portrait" aim to tell a story in a visual manner (Figure 4). In the exercise “Talking Objects” the task focuses on narration. The ability to tell stories through a design and thus to inform the recipient or user to entertain him/her, or to encourage a critical reflection on her/his own course of action, should be investigated. The result is a series of more or less ‘purposeless’, narrative objects that tell a poetic or ironic story.

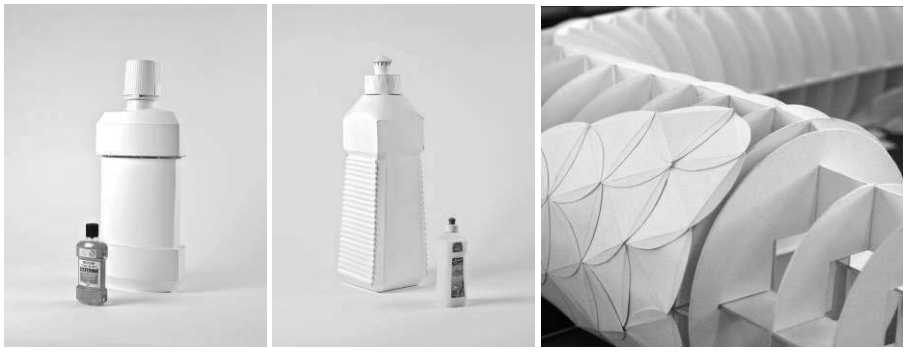

Figure 1. Ttutorial »Paperlab« – reconstruction of everyday objects in paper, M 3:1, HS Anhalt left: Listerine by Kristin Sauer & Christian Schamari, centre: Fit liquid dishwasher by Aileen Wilke and Sascha v. Oettingen, right: paper construction – to the detail, 2011)

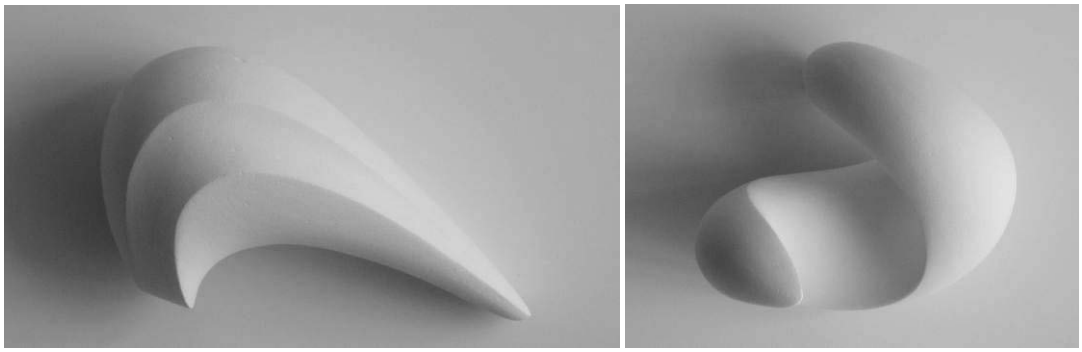

Figure 2. Semantic freeform sculpture, TU Dresden (plaster of Paris, approximately 10 cm, left on the concept »powerful«, Janine Kasper 2012; right on the concept »sensitive«, Lisa-Marie Lüneburg 2012)

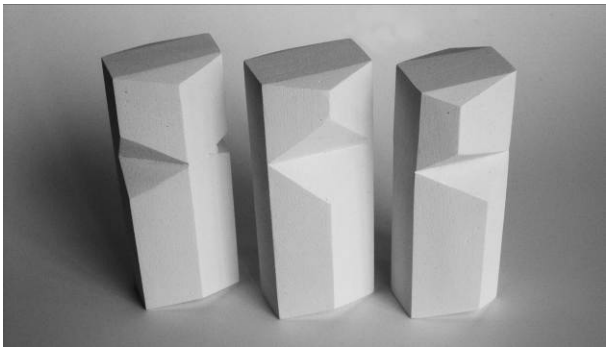

Figure 3. Tutorial »Pragmatic Forms«, TU Dresden. (PU foam, from left: Bending, Pulling, Turning, Fanny Hauser 2012)

Figure 4. Tutorial »Design Monster« – Visualization of a Given Concept Using Paper and Orchestrated Photography, HS Anhalt (left: »Enthusiasm«, Frederik Dühsler, right: »Nostalgia«, Maximilian Fuchs, 2012).

Figure 5. »Talking Objects« – HS Anhalt, Time Telling Machine; Criticism of Everyday Stress (Design: Frederik Dühsler, 2013).

7 DISCUSSION

This paper analyzes the design fundamentals education at two different German Universities, with the goal to identify new trends and focal points within design education. The two analyzed courses demonstrate a shift from traditional craft and aesthetic education, as it has been known in the past century, e.g. in the German Bauhaus, towards more current streams of experience design, problem solving, and design narration. A product can tell a story, the context defines the product experience, and students should learn to critically discuss a design. Although the traditional pillars of design education, such as form studies, material experiments, or construction exercises, are still relevant and play their part in the two analyzed institutions, emerging concepts like user-centered design, critical design, affordance, and narration, have become equally important in today's design fundamentals education.

Although the two analyzed design institutions represent only a narrow insight into today's' design education, we believe that the presented cases in this paper indicate a shift in design education that warrants further research, e. g. in other institutions. Furthermore, the presented examples of design exercises might inspire design educators to implement new forms of exercises that allow for a user-centered, experiential, or critical discussion among design students, starting already from the first year of their education.

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