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FELICITIES AND FALLACIES OF TEACHING DESIGN THEORY: A COMPARATIVE STUDY

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ABSTRACT
The scope of design has changed significantly in the last decades - from a focus on material aspects to the intangible, from functionality to pleasure, and from making products to providing services and experiences. Even if being aware of changes, design curricula rarely reflect theoretical challenges and opportunities connected with these issues. Design educators do not only struggle with the complexity and the metafix feature of their discipline but also with the fact that its basic conjectures are seldom made explicit, which in turn impedes possibilities for teaching design theory to students. The paper discusses the question of how to facilitate the understanding of design theory introductions by comparing two curricula. The objective of these is to provide design students with the ability to understand and implement design theory in their practice. Following the introduction, which positions the paper in a specific learning context, the second section describes course requirements, tools and methods applied in two teaching approaches. Based on a comparison of the two courses the third section points out barriers and opportunities, such as a contextualization of theory teaching within more applied activities in design education, and discusses ways of enabling different types of learning related to design theory.

Keywords: Design theory in education, values of design methods, methods for teaching, students' maturity and progress, learning methodologies at different stages of design curricula

1 INTRODUCTION

According to Levin [1] "There is nothing so practical as a good theory". However, the design community still treats theories either as something foreign to practical design work, or as an instrument that can be applied as a recipe without much understanding of underlying values or conjectures. Even if the objects of design activities have gradually shifted from physical artefacts to encompassing interaction [2], values and social systems [3,4], from functionality to pleasure [5], and from making products to providing services and experiences [6], theories on how these changes influence design as an academic and practical field are still rare. Even if professions such as the design academician have emerged, design educators still struggle in many cases with theoretical skills to reflect these changing objects of design, which point to a need to adopt and adapt new knowledge from other disciplines.

1.1 Design theory and its contribution to education

Design draws on knowledge from different domains. Analytically, the design professions can be considered as consisting of different knowledge types (see fig.1) that are in concert with each other to varying degrees. The term *professional knowledge* relates here to being familiar with design theories, tools and methods, to select important information and to find high quality expertise based solutions, e.g. through knowledge of case studies. It is achieved through specialization and successful training in design education. In the triad of design theory, methods and tools, theory constitutes the fundament for the latter often consisting of basic statements or definitions such as "design is (-problem-solving, communication, reflection-in action etc.)", "the tasks of the designer consists of" etc.
Cultural knowledge relates to the development of aesthetic, social and intellectual abilities. It means to ask how humans and societies give meaning to the world and things around them and define their place in that world. There is no "Know-how" of cultural knowledge in terms of techniques or tools. Gaining cultural knowledge means however to increase the ability to know, communicate, express oneself and ones 'design solutions' and interact with other humans. Finally, *common sense knowledge*

is knowledge that consists of comprehending what people usually consider as 'natural' understanding, it relates to human experience and is achieved through learning from practical experience.
Professional knowledge plays the most prominent role in design education, but the need for cultural knowledge is increasing. Design education has traditionally emphasised skills, but with changing objects of design, cultural knowledge as well as understanding of common sense knowledge becomes increasingly important in design as part of a professional identity. Expanding the scope of the profession to dealing with global markets, increasingly complex development projects etc. challenges designers to be skilled also in taking in new knowledge, and making their reasoning explicit. Considering these issues, a course in design theory could support students in their reflections and should make students familiar with main design concepts and theories thereby contributing to the development of professional knowledge, the students' reflection, communication and argumentation skills. Being able to professionally interact with different stakeholders such as clients, users and political decision-makers is the key for achieving a broader socio-cultural understanding and common acceptance of solutions. A major objective of a course in design theory should hence be to support critical thinking, and to build up the students' argumentation and reasoning. Eventually, one does not study design or architecture to replicate what others think but to learn to think as designer or architect and to become able to reflect and exceed boundaries in the concerned field.
The courses described in this paper aim to help students to engage with theory in a meaningful way. We want students to move beyond theory as something that is to be recited, what Marton and Säljö [7] referred to as a surface approach to learning. Instead they should comprehend the material and relate it to prior experiences and knowledge, i.e. what Marton and Säljö referred to as a deep approach. Teaching students to connect theory to their actual work, and relating it to the cognitive-, affective and behavioural domains, cf. Bloom's taxonomy [8], can trigger double loop learning [9]. Here the students not only reflect on and improve their doings, but also on their assumptions, attitudes and goals.

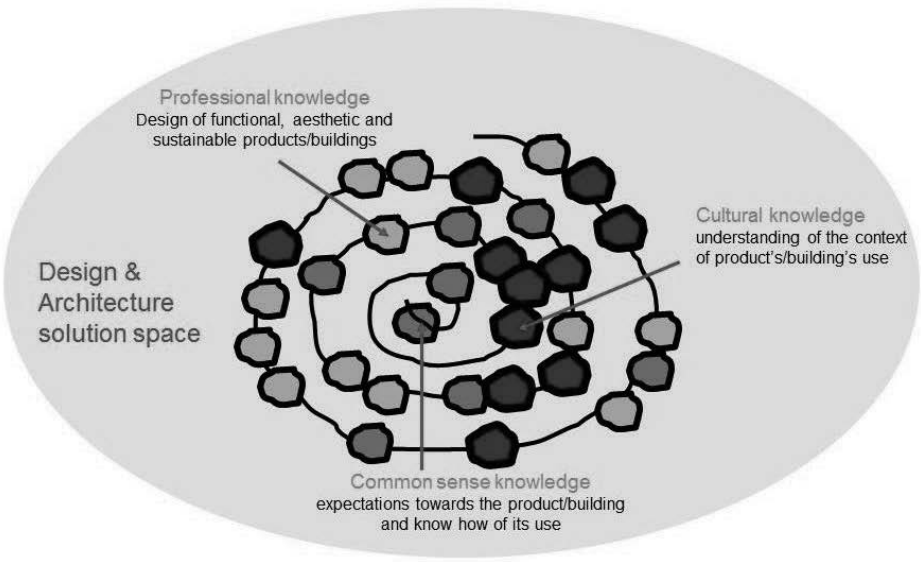

Figure 1. Knowledge types in design education

1.2 Some challenges

Due to the challenges that come with a changing profession, the way product design is taught is successively changing. While much design education previously focused on praxis development, often through studio based approaches, an academization is taking place in the last 30 years [10]. However, teaching theory to design students faces some special challenges, as the profession does not have a strong history of theoretical discourse. Among the more notable challenges is a tension between practice and theory, sometimes presented as a dichotomy between theorists not grounded in (design-) practice, and practitioners teaching in academia without having a strong theoretical background. Regardless of the truth content of this assertion, its reification has implications for how students perceive and relate to both theory and practice. Students arrive at a university expecting to learn a profession and are eager to become members of a certain community. With their identity invested in the future mem-

bership of a certain practice (cf. Wenger [11]), students may strive to adopt roles, values, and principles that they associate with the profession. Theory may easily be perceived as something strange, something that belongs at academic institutions, abstract and deprived from practical applicability.

1.3 Experiential learning

One model that relates different modes of creating knowledge to each other is the experiential learning model of Kolb [12], which draws on Dewey, Piaget, and Lewin. It describes learning as a continuous process, grounded in experience, which requires resolution of conflicts between dialectally opposed modes of adaption to the world. "Experiential learning is a process of constructing knowledge that involves a creative tension among the four learning modes that is responsible to contextual demands." [13]. Kolb's model describes the learning process along two axes (fig 2); a vertical axis spanning from Concrete Experience to Abstract Conceptualisation and a horizontal axis spanning from Active Experimentation to Reflective Observation. Very briefly, Concrete Experience is preserved and mediated practically from master to apprentice level, while Abstract Conceptualisation condensates as theory that has to be understood. Active Experimentation presupposes the design of a setting to achieve information (inductive, empirical), while Reflective Observation focuses on in-situ interpretations and analyses (deductive, nomological).

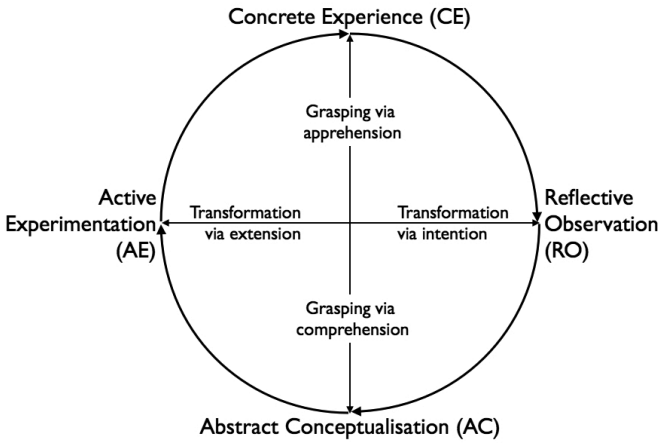

Figure 2. Central dimensions of Kolb's [12] learning model.

Which mode of learning is preferred may differ between individuals as well as disciplines [14]. At first sight, it could be argued that successful teaching activities should be tailored to the preferred learning style of the students. However, "learning involves the integrated functioning of the total person- thinking, feeling, perceiving and behaving" [13]. Over emphasis on abstract conceptualisation (theory) or concrete experiences (practice) risks limiting students to conventional forms of design thinking and practice, rather than supporting them in addressing the new objects of design. Furthermore, it may also hamper their ability to engage in new ways of confronting problems.

2 THE TWO TEACHING APPROACHES

Considering the transitional and dynamic character of different learning styles the following sections introduces two approaches to teaching theory in design. At the Norwegian University of Science and Technology (NTNU) the teaching of design theory took place as a part of the course: TP 4115, Product Design, industrial project, in autumn 2011 for 3rd semester students. The contents of the course were among others: Initiating projects, concept development, strategic design, project planning, and project management. Besides applying advanced design methods and interacting with companies, the students should become familiar with the area of design thinking. Through a main design project, she/he should become able to master processes, methods and techniques to facilitate Product Planning and Management, as well as acquire skills in project management, networking, and communication. "Social", "Technological", "Economic", "Environmental" and "Political" (STEEP) issues, which are driven by culture and implicating external goal finding, were a central theme in the course. The students write a final report on the project development including the proposed design solutions.

The theory introduction concentrated on four aspects: What is design research, the role of theories in design, Theory of science and two main design paradigms, and consequences of design theories for methods and practice thereby employing a literacy approach.
The teaching at the University of Skövde (HIS) took place as a part of the course: IP322G, Design Methods in autumn 2011, given for undergraduates on a Product Design Engineering program in their third semester. Prior to this, students have little background in design theory. This course employs a systematic approach covering methods for issues such as Identifying and structuring requirements, Identifying and generating alternative solutions, Evaluation, synthesis and selection of solutions, Communication of proposed solutions and work process. Emphasis is put on reflection and argumentation behind product- and process related decisions. Furthermore, the course also addressed limitations of different methods, and how the use of methods has been discussed within design theory. The students take on a series of short (2-3day) design projects in which they apply theories and methods from class. In connection to these, the students write short reports, which serve as a basis for assessment of the course covering a) the problem, b) the process, c) the outcomes as well as reflections in relation to theory. Following each assignment students review the reports of peers and take active part in seminar discussions.

3 ANALYSIS

Based on a comparison of teaching and learning activities of the two courses with respect to Kolb's learning model, the following section discusses barriers and ways of enabling different types of learning related to theory within design education. See table 1.

Table 1. Comparison between the two courses

	Product Design, industrial project (NTNU) 7,5 ECTS	**Design methods (HIS) 7,5 ECTS**
Participants	18, second year undergraduates	28, second year undergraduates
Assessment	Series of short reports	Series of short reports
Concrete Experience	Industrial project for real client	Series of short projects without client
Reflective Observation	Interim Working documentation	Interim Working documentation
Abstract Conceptualization	Connecting design theory with their project development experiences	Description and reflection on working process and methods, elaborated in reports and seminars.
Active Experimentation	Continuous	Recursive

While the NTNU course addressed deeper theoretical foundations the HIS course primarily focused on texts elaborating design methods without going much into depth on underlying paradigms. The ambition in the latter case was to try to repeatedly problematize different aspects of design. In the HIS course, students are at an early point of their education and have only a limited background from design projects. At this stage transitions from Abstract Conceptualisation to Active Experimentation and from Concrete Experience to Reflective Observation should perhaps open up for questions and reflection rather than introducing grand theories. With a more extensive background students may be more receptive to a deeper discussion as they have a wider range of experiences to draw from.
The onset of the authors was in both cases that professional knowledge is and should be the main pillar of design education and that other types of knowledge gain value only to the extent to which they contribute and enlarge this. While theoretical knowledge may improve and expand the professional knowledge, it has to be repackaged and students given "entry points" relating to their own practice. Paralleling Pilerot's and Hiort af Ornäs' [15] discussion on information literacy, we advocate embedding the teaching of theory within activities of engaging with doing design. This would require alignment of Learning objectives, Teaching and Learning activities and Assessment methods (cf. Biggs [16]), and formative rather than summative assessment [17].

4 REFLECTIONS ON EMBEDDED TEACHING OF DESIGN THEORY

Based on the brief analysis of the two courses, some reflections can be made regarding benefits and challenges of embedding design theory teaching in practical projects.

First, theory is often experienced distant from practice, and students need help moving from concrete design applications to Abstract Conceptualisation and vice versa. In the NTNU course students were to a greater extent introduced to underlying foundations of different theories. The goal of integrating design theory in the course was to make the students aware that concepts do not exist in a vacuum but are closely related to design development as well as to designers' daily work and method/tool applications. Of course, this claim had to be supported by many examples and case presentations for them, in order to realize that in fact that there exists a close connection between theory and practice, and that the concept that a designer chooses will influence methods and tools selection and ergo the outcomes of the projects and the acceptance of this outcome by the stakeholder.

Second, what particular theories are taught may be secondary to enabling students to understand and utilize theoretical material. The two courses differ in what theories were covered, with the His course primarily focusing on professional knowledge while the NTNU course to a greater degree focused on core design ontologies and epistemologies. While the latter may better prepare students for future changes it also comes with some challenges in that it may be more difficult for students to relate to.

Third, genuine projects provide real opportunities to learn, while a predetermined set of learning objectives may require projects to be staged in a way so that specific theories become instrumental. The applications of theories (Active Experimentation) took different forms in the two courses. In the NTNU case the genuine project is the main focus, with theoretical lectures supporting or problematizing the students work. The HIS course was based on a series of short projects, made up in way as to demand a range of different skills. The projects are in this case artificial, but set up as to make the students address certain issues. Considering the project duration, a longer project may provide a richer range of experiences and deeper elaboration, while an approach with shorter recursive projects may take students through the learning cycle several times.

Fourth, there is a tradeoff to be made between deeper elaboration of certain issues, and taking students through the learning cycle several times. Epistemologically, in the NTNU course it was possible to go in depth into the different knowledge type domains in fig 1, and theories. As one student said with reference to Lakatos' disciplinary model [18] "Even if we have a small core of truths in our discipline, I know now that there exists one". The HIS course framed each short project with introductions to theories to be applied, and reports followed by seminars, supporting transitions from Abstract Conceptualisation to Active Experimentation, and Concrete Experience to Reflective Observation respectively.

Fifth, a longer project may provide a richer range of experiences while a recursive approach with several short projects may to a greater degree impose Reflective Observation and Active Experimentation grounded in theory. The genuine project at NTNU provided opportunities to engage in active experimentation and concrete experience, but posed some challenges for staging natural transitions to and from abstract conceptualisation due to the focus on the industrial project. While Reflective Observation was satisfactorily achieved (as a final report), Active Experimentation remained in a rather early and undeveloped stage. The Reflective Observation was in both courses coerced by a need for students to produce working documentation and final reports. However, differences in time frames set different agendas. Whereas the NTNU approach allowed for students to continuously work with the details of one well-polished deliverable, the HIS-approach forced students through a recursive set of deliverables within timeframes that only allowed for them to focus on the most central issues.

5 CONCLUDING REMARKS

Conclusively, the integration of design theory in curricula can be described with what Rittel and Webber [19] called a wicked problem. It aims to foresee future needs such as the academization of the design discipline based on current standards and practices. While knowledge seems to be a key parameter for all future design research and development, the ways and methods of how this knowledge is generated and distributed can vary greatly from case to case as the two approaches from above illustrate. In our experience, design students tend to prefer activities that focus on Active Experimentation and Concrete Experience. Their aspiration to practice can be a starting point for entering theory discussions and also helping them back, scaffolding activities that enabling movements between different stages of the experiential learning cycle. Design theory teaching and learning should further be appropriately timed in relation to the overall curricula and contextualised within applications in practical

projects. This will enable students to engage with the material in meaningful way, growing a range of skills, and seeing the value and practical implications of theories.

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