An Educational Perspective: Research Through Design

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Abstract: The CSCL community and the learning sciences is concerned with (among others) theories of learning, social and situated cognition, socio-cultural perspectives on learning, understanding knowledge building and knowledge creation as well as the design and use of technology in learning. The domain needs to reflect the relation between research and design, analysis and synthesis, descriptive and prescriptive action. This paper classifies education as a design discipline and conceptualizes design as inquiry. The focus is on the epistemological and methodological foundation of design. Processes of *research through design* aim at generating knowledge and contributing to technology development. The role of the artifact as epistemic and transformative (transforming knowledge practices) and the artifact as hypothesis is stressed.

Introduction

As the CSCL community focuses on computer supported forms of collaborative learning an issue beyond deepening understanding and analysis of learning processes has to be addressed: How do insights gained from research and various theories of understanding and learning relate to the design of CSCL scenarios and technologies? How does descriptive analysis relate to prescriptive synthesis? What does it mean to generate the conditions we observe as our interventions transform reality? Regarding the relation between reserach and design we are interested in how activities in the CSCL field contribute to innovation in education and technology development. This is a relevant issue if we agree that it is not sufficient to wait for innovative technology to be developed in other disciplines such as computer sciences in order to be used and applied in learning scenarios and hopefully to innovate teaching practice. If we want to go beyond analysing learning processes and contribute to design (design of interventions, learning scenarios, and technology alike) it is crucial to reflect design processes and conceptualize the role of knowledge in design. Regarding the design process we are interesnted in question such as: How to initiate and advance processes which create conceptual innovation in learning and teaching as well as knowledge on the field? In which form does CSCL research contribute to innovation in teaching and learning? This paper describes a *research through design* approach in the field of CSCL from an educational perspective, which conceptualizes an artifact as a hypothesis. The approach draws on cultural-historical activity theory as epistemology and theory of "*transformative material activity*" (Miettinen, 2006). Research through Design means to relate the design of innovative learning and teaching scenarios to deepening understanding and scientific insight. Designing innovative services and technologies is regarded as a form of knowledge work and knowledge generation.

The Relation between Research and Design & the Role of Knowledge in Design

Several disciplines conceptualize the relationship between research and design, i.e. analysis and synthesis. Educational sciences, design studies, and science and technology studies among others are concerned with the role of knowledge in design practices as well as design as epistemic culture (Mareis, 2010, p. 178). In the field of CSCL we can distuingish different approaches concerning the relation of design and research. Those approches differ in at least the following aspects: (1) the role of knowledge in design; (2) the process to proceed from analysis to synthesis to observing use and learning processes; (3) the status the generated knowledge has regarding its generalization with regard to context. The different approaches will shortly be described in the following sections. The first approach describes design as applied science, assuming that the knowledge needed is prior to the design process. A different position on the role of knowledge in design has been taken by the proponents of the design-based research approach, associated with the works of Brown (1992) and Collins (1992). This research approach aims to integrate the purposive design of pedagogical interventions and learning environment with the systematic investigation of the learning process taking place in these environments. This approach is characterised by the interleaving of design and theory building, an emphasis on the design of interventions that prove useful under authentic conditions, a theoretical anchoring of the design, an iterative approach of design, enactment, analysis and redesign, and the careful investigation of the effects of the intervention or learning environment (cp. Design-Based Research Collective, 2003). Even though the design-based research approach has been applied in a growing number of research and development projects, there is a still ongoing debate on the methdological foundations of this approach (e.g. Kelly, 2004). While a lot of the discussion has been centered around the question of scientific rigor the role of design in design-based research is quite underarticulated (cp. Bannan-Ritland & Baek, 2008).

The approach presented in this paper conceptualizes design as knowledge creation and epistemic process. Design as open-ended and object-bound inquiry aims at creating both, artefacts (products, services, interventions) and knowledge. Main issues are: (1) The co-evolution of analysis and design (emergent qualities), where the understanding of the problem and the design space is the outcome of a design process, not the starting point. Cross (1995) points at the co-evolution of problem and solution and refers to generating a multitude of alternative solutions as a means to explore and understand the problem. Design and synthesis allow for understanding and investigating the problem. Drafting, conceptualizing and testing possible solutions allows for deeper understanding of the problem as implications and underlying assumtions are probed and questioned. The result, not the starting point of design is a deliberate description of the problem as well as knowledge about the design space. In a design space problem and solution are mutually dependent and in flux. Design problems are wicked: as soon as a problem is solved the solution is the sprout for a new problem. Contextualized scientific problems as well as design problems are open-ended (Jonas, 2005). (2) the artifact as hypothesis and prototyping as inquiry which allows to probe experiences and emergent & transformed practices. The arifact (product, service, intervention planned) is the hypothesis in the object-bound inquiry, derived by abductive reasoning. The conceptual and material (sign-realted) quality of the artifact is assumed to have an effect on the findings and insights to be gained. (3) the articulation of a design hypothesis, which takes into account the material and sign-related quality of the artifact (intervention/technology) used in inquiry. (4) desicribing the conditions and interventions (factors) and searching for generative mechanisms to explain a transformation. Whereas conditions are local, the generative mechanism explaining the transformation goes beyond the context given. Hedström & Swedberg (2005) define generative mechanisms as explaining the relation and transformation between two states. In sociology they are referred as middle ground theories – being middle ground as they are less universal than rules and laws, but more explanatory then pure descriptions of states and situations. Not only the science of education but also design studies and the discipline of interaction design are concerned with these issues and elaborated approaches such as: *Research through Design* (Findeli et al., 2008), *Thoughtful Interaction Design* (Löwgren & Stoltermann, 2007), as well as *Design as Knowledge Creation* (Allert & Richter, 2009). In the design process we draw on the epistemic role of artifacts in processes of open-ended inquiry, and will clarity the form of knowledge generated in design referring to a general design theory. The design process sketched here is referred to as practice-oriented design and simply in as alternative to more prominent approaches such as product-oriented design and user-oriented design. This is just one option in doing design as knowledge creation. The co-evolution of analysis, synthesis and contextual conditions is conceptualized as object-bound inquiry. We refer to the general design theory of Goldkuhl (2004) in order to identify aspects, which are undetermined and allow for creative and reflective thinking. We draw attention to the grounding of design decisions, the role of knowledge in design and the articulation of knowledge generated in design. As the artifact can neither be derived deductively from theory nor inductively from requirements and analyses, it is conceptualized a hypothesis. To design an artifact means *designing a prototype to probe some of the underlying design assumptions.* The Design Process:
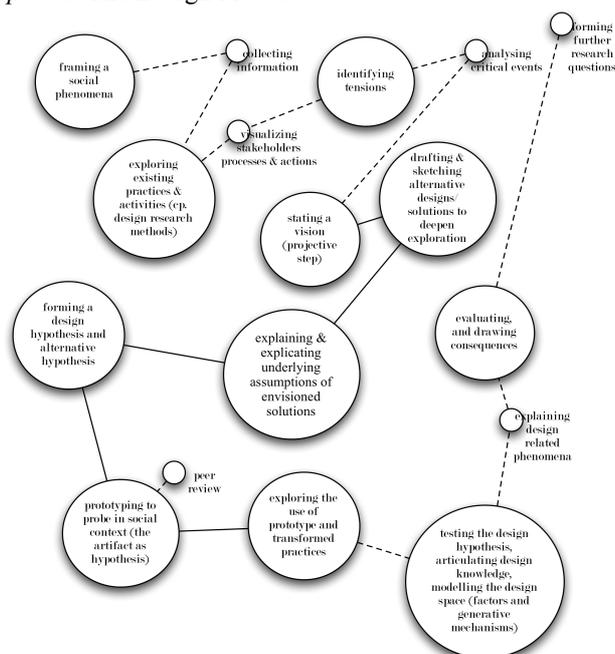

Figure 2. Typical phases in a process of design as knowledge creation

Acknowledgements

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