

An Educational Perspective: Research through Design

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Abstract: CSCL is concerned with theories of collaborative learning, respective educational practices and instructional models as well as the design and use of related technologies. The discipline needs to reflect the relation between research and design, analysis and synthesis, description and prescription. This paper focuses on the epistemological and methodological foundations of design and conceptualizes educational design as an object-bound process of inquiry entailing both knowledge generation and technology development.

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

As CSCL 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 to relate descriptive analysis to prescriptive synthesis as we generate the conditions we observe and as our interventions transform reality? How do research activities in CSCL contribute to innovation in education and technology development? If we want to go beyond analysing learning processes and contribute to design (of interventions, learning scenarios, and technology alike) it is crucial to reflect design processes and conceptualize the role of knowledge in design. How to initiate and advance processes which create conceptual innovation in learning and teaching as well as knowledge in 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. The approach draws on cultural-historical activity theory as epistemology and theory of “*transformative material activity*” (Miettinen, 2006). Research through Design relates the design of innovative learning scenarios to deepening understanding and scientific insight. Designing services and technologies is regarded as a form of knowledge work.

Several disciplines conceptualize the relationship between research and design, i.e. analysis and synthesis. Educational sciences and design studies among others are concerned with design as epistemic culture (Mareis, 2010, p. 178). In the field of CSCL we can distinguish various approaches, which differ concerning the relation of design and research. The approaches differ in at least the following aspects: (1) the role of knowledge in design; (2) the process to proceed from analysis to synthesis; (3) the status the generated knowledge has with regard to its generalization from local context. Some approaches describe design as applied science, assuming that the knowledge is prior to the design process. A different position with regard to 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 environments 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 methodological 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 object-bound inquiry aims at creating both, artefacts (products, services, interventions) and knowledge. Constitutive elements: (1) The co-evolution of analysis and design. Cross (1995): the co-evolution of problem and solution allows for understanding and investigating the problem. Generating a multitude of alternative solutions as a means to explore and understand the problem / design space. Drafting, conceptualizing and testing possible solutions allows for deeper understanding of the problem as implications and underlying assumptions are questioned and probed. 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 (emergent qualities). Design problems and contextualized scientific problems are open-ended and wicked: as soon as a problem is solved the solution is the sprout for a new problem. (2) the artifact as hypothesis: prototyping as inquiry allows to probe experiences and investigate emergent qualities & transformed practices. The artifact (product, service, intervention planned) is the hypothesis in the object-bound inquiry, derived by abductive reasoning. (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. The conceptual and material (sign-related) quality of the artifact is assumed to have an effect on the findings and insights to be gained. (4)

describing 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 to as middle ground theories – being less universal than rules and laws, but more explanatory than descriptions of states and situations. We draw on the epistemic role of artifacts in processes of open-ended inquiry, and clarify 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 is an alternative to approaches such as product-oriented design and user-oriented design. The co-evolution of analysis, synthesis, and contextual conditions is conceptualized as object-bound inquiry. Design is undetermined and allows for creative and reflective thinking. We draw attention to the grounding of design decisions (general design theory: Goldkuhl, 2004), the role of knowledge in design and the articulation of the knowledge generated in design. As the artifact can neither be derived deductively from scientific theory nor inductively from requirements and analyses, it is conceptualized a hypothesis. Also see approaches such as: *Research through Design* (Findeli et al., 2008), *Thoughtful Interaction Design* (Löwgren & Stoltermann, 2007), *Design as Knowledge Creation* (Allert & Richter, 2011). The iterative design process: (1) Framing a social phenomena. (2) Collecting information. (3) Exploring existing practices ((design) research methods, e.g. visualizing processes & practices in a journey framework). (4) Identifying tensions & analyzing critical events. (5) Stating a vision, taking up a position (projective step). (6) Drafting & sketching alternative design solutions to deepen exploration. (7) Explaining & explicating underlying assumptions of envisioned solutions. (8) Forming a design hypothesis & alternative hypothesis. (9) *Designing a prototype to probe underlying design assumptions*: Prototyping to probe in social context. (10) Exploring the use of prototype: emergent qualities & transformed practice. (11) Testing the design hypothesis, articulating design knowledge, modeling the design space (factors & generative mechanisms). (12) Explaining design related phenomena. (13) Forming further hypothesis & research questions. Acknowledgements. This work has been supported by the EU founded research project Knowledge Practices Lab.

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