



Design Thinking and the Learning Sciences: Theoretical, Practical, and Empirical Perspectives

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Introduction

The learning sciences, informed by a diversity of fields such as cognitive science, anthropology, education, and sociology, has a long history with design while engaging in the study of learning in real-world, non-simplified contexts. From its genesis approximately thirty years ago, the learning sciences as a field has grown to encompass the study of learning from different lenses, as well as to advance theories of learning through the design and study of new technologies and environments. Within the realm of the learning sciences, the concept of design and design thinking is of great consequence as it helps us understand how teaching and learning happen in the rapidly changing 21st-century knowledge society, as well as can be used to inform the design of effective, innovative, and equitable interventions. Design thinking in the learning sciences can be made manifest in activities ranging from iterative curriculum design, to researching affordances and constraints of tools, techniques, and learning environments, to appropriating design concepts in both physical and digital spaces. It also sheds light on how the socio-material histories of materials inform learning and participation. This bibliography focuses on learner-centered design principles and how various research methodologies (e.g., participatory design and design-based research) contribute to appropriating design thinking into learning, teaching, and pedagogical processes. The evolution of this field is interwoven in the powers of design.

General Overview

The learning sciences seek to fundamentally advance theory and practice through the designs of new learning artifacts and environments and through new methods to capture learning in situ. Learning sciences comprises a spectrum that ranges from cognitive to sociocultural perspectives on learning, and yet, unifying this spectrum is a consistent emphasis in how people theorize and analyze the relationship between learning and design. Given that learning sciences uses theory to guide both design of new educational artifacts and contexts, as well as methodologies, we have divided this article into three major sections: (1) theoretical perspectives, (2) methodological approaches, and (3) learning contexts. The first section on Theoretical Perspectives provides illustrative work that has infused design methodology and design principles with learning theories. In this section, we present three learning theories that have interacted with design thinking, namely Constructivism, Constructionism, and Activity Theory. For example, we refer to an edited volume by learning scientists, Kafai and Resnick 2000 (cited under Constructionism), which draws on real-world experiments in both in- and out-of-school spaces to describe how the design of emerging computational technologies can transform the way learning, teaching, and knowledge are perceived. In addition, Svihla and Reeve 2016 (cited under the Discipline of Design and Design *Thinking*) highlights design processes over final designed products from a series of case studies coming from a variety of contributors. In addition, this article's subsection titled the Discipline of Design and Design Thinking provides an introductory overview of a few examples of the seminal work from that discipline to provide some context. The second section, Design Thinking in the Learning Sciences Methodology, focuses on the methods and methodological practices that are informed by design thinking—e.g., Participatory Design/Co-Design, Design-Based Research (DBR) and Design-Based Implementation Research (DBIR)—to create processes and/or learning environments. For example, the edited volume DiSalvo, et al. 2012 (cited under Participatory Design/Co-Design) discusses the complexity of community-based participatory design in addition to potential issues and prospects for future research. The third section includes Learning Contexts, which depicts the integration of design principles and theories of the learning sciences to create equitable, effective, and innovative educational technology, and in- and out-of-school learning environments. The fourth section, Educational Resources, can serve as a starting point for practical examples of design thinking principles and processes in

educational spaces. Finally, the last section, Journals, includes a list of renowned peer-reviewed academic journals on design and also from the learning sciences.

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