

# Emergent Practices in Conceptualizations of Learning

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**Abstract:** This paper presents a research study investigating practices in teaching and learning through a complex conceptual systems perspective which analyzed practices as phenomena emergent in conceptualizations of learning. Developing on previous research which found two distinct conceptualizations of learning (*Transfer/Acquisition* and *Construction/Becoming*), this study found two clustered sets of practices, each aligned with one of the conceptualizations of learning. These findings provide evidence for the perspective that practices are emergent in conceptualizations, and therefore that adoption of new practices in teaching and learning may require prerequisite work in problematizing and developing conceptualizations of learning in which such practices are emergent.

## Introduction

Conceptualizations are complex systems with multiple types of elements beyond metaphors (Donaldson, 2019a; Donaldson & Allen-Handy, 2019). Complex systems are unique in that interactions between elements within the system result in emergent phenomena which disproportional to the activity within the system, do not follow patterns of direct linear causality, and cannot be predicted (Bar-Yam, 1997). Interactions are interdependent and co-constitutive via mechanisms such as feedback loops. Therefore, complex systems with high degrees of robustness are resistant to change and perturbations result in interactions that bring the system back into a state of equilibrium (Hieronymi, 2013; Yoon, 2018). Earlier studies of conceptualizations of learning (Donaldson, 2017; 2018; 2019a; 2019b) supported the argument that they are complex conceptual systems and that elements within these systems include at least four types of interdependent complex systems which together form the larger complex conceptual system: conceptual metaphors, conceptual stories, worldviews, and paradigms. Emergent phenomena in four categories were found: practices, communications, cognitive filters, and value statements and enactments. A previous study within the larger research project (Donaldson, 2019a) resulted in robust characterizations of two conceptualizations of learning. The *Construction/Becoming* conceptualization of learning was dominant in learning scientists group and the *Transfer/Acquisition* conceptualization was dominant in the STEM professors group. The current study focused exclusively on practices as phenomena emergent in conceptualizations of learning among learning scientists in comparison to professors in science, technology, engineering, and math (STEM) fields. The research question was: *What practices are emergent in different conceptualizations of learning?*

## Methodology

This study was part of a larger comparative case study using the Iceberg Framework for Conceptualization Analysis (see details in Donaldson, 2019a) which includes aspects of a number of methodologies from conceptual metaphor analysis, grounded theory, and network analysis. Ten learning scientists and ten STEM professors participated in semi-structured interviews (1-2 hours each) regarding learning, teaching, knowledge, the purpose of education, and practices endorsed and condemned. A correlation matrix of conceptualizations of learning, practices endorsed, and practices condemned was created to identify practices emergent in each conceptualization. Co-occurrence correlational matrices which were analyzed in the UCINET network analysis software (Borgatti, Everett, & Freeman, 2002) as 1-mode networks using factions cluster analysis and network maps were created in the NetDraw network visualization software (Borgatti, 2002). The results of the network analysis were then used for interpretive analysis to characterize the emergent practices.

## Findings

In the current study, two distinct sets of practices were found to be aligned with each of the conceptualizations of learning. The *Transfer/Acquisition* conceptualization correlated ( $p < 0.05$ ) with a unique set of practices including: exams/tests, grading, cooperative learning, textbooks, clickers and lecture interaction technologies, lectures as a primary modality, content work, teacher-directed problem solving, homework, workbooks/worksheets, and in-class exercises. Interpretive analysis found that these practices rest on assumptions of: 1) the teacher “having” knowledge the students do not have, 2) knowledge must be structured to align with learning objectives determined by the institution, 3) external knowledge objects are presented to students, 4) students acquire knowledge objects through transfer practices (e.g., textbooks, lectures), 4) teachers have to make sure knowledge objects “stick” in students minds through activities such as homework problems, clicker technologies, in-class exercises,

worksheets, or teacher-directed problem solving, and 5) teachers have the responsibility of measuring how many knowledge objects students have acquired and can manipulate through tests and grading. The *Construction/Becoming* conceptualization was correlated ( $p < 0.05$ ) with a very different set of practices including: engaging students in real-world impact work, building a community of practice, perspective taking and framing, critical pedagogy work, collaboration, self-evaluation, design work and processes, interest-based learning, relevance exploration, and agency in learners. Interpretive analysis found that these practices rest on assumptions of: 1) knowledge is not externalized objects to be internalized, but a dynamic process where students participate in knowledge, 2) learning happens by collectively deconstructing, negotiating, transforming, and constructing new ways of knowing, 3) assessment of learning is a reflective practice rather than measurement, and 4) assessment practices such as grading or exams are potentially mechanisms of oppression and marginalization so they must be challenged by engaging students in development of critical consciousness and praxis (reflection and action upon the world). In addition to each conceptualization having a unique set of correlated phenomena, practices were found to be independently clustered in the network map of practices created with UCINET network analysis software (Borgatti, Everett, & Freeman, 2002) using a correlation matrix and visualized with the NetDraw (Borgatti, 2002) software. The independent clustering of practices correlates with clustering of elements within the constitutive complex conceptual systems (conceptual metaphor, conceptual story, worldview, paradigm) in each of the conceptualizations of learning, while also correlating with conceptualizations. This suggests that practices are indeed emergent phenomena.

## Implications and conclusion

This study was an example of using innovative methodologies in learning sciences research that situates conceptualizations as complex systems, but further development of the conceptual framework and methodology is needed, especially: 1) investigation of other important aspects of complex systems such as equilibrium, robustness, and tipping points, 2) design-based research to develop principles for the design of learning and further refine the theory. The findings in this study suggest that some powerful practices such as learner-driven project-based learning, collaborative learning, interest-driven learning, and constructionist learning are emergent in a conceptualization of learning that is so different than the dominant conceptualization of learning that adoption of these practices may first require changing the conceptualization of learning among both the educators and the learners in a given context. This study suggests that sustainable adoption of practices emergent in conceptualizations of learning in the learning sciences may require work to change the conceptualization of learning in context. These findings also suggest that “what works” means something completely different for learning scientists than it does for others such as STEM professors. As learning scientists we must be more attentive in articulating our conceptualizations of learning so that educators who look to our research will know what we mean in our publications and presentations about learning, as well as understand how the practices we study contribute to learning as defined according to our conceptualizations.

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