Reclaiming distributed cognition in networked learning: An inter-subjective, socio-material perspective

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Abstract

On the tenth anniversary of the networked learning conference I am looking back at developments in identifying the sites of learning in networked learning design and praxis. Beginning with McConnell's (1998) premise that collaboration is central to the development of democratic 'learning communities' and Jones' (2000) relational perspective on the role of technologies in connecting learners, tutors, and learning resources, I examine early critiques of community and the implications of those critiques for design, tutoring, and assessment practices. I then turn to a discussion of interrelated human and technological agencies and a historical trajectory of design foci at the resource, task, and activity levels. Tensions between research orientations that focus on individual learning and those that focus on collective learning are traced to associated theoretical perspectives and methodological choices. The construct of the individual mind and the notion of connectivism are critiqued. The agencies of socially constructed technologies to distribute learning capacities across networks are examined for insights into and implications of differing approaches to collective coordination of social-material practices. In concluding this retrospective, I return to the critical and humanistic roots of networked learning and introduce Hodgson, de Laat, McConnell, and Ryberg's (2014) call to "transcend the dualism between abstract mind and concrete material social practice" (p. 3).

I use discourse analysis to critique contemporary cognitivist, computational conceptualizations of the individual mind and the resultant focus on instructionalist underpinnings in broader educational technology approaches to design. I argue that this perspective on cognition is reductive: focused on teacher-designer-researcher control, hierarchical perceptions of learning contexts, and suggest the quest for designed orchestrations of learning processes has led to an assumption that the efficaciousness of learning can simply reside in resources. The computational, cognitivist perspective on design is contrasted with Conole's (2006) rejection of resource-level foci on design and with Goodyear, Carvalo, and Dohn's (2014) distinctions among designable tasks and emergent activities; situated conceptualizations of affordances and mutually constitutive perspectives on the relationships among material social practices and learning. The "reclaiming" section of the paper examines three pre-computational conceptualizations of distributed cognition as embodied, integrated with socio-material artifacts, and enacted through practices. I conclude with looking forward to a time where pre-computational conceptualizations of distributed cognition provide links to networked learning theory, a route to transcending dualisms, and opens new examinations and problematizations.

Keywords

Distributed cognitions, socio-material practices, embodied learning, inter-subjective learning

Introduction

This paper is, in part, a retrospective on evolving perspectives on the sites of learning in networked learning, and in part, an attempt to reclaim a more complex, pre-computation conceptualization of cognition. I have reviewed the past nine conference proceedings with a view to revisit the initial definitions and explications of networked learning, foci on theorizing and researching learning and design, and associated research methodologies. This journey led me to focus on the call find ways to "transcend the dualism between abstract mind and concrete material social practice" (Hodgson et al., 2014, p. 3). I argue that the notion of the individual mind, its parts and their functions in learning processes can be linked to computational cognitivist theories of learning and research practices that have led to

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instructivist approaches to design, and then contrast this perspective with Conole's (2006) rejection of resource-level foci on design and with Goodyear, Carvalo, and Dohn's (2014) distinction between designable tasks and emergent activities, situated conceptualization of affordances, and mutually constitutive perspectives on the relationships among material social practices and learning. Finally, I turn to three pre-computational conceptualizations of cognition as distributed, embodied, integrated with socio-material artifacts, and enacted and influenced in practice, which I link to networked learning theory and practice. I leave you to consider whether these pre-computation conceptualizations of cognition can reclaim distributed cognition as a construct within networked learning.

Looking back

For two decades delegates of networked learning conferences have been differentiating networked learning praxis from broader e-learning research via shared interests in participatory pedagogies, collaborative assessment practices, and a relational view of virtual learning communities. McConnell (1998) emphasized "collaboration as the major form of social relationship within a learning context" and the role of technologies as "networking people and resources," into 'learning communities' whose members share "resources, knowledge, expertise, and responsibility through reciprocal collaborative learning" (p. v.ii). McConnell's vision set a clear set of parameters for conceptualizing networked learning as a critical teaching and learning practice and drew our attention to a framework that included socio-cultural, democratic, inclusive perspectives integrating technologies into collaborative teaching, learning, and assessment. Jones (2000) defined a relational role for technologies as enabling connections among learners, tutors, and resources. The Networked Learning 2002 manifesto clearly positioned community as inclusive of "models of learning that are based on participation and not ones that are based on transmission" (Beaty, Hodgson, Mann, & McConnell, 2002, p. 6). The manifesto included expectations that "teachers and learners collaborate in the assessment process" and that learners contribute to "the development of learning resources" (Beaty et al., 2002, pp. 5-6). Learning resources were conceptualized as "both human and material" (p. 8). Thus we may consider human and material resources as instances of distributed cognitions across a network.

While the notion of a critical, democratic, digitally connected learning community has been pivotal in distinguishing networked learning from broader research in the field, participation and collaboration discourses have also been interrogated. Reynolds, Sclater, and Tickner (2004) critiqued three approaches to online design and assessment practices. In instrumentalist approaches to interactive learning designs "the idea of 'community' is used as a *motivational* device" and there are "fairly normative values about how groups *should* work which are conveyed and reinforced by the reward process" (para, 4). In emancipatory approaches, technologies are perceived as "means by which hierarchical power differentials can be levelled out amongst networked individuals" but pedagogies remain primarily tutor led and/or facilitated (para, 5). In communitarian approaches, democratic principles are valued for their own sake, design and assessment decisions tend to include learner perspectives, but the darker sides of community—"coercion, conformity, marginalisation of minority interests" (para. 6)—tend to be ignored. Thus, Reynolds, Sclater, and Tickner posited the notion of a cosmopolitan approach to design and assessment in networked learning communities that values sub-communities and, where there is emphasis on learning *from* difference. In 2004 the interrogation of power relationships in networked learning communities expanded to include a closer examination of the relationships among pedagogical practices, digital artefacts, and inter-related agencies. In response to international e-learning initiatives to standardize distribution of re-useable digital learning resources, Koper and Olivier (2004) critiqued the emphasis on IEEE and LOM specifications, and argued that these 'solutions' were based on the metaphor of learning as knowledge transmission from expert to novice via technology. Koper and Olivier noted a disregard of contextual considerations and theory-based pedagogical practices. Conole (2006) forwarded the inquiry by rejecting the notion of focusing the "design of learning at the resource level" (p. 3) and re-focusing learning design scholarship and practice on the activities in which learners are asked to engage. Conole highlighted six networked learning design foci: (1) learning contexts, (2) teaching and learning approaches, (3) tasks to be undertaken, (4) technological tools and digital resources, (5) expectations for interactions among all involved, including negotiated roles, and importantly, (6) the influence of assessment practices on sustainability of networked learning communities. This shift in focus from the e-learning research focus on resource level to the networked learning focus on the activity level was examined further in Zenios and Goodyear's (2008) discussion of researching

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epistemic activities in networked knowledge construction. Zenios and Goodyear put forward the argument that inquiries into collaborative learning can benefit from acknowledgement that learning is:

> By no means and individual process separated from the context of the lived experience of participation in the world. The relations between members of the community are brought into perspective as they are interconnected with the practices of the community. (p. 608)

Similarly, Alexander and Booth (2008) articulated a linkage between "individual orientation" and "social orientation" (p. 443), methodological choices, and theoretical perspectives. Conole (2010) reiterated that theoretical perspectives on whether learning occurs *in here* [within an individual mind] or *out there* [in relation to a socio-technological context] influences choices of networked learning research methodologies and can be a source of either tension or advancement. The impact of differing perspectives on the site of learning come to the fore in Ryberg, Buus, and Georgsen's (2012) call for subtle distinctions between personal learning environments that focus on "the phenomenon of the individual mind" (p. 47), and collaborative learning environments that focus on social engagements, shared cognitive responsibilities, and interactional connections that lead to critical reflections on experiences and practices. One result of these distinctions is setting the "notion of connectivism" (p. 55) apart from networked learning, but maintaining the focus belonging to a networked community. Working from a socio-material perspective on practices and learning, Fenwick (2012) emphasized the agencies of technologies in distributing capacities across networks. Oliver (2012) posited the notion of technology as practice and highlighted the efficacy of acknowledging its "socially constructed character" (p. 441). He suggested that technology be understood in a "relational way—as something in flux, its meaning determined in important ways by the contexts and manner of its use" (p. 442), in order to gain insights into "how people undertake and coordinate socio-material practices" (p. 443). This positioning of teaching and learning as social-material practice highlights interactions among human and material agencies, distributes sites of learning, surfaces issues of power, and reiterates the need for awareness of underlying values enacted in the design in technological environments.

In the concluding chapter of *Exploring the Theory, Pedagogy, and Practice of Networked Learning*, Dirckinck-Holmfeld, Hodgson, and McConnell (2012) made a call for closer examinations of how networked learning environments can be:

> Designed and shaped in different ways depending on the underlying values of and views of human cognition, learning, formation, the technology and pedagogy. At one extreme, they can be designed as constellations of technologies, where the individuals are free to form and control their learning processes by connecting to others for inspiration and resources and used across various levels of aggregation in the group, the network and the collective. While at the other extreme, networked learning environments can be designed as platforms for greater levels of mutual engagements and dedication, critical reflection, emancipatory formation and empowerments. (p. 300)

This focus on theoretically informed and ethically enacted learning designs is again emphasised in the opening chapter of *The Design, Experience, and Practice of Networked Learning*. Hodgson, de Laat, McConnell, and Ryberg (2014) remind us of the centrality of the "critical and humanistic traditions" (p. 2) underpinning networked learning, and shared ongoing commitments to "transcend the dualism between abstract mind and concrete material social practice" (p. 3).

Problematizing computational, cognitivist learning models

Contemporary, computational cognitive theories of learning that focus on computational constructs and evoke "information processing" models "composed of the following basic elements: sensory receptors, perception, short-term and long-term memory" (Tennyson & Rasch, 1988, p. 369) have for decades portrayed the individual mind as isolated and mechanistic. Over that time cognitive theorists have claimed a clearer understanding of cognitive processes can lead to "instructional strategies that can directly improve" learning (Tennyson & Rasch, p. 370). For example, Clark and Paivio (1991) hypothesized that within the structure of the brain there are separate verbal and information subsystems. Mayer and Anderson's multiple representation principle (Mayer & Anderson, 1992)

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posited that technology enhanced learning designs can be made more effective through simultaneous presentations of audio and visual representations of information to ensure efficient short-term memory processing and long-term memory storage. However, the split-attention effect (Mayer & Moreno, 1998) can tax short-term memory; therefore: "using the audio system for verbal information and the visual system for imagery is a more efficient division of labour (p. 4). Time allocations for specific tasks within instructional settings; managing the display and order of declarative, procedural, and conceptual information, linking coding and decoding tasks, etc., influence the effectiveness and efficiency of the "cognitive system" (Tennyson & Rasch, 1988, p. 373). An instance of a time concern that can be 'managed' via design is that "cognitive load may be increased if technology skills and specific subject content area concepts are learned concurrently" (van Merrienboer, Kirschner, & Kester, 2003, p. 95); therefore, learning tasks need to be purposefully sequenced (Morrision & Anglin, 2005). An underpinning assumption of the contemporary cognitivist project has been that if researchers, designers, and teachers design with skill, they can control variables and inscribe foci of attention and structured tasks into e-learning resources; therefore, the efficaciousness of learning can reside in well-designed resources.

Conole's (2006) rejection of the cognitivist perspective of focusing attention on the "design of learning at the resource level" (p. 3) and her re-focusing design scholarship on learners' experiences of the tasks in which they are asked to participate makes a subtle distinction between a networked learning approach to learning design and computational models of cognition as the bases of instructional design. Goodyear, Carvalo, and Dohn's (2014) pose the question of "whether it is actually possible to design for someone else's learning" (p. 139). In part, they respond to their own question, in their framework for network learning design, which makes a distinction between designable tasks and emergent activities. They argue that the physical setting for networked learning includes places, material and digital tools and artefacts, designed tasks, and associated divisions of labour. These physical architectures need to provide human-to-human, things-to-human, and things-to-things connections to allow activities to emerge. While these architectures may have affordances, they note, "an affordance of a thing for a person depends on the qualities of the thing in relation to the person (skills, perceptual ability, etc.)" (p. 138). However well designed they are, the architectures will also have constraints. For example, Goodyear, Carvalo, and Dohn (2014), reject "dualist" positions that:

> Assume a clear distinction between (1) the physical (rocks, buildings, cars, computers, etc) and (2) the human (minds, feelings, perceptions, activities). Bodies, information, knowledge, texts and software then prove to be awkward terms. On the one hand they refer to obvious, hard-to-dispute phenomena, but on the other hand they require quite a lot of easy-to-dispute theorizing to fall into category (1) or (2). (p. 140)

So they turn to a relational perspective that "combines subjective mind and physical body in activity in the world" (p. 141), where humans and materials are mutually constitutive, and where "significance is the ever-changing result of the dynamic co-constitution of the entities" (p. 142). Thus distributed cognitions, in relation to their socio-material contexts and inscribed designs, are continually and mutually emergent.

Rienties, Nanclares, Hommes, and Veermans (2014) argue that when groups of people engage in small group activities knowledge can be "transferred, translated, and transformed" (p. 128) between and among groups. Thus locating learning—meaning making and discovery of significance—soley within human cognitions—becomes problematic, and the premise that the efficaciousness of learning can reside in well-designed resources, becomes equally problematic. So can we reclaim the notion of distributed cognitions in networked learning by turning to social, cultural, material perspectives?

Reclaiming the construct of distributed cognition in networked learning

The early 20th century socio-psychologist, Hugo Münsterburg (1914) focused attention on interrelationships across cognitions within the individual mind, sensory functions of the human body, and socio-material artefacts, and the institutions within which humans engage. He posited that the notion of an individual mind was an "artificially isolated fragment" in the larger picture of the "social mind" (pp. 265-267), claiming:

> There is a "synapsis" between any two brain neurons, and the same "synapsis" between any two social neurons. But in all communication and intercourse the individual transmits by his motor apparatus, his muscles, and the next receives by his sensory apparatus, his sense organs…. The brain cells cause the contraction of the muscles in the arms or fingers, and these contracted muscles awake new sensations in the brain cells. The interplay of the mental states demands this constant reference to the products outside of the brain. (pp. 267-268)

Further, books, newspaper articles, and personal letters act as inter-mediators of human communications and understandings of chronicled events and ideas. These artefacts of previous human cognitions play an active role in influencing contemporary individual cognitions, public discourses, as well as future ideas and social actions.

> Every objectified expression becomes a social short cut. As any psychophysical explanation of the individual mental life must give attention to those unconscious brain processes, the explanation of the social mind necessarily involves the objectified records of experience and suggestions, which intermediate between individuals. They are an organic part of the psychophysical mechanism of the social group. (Münsterburg, 1914, p. 268)

Münsterburg's (1914) conceptualization of distributed cognition is not only embodied and socially situated, but also interconnected with practices. His explanation of social institutions (e.g., administrative, legal, educational, religious, economic, and technical) is based on a relational view, where social groups cooperate to construct institutions, any change in the social practices within these institutions has consequences for both individuals and the social group. Across Münsterburg's argument, his shifting foci on phenomena of analysis from the physical workings of the individual brain, to the embodied nature understanding, to the notion of social neurons, to roles of artefacts of human communications, actions, and decisions in the development of the social mind, and finally to institutional practices. However, his thesis that each of these phenomena is inherently interconnected and consequential and suggests an early social socio-psychological endeavour to "transcend the dualism between abstract mind and concrete material social practice" (Hodgson et al., 2014, p. 3) that aligns with current networked learning conceptualizations of distributed cognition. See for example, Dohn's (2014) explication of distributed cognition as where:

> Knowledge is characterised as tacit, situated, context-dependent, embodied doing, grounded in immediate recognition of and response pairing to the situation's gestalt. Thinking and communicating are phenomena of this doing and as such take their meaning in part from the situation in which they arise. (p. 36)

While Münsterburg's (1914) perspective on cognition differed in many respects from Vygotsky's *Mind in Society* (1978), parallels can be drawn. There is an alignment between Vygotsky's notion of distributed cognition as a "unity of perception, speech, and action" (p. 26), within activities mediated by tools and others in the social and physical environment, and Münsterburg's conceptualization of distributed cognition as physically, socially, and artefact-mediated. For example, just as Münsterburg observed labourers as they engaged in learning manual tasks for the affects of "colors of the surroundings," the "character of the signals, by the position during work, by the filling of the pauses, by pleasant or unpleasant distractions, by continuity or interruption" (p. 425), Vygotsky observed children's approaches solving "practical tasks" by "applying as tools those objects that lie near at hand," and also "searching for and preparing such stimuli as can be useful in the solution of the task, and planning future actions" (p. 26). Both theorized learning in social, situated, materially mediated, and "embodied doing" (Dohn, 2014, p. 36). In a similar vein, John Dewey (1910) attributed designed objects and tools with the capacity to support reflective thought and plan systematic actions. For example, Dewey argued, "We deliberately erect monuments and memorials, lest we forget," and we "deliberately institute, in the advance of the happening of the various contingencies and emergencies of life, devices for detecting their approach and registering their nature" (1910, p. 15) in order to minimize negative impacts. He defined learning as "of, by, and for" experience (p. 249), and forwarded the premise that we live in a world of persons and things that are linked to or are artefacts of previous human experiences; therefore, a new experience cannot be "treated as if it were something which goes on exclusively in an individual's mind and body"

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(1938, p. 34). The influences of our physical and social surroundings "contribute to experiences that are more worthwhile" (p. 35). Therefore, Dewey argued that teachers should approach learners with an intimate acquaintance with the "conditions of the local community, physical, historical, economic, occupational, etc." (p. 36) and approach teaching and learning as a collaborative, democratic, activity-based, and socio-material set of practices.

Looking forward

Underlying democratic values and socio-material, relational views of learning experiences set networked learning apart from broader educational technology praxis communities. Turning to pre-computational conceptualizations of distributed cognition can overcome constrained psychological discourses and return to a broader socio-psychological and socio-material understanding of interconnected activity systems in which cognitions within the individual mind are embodied and mutually constitutive within socio-material artefacts and institutional practices. From a pre-computational perspective, distributed cognitions implicate emergent—potentially competitive—individual, social, political, economic, technological, and material agencies that influence teaching and learning practices *in* the world. The site of networked learning can then move on from the "*in here/out there"* debate, and distributed cognition can become a relational, situated, democratic, *inter-subjective* construct that surfaces spaces where discourses on design, power, agency, difference, practice, and technological affordances can be further examined and problematized.

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