Sociomaterial Entanglement Theory (SET): The New Technosocial Reality

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Abstract

The cognitive sciences remain oblivious to the medium or material that shapes human interaction and agnostic of its affordances and how they influence the manner in which people act, perceive, or think. Sociomaterial Entanglement Theory (SET) is proposed as a theory that embodies the sociomaterial entanglement with which people learn and the technosocial reality we live in as well as an approach that enacts contemporary ideas about how people learn.

Keywords: Sociomateriality, sociomaterial entanglement, technosocial reality, pedagogical ecology, learning technologies, social media technologies, personal learning environments

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Several attempts have been made to battle the prevailing tendency to limit conceptions of the social to interactions between persons rather than between persons and things (Malafouris & Renfrew, 2010). Gibson’s theory of affordances is one of those attempts. Gibson’s theory of affordances is an ecological or environmental approach to psychology that emphasizes perception and action rather than memory and retrieval. Gibson (1979) proposed that objects or artifacts (e.g., technologies) have certain affordances (capabilities) that lead organisms (e.g., people) to act based on their perceptions of these affordances. In other words, people act when they perceive an opportunity to act. Therefore, action and perception are linked through the
affordances present in a given situation. Affordances provide strong clues to the operation of things. For example, chairs ‘afford’ sitting, glass ‘affords’ seeing through or breaking, knobs ‘afford’ turning, balls ‘afford’ throwing or bouncing, etc. (Norman, 2013; Kaptelinin, 2014).

The theory of affordances has direct implications on how we may understand the evolution or ecology of online learning and the technology-based design of learning activities and interactions (Dabbagh, 2004; Dabbagh & Reo, 2011). For example, pre-Internet technologies such as broadcast technologies that focus on transmitting information or one-way provision of content ‘afford’ pedagogical practices that are primarily behaviorist or objectivist in nature. Examples include direct instruction, self-contained curricular units, and drill and practice activities.

Web 1.0 technologies that characterized the first stage of the WWW, enabled more open and flexible learning spaces and afforded multiple forms of interaction such as learner-learner, learner-group, learner-content, learner-instructor, and group-group, allowing teaching and learning events to be distributed across time and place synchronously or asynchronously (Dabbagh & Bannan-Ritland, 2005; Dabbagh et al., 2019). The pedagogical ecology of Web 1.0 technologies resulted in pedagogical practices that are more constructivist in nature, such as collaboration, articulation, social negotiation, exploration, and reflection.
Web 2.0 technologies characterized the second stage of the WWW representing a qualitative shift in how information is created, delivered, and accessed on the Web (Dabbagh & Reo, 2011). Web 2.0 saw ICTs move away from simply transmitting and conveying static content to allowing users to generate their own content, and interact with what they were experiencing on the Web. Web 2.0 became a concept and not just a technology, embodying themes such as openness, personalization, customization, participation, social networking, social presence, user-generated content, the people’s Web, read/write Web, and collective wisdom leading to its characterization as the ‘Social Web’ (Alexander, 2006; Davis, 2008; Jones, 2008; O’Reilly, 2005). The 2014 NMC (New Media Consortium) Horizon Report (Johnson et al., 2014) also emphasized the social side of Web 2.0 particularly as this relates to the ubiquitous use of social media technologies in the education sector and the way this use is changing how students and educators interact, present information, and judge the quality of content and contributions.

The new activities that grew out of Web 2.0 technologies (e.g. blogging, wikis, creating and posting videos) moved technology supported activities away from having to be teacher-centered to the possibility of being more learner-centered. First, Web 2.0 technologies made it possible for learners to engage in high levels of dialogue, interaction, and collaboration through social networks and provided learners with the ability to generate and share knowledge across learning networks. Second, Web 2.0 technologies deflected control of learning away from a single instructor or expert by distributing learning among all participants in the learning community, promoting agency in the learning process and an appreciation of diversity, multiple perspectives, and epistemic issues. And third, Web 2.0 technologies enabled learners to personalize their learning environment by selecting the technologies they wish to use (e.g., apps on mobile devices), accessing and organizing information sources, customizing the user interface of a technology, and building personalized learning and professional networks (Dabbagh et al., 2019).
Web 3.0 technologies are now surfacing as the next wave of ICTs and the next phase or iteration of the World Wide Web. Web 3.0 technologies can be characterized as the “semantic”, “spacial”, or “3D web” (Evans, 2021; Roy, 2022). As Evans describes, rather than seeking information by keyword, activities, or interests, users will be able to define their preferred means of information seeking. Enabled by blockchain technologies, the Web 3.0 movement has been characterized by embracing the principles of “open, decentralized, censorship-resistant, immutable, trustless, and permissionless” interactions (Eshita, 2021). These platforms cut out the middle man of the larger corporations so that the user can control their own data analytics, set their own rules, and obtain the full monetary gain from their efforts online. Web 3.0 also promises interoperability so that end users do not need to create multiple accounts for multiple services. Given the promised interoperability, Web 3.0 may enable personalization across platforms, yielding a cryptographically backed digital identity to be represented across the web and resources that better connect to the end users based on their interests and powered by machine learning (Evans, 2021). These extended capabilities, however, are very much in their nascent stages and beg questions about privacy, security, bias, and censorship.

Web 3.0 technologies can also be characterized as immersive technologies in that they allow participants to be totally “immersed” in the context that the environment represents. Immersive environments allow participants to be “in” the experience created by the tool (Pagano, 2013). They create virtual experiences that strive to look and feel like real settings. Immersive environments can be created as either a “classic” immersive reality where the participant may wear goggles, and interacts via a headset and a joy-stick or other controller, and experiences the environment through these devices. Immersive technologies allow the participant to create an avatar to represent themselves. Simulations, educational games, virtual reality environments are all examples of immersive environments. The immersive environment would include a 3-dimensional visual experience, audio and potentially olfactory stimuli.

Augmented reality (AR) experiences, extended reality (XR) experiences, mixed reality (MR) experiences, and virtual reality (VR) experiences are all examples of Web 3.0 technologies that
are transforming the “learning with technology” landscape. Advances in artificial intelligence (AI), computational design, machine learning and smart technologies like the Internet of Things (IoT) are automating the design of human-centered environments and human-machine partnerships whether in real or virtual reality transforming the future of work, entertainment, healthcare, education, business and everyday life.

It is clear that online learning (or what used to be called distance learning) has significantly changed over the years from a social, pedagogical, and technological perspective. These changes seem to coincide with the changes and advances in learning technologies, making it difficult to separate the impact of technology on the teaching and learning process and supporting the argument that technology is not neutral, rather, it brings with it its own affordances and implications on learning designs premising a pedagogical ecology that emphasizes the non-neutrality of the learning space and consideration of the expectations and potentials that each learning medium brings forth to the teaching and learning process. Supporters of this view argue that each medium has a unique set of characteristics and that understanding the ways in which students use the capabilities of the medium is essential to understanding the influence of the medium on learning and on building media theory (Kozma, 1994).

Enter Sociomaterial Entanglement Theory (SET) (Decuypere & Simons 2016; Fenwick et al. 2011; Carvalho & Yoeman, 2019); the intersection of the technical (material) and the social (human) through thought and action, also known as multiagent socio-technical systems, which means that humans and “things” are ontologically inseparable from the start” and are observable through the intra-action (Frauenberger 2020, p. 21) and the relationships with the other elements of the learning environment in the context of their contribution to the learning activity.

Sociomateriality is another attempt at breaking the prevailing tendency to limit conceptions of the social to interactions between persons rather than between persons and things. It provides a post-humanist/sociomaterial perspective of how people learn and ensures that we have a deeper understanding of the learning activity. In other words, the components and the actors in the
learning environment—including the learner—mutually condition and transform each other while they interact, continuously shaping the learning activity (Castañeda et al. 2017).

SET is not an explanatory theory, rather an approach or framework with a broad spectrum of applications that are able to integrate some of the most naturalistic ideas about how people learn in the digital environment. The most relevant of which are:

- learning anytime, anywhere, or what has come to be known as ubiquitous learning (Taraghi 2012);
- adult learning, specifically as this relates to self-directed learning or what is known as heutagogy (Blaschke 2012, 2013);
- learning with others as conceptualized by social constructivism (Rahimi et al. 2015; Torres-Kompen et al. 2019); and
- learning in connection or connected learning as embraced by connectivism (Siemens 2005; Downes 2007) and networked learning (Drexler 2010; Goodyear 2005; de Laat and Dohn 2019).

If something has exceptionally changed in education, it is the ecologies in which people learn that are now full of emerging resources and technologies that scatter learning experiences across institutional, geographic, societal, and economic boundaries resulting in the personalization and globalentization of the learning experience (Dabbagh & Castaneda, 2020). Also, if something has exceptionally changed in educational research, it is the importance of the learning activity and how we understand the relationships among the actors towards this activity. In this context, Sociomaterial Entanglement Theory or SET recognizes the ecologies in which people learn, how the elements of those ecologies interact to transform the learning activity, what this means for the practice of teaching and learning, and how people take advantage of the possibilities to learn they already have (Dabbagh & Castaneda, 2020). SET can be conceptualized as a technosocial reality that embodies the sociomaterial entanglement with which people learn as well as an approach that enacts contemporary ideas about how people learn. Learning can no longer be understood by focusing solely on cognition, development, or the behavior of individual learners; neither can it be understood without reference to its situated, sociocultural and lifelong nature, the tools through which learners construct meaning, and the context in which these tools are used.
References:


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