



Synthesis

Social learning in conservation and natural resource management: taking a sociocultural perspective

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ABSTRACT. Involving multiple stakeholders in conservation and natural resource management through participatory and collaborative approaches has been lauded as having great potential for achieving healthy and resilient social-ecological systems. Within these approaches, social learning has come to be understood as a key process that can support resilient systems by fostering trust and mutual understanding between stakeholders, bringing diverse types of knowledge into management schemes, and increasing the adaptive capacity of social-ecological systems so they are better equipped to accommodate change and disturbance. Yet, research on social learning with respect to conservation and natural resource management has thus far failed to consequentially attend to the intensive research and theoretical perspectives on learning from the learning sciences and educational research more broadly, perspectives that we argue can offer new insights to the social learning scholarship. Specifically, we synthesize and assess the value of sociocultural theories of learning to improve research on social learning processes and outcomes in the context of social-ecological resilience. Sociocultural learning theories help explain learning at both the individual and collective level, as well as the role of social, cultural, and historical contexts as constitutive components of learning. We argue that future studies of social learning should consider engaging with these theories to yield more rich and nuanced insights for the conservation and natural resource management fields with the goal of bolstering social-ecological resilience.

Key Words: *resilience; social learning; sociocultural learning theory*

INTRODUCTION

As the 21st century progresses, social and ecological crises continue to grow in number, scale, and complexity. Increasingly, scholars in the conservation social sciences have identified learning as a paramount consideration and key mechanism for achieving positive conservation outcomes and social-ecological resilience amidst this ongoing environmental change and disturbance (Armitage et al. 2008, Berkes 2009, Gerlak et al. 2019). Various terms such as social learning, policy learning, and organizational learning have been employed in empirical research to describe how and what people learn in the unique context of conservation and natural resource management, and how such learning relates to social-ecological resilience (Gerlak et al. 2018). Amongst these constructs, social learning in particular has been widely adopted in the conservation social sciences, in part because of its central role in facilitating successful multi-stakeholder initiatives (Pahl-Wostl 2006, Gerlak et al. 2018, Suškevičs et al. 2018, Ernst 2019).

Previous syntheses define social learning as both a process and outcome that operates at the individual and collective level amongst diverse stakeholders (Muro and Jeffrey 2008, Reed et al. 2010). It entails changes in understanding for both the individuals involved as well as the co-construction of shared knowledge that becomes situated within wider groups (Reed et al. 2010). Muro and Jeffrey's systematic literature review concludes, "there seems to be consensus that social learning requires the communication and interaction of different actors in a participatory setting which is believed to result in a set of social outcomes" (2008:339). Through the collaborative and participatory processes that facilitate social learning, different actors can share and contribute their perspectives so that conservation and natural resource management approaches encompass the values, interests, and

understandings of multiple groups, as opposed to solely those of scientists and natural resource managers.

Early discussions of social learning can be found in studies of social psychology and human behavior pioneered largely by Albert Bandura (Bandura 1977). Bandura's work elaborates on how people iteratively learn through the observation and imitation of others, and represented a significant contribution to the field of developmental psychology at the time of its publication. Pahl-Wostl and Hare (2004), however, argue that Bandura's approach is too narrow to embrace all the learning processes of relevance in conservation and natural resource management, which is why social learning has assumed a unique definition in this context. Fundamental to the salience of social learning for conservation and natural resource management is the notion that stakeholders with different perceptions, values, and goals can engage with and learn from each other, such that they all produce a new understanding of a given issue at hand (Wals and Van der Leij 2007).

And yet, although social learning remains an important process for conservation and natural resource management, there has been widespread critique regarding an overall lack of theoretical rigor in the research on social learning, which has limited scholars' ability to generate cumulative insights and substantive understandings of the phenomenon (Muro and Jeffrey 2008, Reed et al. 2010, Rodela 2013, Gerlak et al. 2019). Some of this critique has explicitly highlighted inadequacies in attending to context (Suškevičs et al. 2019), power (Suškevičs et al. 2018), and the links between individual and collective learning (Gerlak et al. 2019). We respond to these critiques by asserting that theories from the learning sciences, specifically sociocultural theories of learning, can provide a lens to address them while simultaneously offering

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new and valuable perspectives to ongoing research on social learning. Sociocultural learning theories describe learning as fundamentally a social process, and can guide analytic frameworks that offer the theoretical rigor needed to better identify and describe how social learning occurs in diverse contexts. In making this argument, we respond to calls from conservation and natural resource scholars who argue for drawing on theoretical perspectives from educational research (Gerlak et al. 2019) as well as a more “robust trans-disciplinary alliance between ecologists and educationalists” (Fazey et al. 2007:379).

LEARNING FOR RESILIENCE: THE ROLE OF PARTICIPATORY AND COLLABORATIVE APPROACHES

To understand how social learning can contribute to social-ecological resilience, we describe the relationships between participatory and collaborative approaches to conservation and natural resource management, and resilience. Resilience refers to a given system’s ability to adapt and sustain its core functions over time in the face of disturbance (Krasny et al. 2010). Though not always a desirable quality, e.g., for salinized landscapes or eutrophic lakes, it has become a normative goal for conservation in the face of environmental disturbances (Walker 2020). Managing for resilient social-ecological systems changes the focus from attempting to achieve an optimal state for any given system to treating variation as both natural and desirable, and considering both human and natural processes as integrated and important (Walker et al. 2004, Biggs et al. 2015).

Managing for resilience in the context of complex environmental problems does not lend itself entirely to straightforward analyses by the conventional scientific management approach of defining the problem, collecting and analyzing data, and making decisions based on the results (Scott 1998). Berkes (2004) argues that this necessitates a new kind of conservation science and management created through researchers and stakeholders jointly defining important questions, objectives of study, relevant evidence, and convincing forms of argument. This approach emphasizes public participation and collaboration, e.g., through processes such as community-based monitoring or adaptive co-management, through which stakeholders can share and integrate their values, goals, and types of knowledge. This mutually constructed understanding of the system is a product of social learning, which is a key mechanism through which social-ecological systems become more resilient (Pinkerton 1989, Keen et al. 2005, Armitage et al. 2009). For instance, where there is evidence of ongoing or continuous social learning, social capital may be produced or increased, and a group or network may become more adaptive (Plummer and FitzGibbon 2007). To this end, scholars have increasingly highlighted adaptive and participatory approaches to conservation and natural resource management as key strategies for achieving social-ecological resilience, in large part because they catalyze social learning explicitly or implicitly (Armitage et al. 2007, 2009).

Indeed, early literature on adaptive management for resilience discusses the central role of learning to the process, but often depicts it as a simple feedback loop between monitoring and the acquisition of scientific data, new knowledge, and decision making (Fernández-Giménez et al. 2019). This model lacks the ability to account for the complex social processes in which

learning occurs for both individuals and larger groups involved in conservation and natural resource management. To this end, social scientists have increasingly paid attention to the many dimensions of social learning as a process, outcome, and goal of participatory and collaborative approaches to conservation and natural resource management, for example, in the contexts of citizen science (Jordan et al. 2016) and collaborative governance (Siddiki et al. 2017). And yet, despite the increased interest in social learning, the natural resources scholarship as a whole has failed to adequately attend to aspects of learning theory in empirical studies of social learning. Social learning that is optimal, that is, mutual and equitable, is by no means a guaranteed outcome of participatory and collaborative approaches to conservation and natural resource management, but we argue that greater attention to learning theory will allow researchers to identify the conditions under which social learning emerges so that we can better design initiatives that support learning for social-ecological resilience.

USE OF THEORY IN EXISTING SOCIAL LEARNING SCHOLARSHIP

Numerous scholars in the conservation social sciences have identified weaknesses in the broader literature on social learning, and recent review papers aiming to characterize the state of the research literature have reinforced these arguments (Muro and Jeffrey 2008, Rodela 2013, Gerlak et al. 2018, Suškevičs et al. 2018, 2019, Ernst 2019). These critiques center primarily on the theoretical and conceptual treatment of social learning in empirical scholarship and reveal gaps in understanding.

For one, many studies of social learning offer vague and non-specific definitions of the phenomenon, such that operationalizing the concept and applying it to conservation and natural resource management is difficult. Reed et al. (2010) elaborate on this lack of conceptual clarity, noting that with such “hazy” definitions, these studies often confuse learning with the conditions or methods necessary to facilitate learning, such as stakeholder collaboration and public participation. Reed et al. (2010) also call attention to persistent confusion between social learning and its potential outcomes, such as trust between stakeholders, increased social capital, and pro-environmental behavior, in addition to little distinction between individual and wider social learning. This lack of clarity has led to an emergence of multiple disparate “strands,” or sub-fields, of scholarship that make it difficult to generate cumulative insights about the phenomenon of social learning (Gerlak et al. 2019).

Stronger theoretical and conceptual development can help guide more rigorous empirical assessment of social learning. Although the majority of research on social learning is empirical in nature, few studies on social learning successfully integrate theory and empirical research, or use theory to support their analytic frameworks in a detailed way (Rodela 2013). Ernst (2019) echoes this, identifying “a scarcity of profound analytical concepts guiding such empirical analyses” of participatory processes and social learning. For example, few studies examine how contextual elements of the learning environment, whether these be material or structural, relate to social learning processes and outcomes (Gerlak and Heikkilä 2011, Rodela 2013). In another example, Gerlak et al. (2019) argue that current understandings of both individual and collective learning are undeveloped. Stronger

attention to theory in these areas would provide an anchor to guide researchers in developing new questions and applying methods, whether they are attempting to understand causal relationships through quantitative approaches, or generating rich descriptions through qualitative approaches, so as to better identify and understand the many components of social learning.

TURNING TO EDUCATIONAL RESEARCH

Ideas from outside the field of conservation and natural resource management are necessary to address current theoretical weaknesses in the social learning scholarship and enrich future research in this area (Fazey et al. 2007, Gerlak et al. 2019). Scholars in conservation and natural resource management have already applied theoretical perspectives from educational research to better understand learning in these contexts, for example, by turning to theories of transformative learning theory and experiential learning. In one study, Wilner et al. (2012) used Mezirow's (1991) theory of transformative learning in their study of integrated coastal resource management. Mezirow's theory centers on critical reflection being a tool to effect changes in our individual frames of reference, or the structures of assumptions through which we understand our experiences. Moyer and Sinclair (2020) provide a review of how transformative learning theory has been used in the context of sustainability. Beyond transformative learning theory, Toderi et al. (2007) used Kolb's (1984) theory of experiential learning in their study of nitrate management in an agricultural region. Similar to transformative learning theory, experiential learning theory describes how participation in a cycle of concrete experiences, reflection, and abstraction can support learning and new ideas.

Both Mezirow's and Kolb's theories of learning offer useful frameworks for assessing changes in understanding by individuals and the factors associated with such changes, which can certainly inform research in natural resource contexts (Reed et al. 2010). Each has been widely cited within research on adult education and used in studies of individual learning across diverse contexts. Individual learning has conventionally been conceptualized as the acquisition of knowledge and cognitive skills (Salomon and Perkins 1998), and this represents one unit of analysis to understand changes in understanding for those involved in participatory and collaborative approaches conservation and natural resource management. These theories provide a valuable way to understand how these approaches might foster changing ideas that lead to individual, interpersonal, or collective action (Moyer and Sinclair 2020), and may provide a useful lens for studying these sub-components of social learning processes.

However, because they are limited to learning at the individual level, Kolb's and Mezirow's theories are insufficient on their own for understanding broader social learning processes, as social learning entails both individual learning and collective learning. To understand social learning, we need to look beyond the individual and simultaneously analyze how both individuals and broader groups learn in the context of conservation and natural resource management (Gerlak and Heikkilä 2011). Collective learning occurs when learning across individuals is translated into social or institutional transformation at the group level or when shared knowledge is co-created (Argyris and Schön 1996, Reed et al. 2010, Gerlak and Heikkilä 2011). Sociocultural theories of learning can offer a valuable lens to understand learning at both

the individual and collective level, as well as the role of context in mediating learning, in conservation and natural resource management.

SOCIOCULTURAL PERSPECTIVES ON LEARNING

Over the past several decades, there has been a sociocultural turn in the learning sciences. Learning sciences research is a prominent, interdisciplinary subfield of educational research, drawing on perspectives from psychology, cognitive science, and cultural anthropology (Sawyer 2005). Sociocultural theories of learning emphasize learning as a "horizontal process," in which expertise is developed within and across practices and communities, in contrast to focusing solely on learning as a "vertical process" in which individuals move from incompetence to competence, or from lack of understanding to full understanding (Gutiérrez 2008). We argue that by (1) describing learning as a social process, which foregrounds context as fundamental to any analysis of learning, and (2) attending to how learning occurs both individually and collectively, these theories provide a means to address many of the weaknesses in the scholarship on social learning in conservation and natural resource management.

Sociocultural learning theory is an umbrella category encompassing the many theories derived largely from the work of L. S. Vygotsky (1978), a Marxist psychologist perhaps most well-known for his commitment to understanding learning as a social activity (unlike others at the time who viewed learning from a more individual cognitive or behaviorist perspective). According to Vygotsky, all learning occurs within a sociocultural context, involving "culturally informed tools and figures as part of a range of highly social activity systems, however alone the learner may be at particular moments" (Salomon and Perkins 1998:16). In contrast to the views of learning that conceptualize it as the unilateral acquisition of fact-based knowledge, sociocultural theories of learning build on these early ideas of Vygotsky to emphasize the interactions between the individual and the social world as fundamental to the learning process. Gutiérrez and Rogoff (2003) suggest that taking individuals as the unproblematic unit of analysis, without any attention to the social world, fails to account for the larger cultural practices that co-evolve with learning. Sociocultural learning theories allow us to understand learning not as entirely cerebral or "in the mind;" but as a socially situated act mediated by material and symbolic artifacts within social, cultural, political, and historical contexts. Rather than serve as a backdrop for learning, these contexts become a crucial component of the learning process. By foregrounding these considerations, sociocultural theories of learning can help explain both the mechanisms underpinning social learning, as well as the links between learning at the individual and collective level.

Despite their individual differences, all sociocultural learning theories share additional common elements that distinguish them from individual cognitive approaches to study learning. Esmonde (2017) identifies the following six propositions as fundamental tenets of sociocultural perspectives on learning:

1. Cultural artifacts (both tools and signs) mediate human activity.
2. Learning should be studied as it occurs in everyday life, not just in the laboratory.

3. As people cross boundaries between different contexts, their learning both endures and shifts.
4. Multiple historical timescales are relevant for the study of learning.
5. Learning should be studied using a genetic (developmental) method that allows insight into the process of learning, not just the outcomes.
6. As they participate in joint activity, people simultaneously exercise agency and are constrained.

Because these theories allow for studying units of analysis beyond the level of the individual learner, they can be used to understand how exogenous sociocultural factors affect learning and vice versa. Suškevičs et al. (2019) argue that contextual issues are often addressed vaguely in the current empirical natural resource management literature. Thus, designing studies that use sociocultural learning theory as their foundation can provide the necessary analytical tools to understand the relationships between social learning contexts, processes, and outcomes.

This attention to context is a particularly relevant need in conservation and natural resource management, in which the social, cultural, and political dimensions of collaboration and conflict are highly salient. Even conservation efforts that attempt to be systematic are not straightforward, uncomplicated processes, and the success of these initiatives depends on understanding the complex connections that people have to landscapes at multiple scales that may span generations (Noss et al. 1997, Baldwin and Judd 2010). Leveraging sociocultural learning theory can make these sorts of contextual complexities visible to researchers studying social learning, offering the explanatory power to make sense of the role they play in learning processes.

To help further illustrate these assertions, we provide an overview of three dominant sociocultural theories of learning: situated learning (Lave and Wenger 1991), identity and agency in figured worlds (Holland et al. 1998), and cultural-historical activity theory (Engeström 2001). While sharing the elements common to all sociocultural learning theory identified by Esmonde (2017), each attends to different elements of the learning process and thus might be useful for different research questions and contexts as they relate to social learning in conservation and natural resource management.

Situated learning theory

Drawing largely on Vygotsky's ideas, Lave and Wenger (1991) argue for understanding learning as both participation in and as a dimension of social practice, or ongoing real-world activity. Instead of describing learning as a simple process of transferring information, their theory of situated learning centers on the notion of legitimate peripheral participation in communities of practice, where participation and learning constitute each other.

A community of practice is a social unit in which members share understandings concerning what they are doing, what it means in their lives, and what it means for their communities (Lave and Wenger 1991). Within a community of practice, it is assumed that members have different interests, make diverse contributions to an activity, and hold varied viewpoints. Thus, a community of practice is not a homogenous unit; instead, it is defined by having

joint enterprise or shared goals negotiated by participating members, mutual engagement amongst such members, and shared repertoires of resources that assist in the negotiation of meaning (Wenger 1998).

Within the model of learning as legitimate peripheral participation, participation in social practice is in itself considered learning. More specifically, learning entails movement from the periphery of a community of practice to full participation (Lave and Wenger 1991). As individuals become more active participants in a given community of practice, they construct identities in relation to these communities. Central to this process is the legitimacy of participation, or the extent to which participation is authentic and recognized as such by the learner as well as other members of the community of practice. The social structure of a practice and its conditions for legitimacy define possibilities for participation, meaning that notions of authentic participation, and what authentic participation means, are central to situated learning.

Furthermore, these changes in legitimate peripheral participation for individual learners entail changes for the broader community of practice. Communities of practice are constituted and reconstituted by their members as they learn and transform over time. To this end, legitimate peripheral participation serves as a conceptual bridge, offering claims about the common processes inherent in changing individuals and changing communities of practice. (Lave and Wenger 1991).

Situated learning theory and the communities of practice framework are not new to conservation and natural resource management, and have been widely cited in relation to social learning in these fields (Armitage et al. 2008, Muro and Jeffrey 2008, Rodela 2013). Pahl-Wostl and Hare (2004), for instance, studied social learning in the context of participatory modeling for urban water management and indicated that Wenger's work on communities of practice (1998) informed their model of social learning amongst utility officials, housing association representatives, city council members, and others by giving space for relational qualities (Pahl-Wostl and Hare 2004). However, Rodela (2013) points out that they did not use it to guide their analytic framework nor empirically verify the aspect of relational qualities. A more recent paper by Lumosi et al. (2019) begins to address this, using Lave and Wenger's work (1991) to understand how learning spaces and associated elements such as interaction, deliberation, and framing, situated within broader cultural, institutional, and historical contexts, shaped emergent social learning processes amongst stakeholders involved in transboundary river management in Africa's Zambezi Basin.

Situated learning theory could continue to inform scholarship on social learning in conservation and natural resource management should researchers more intentionally integrate it into their research design. Not only does it offer explanations for the mechanisms understanding individual learning; it also explains the mechanisms underlying collective learning through the production and reproduction of communities of practice, as bodies with both histories and futures.

Learning through the lens of identity and agency

Closely related to Lave and Wenger's (1991) theory of situated learning in communities of practice is Holland et al.'s theory of

identity and agency (1998). From a sociocultural perspective, identity is a complex construct that entails being recognized as a “certain kind of person” (Gee 2000:99) that is negotiated at the intersection of the individual and the social world, and shifts in relation to the particular social setting and actors (Nasir and Hand 2006, Nasir and Cooks 2009). Agency, on the other hand, refers to how people act purposefully in socially constructed interactions, with attention toward changing those situations (Schenkel and Calabrese Barton 2020). Researchers in the learning sciences are increasingly concerned with how opportunities to author identities and enact agency do or do not allow people to engage in learning (Calabrese Barton and Tan 2010). Holland et al. (1998) put forward the concept of “figured worlds” as sites in which people produce new identities and demonstrate agency in the context of socially produced, culturally constituted activities. These sites are defined as the “realms of interpretation in which a particular set of characters and actors are recognized, significance is assigned to certain acts, and particular outcomes are valued over others” (Holland et al. 1998:52), offering a context in which learning can be analyzed from a sociocultural perspective.

Central to Holland et al.’s (1998) theory is how people’s identities and agency develop in figured worlds. These processes, in which there are changes in identity and how people enact agency, constitute learning in and of themselves. Through participation in figured worlds, individuals develop conceptions of themselves as actors in these worlds, and to the degree that these self-conceptions are conscious, these individuals can exercise agency over their behavior. These moments of improvisation in which people enact agency, supported by the cultural resources on which individuals draw, lead to the continuing adjustment, reorganization, and movement of these worlds. Thus, similarly to Lave and Wenger’s (1991) articulation of legitimate peripheral participation, the concepts of identity and agency serve as a conceptual bridge in which researchers can understand how individual learning, in which there are shifts in identity and agency, and collective learning, in which there are changes at the level of the figured world, are mutually constitutive. With a less regimented definition than communities of practice, however, the strength of the figured worlds framework lies in the fact that it cannot be reduced to one simple, context-specific definition (Urrieta 2007). This can be particularly appropriate for studying social learning in participatory approaches to conservation and natural resource management in which people may occupy multiple roles, cross boundaries, and engage in activities in ways that vary significant across time and space.

Additionally, this framework offers affordances for understanding the roles of power and positionality in learning, another urgent topic in social learning research in conservation and natural resource contexts. Although scholars have begun to recognize the role of power in mediating social learning (Ernst 2019), there is a need to better understand the specific ways in which power and politics influence how learning among individuals does or does not translate upward into institutional and larger system reorganization (Ballard and Belsky 2010, Rodela 2013, Gerlak et al. 2018). On entry into figured worlds, novices gain social positions and “positional identities” that are determined by the more established members of that world, identities that are inextricably entangled with power, status, and rank (Calabrese Barton and Tan 2010).

Power asymmetries also differentiate one figured world from another, for example, in the case of forest resource management and the privileging of land managers’ epistemic authority over that of undocumented non-timber forest product harvesters (Ballard and Belsky 2010). Although Ballard and Belsky (2010) did not use Holland et al.’s theory (1998) in their participatory action research study of learning processes as it related to forest resource management, their case nonetheless provides an example of how communities enact and sustain various networks of power that privilege particular discourses, identities, and forms of participation over others (Basu and Calabrese Barton 2009). Applying the figured worlds framework to this context could allow for understanding the ways in which participants’ identities shifted in relation to participation in the participatory action research project, as well as how they did or did not enact agency. In what ways did their positions, as harvesters or as land managers, matter in these processes and the simultaneous processes of learning?

Research in fields such as political ecology has already begun to examine the relationships between identity and power in the context of environmental change and social-ecological processes (Agrawal 2005, Robbins 2012). And yet, the relationships between these constructs and that of social learning have yet to be investigated in the literature on conservation and natural resource management. Using Holland et al.’s (1998) lens of identity and agency in these contexts may provide a way to understand the links between individual learning and the larger figured worlds in which learning might be taking place collectively, and thus offers a promising way forward for future scholarship.

Cultural-historical activity theory

Cultural-historical activity theory (CHAT) provides yet another theoretical perspective for understanding learning as a sociocultural activity by focusing on knowledge as mediated through artifacts, uniquely assuming activity systems as the unit of analysis for the study of learning. Originating in the work of Vygotsky and his student A. N. Leontiev, CHAT is particularly appropriate for studying learning in complex social-ecological systems where multiple individuals are involved in shared activities within a single or multi-organizational context (Yamagata-Lynch 2010). Similar to theories by Lave and Wenger (1991) and Holland et al. (1998), CHAT emphasizes the relationship between the individual world and the larger context as fundamental to learning. Unlike these theories, however, CHAT allows for the study of learning outside communities of practice or figured worlds, in contexts in which there is not necessarily a stable locus of control, or where there is not a well-bounded work unit that could conceivably be the center of coordination in an activity system (Engeström 2001).

Perhaps most central to CHAT is its focus on object-oriented activity, activities being the ways in which people are actively engaged with the environment as embedded in social context (Engeström 1987, Rogoff et al. 1995, Wertsch et al. 1995). An activity is object-oriented in that it has a particular goal, and involves interactions amongst subject, object, motivation, action, goals, socio-historical context, and the consequences and activity (Yamagata-Lynch 2010). Activities are different from actions in that actions are often individually focused and have less of a collective consequence to the community-based, object-oriented

nature of activities, although actions may be steps that subjects take in the process of participation in an activity.

Within an activity system, there are several key components that interact with each other in complex and multi-faceted ways, together providing a foundation for analytic frameworks that take a cultural-historical perspective to studying learning in activity systems (Yamagata-Lynch 2010). Subjects represent the person or people engaged in an activity who are the focus of a study, e.g., land managers, scientists, or community leaders. Rules represent the laws, codes, conventions, customs, and agreements that community members adhere to while engaging in the activity, e.g., joint powers agreements, meeting structures, or communication norms. The community includes the people who share knowledge, interests, stakes, and goals to accomplish an activity, e.g., the broader stakeholder network, resource users, and local residents. The division of labor indicates how activities are divided amongst the participants, e.g., distribution of roles and responsibilities. The tools are physical things, representations, and systems of symbols that subjects use to accomplish an activity, e.g., meeting minutes, maps, and language use. The object represents the immediate goals of the activity, e.g., acquisition of new scientific data or grant funding, which motivates the outcome, or the long-term goals of the activity, e.g., social-ecological resilience. Historically accumulating contradictions between these different components may lead to tensions that catalyze re-organization of the activity system as a form of collective learning (Engeström 1987).

More recent iterations (or “generations”) of CHAT have expanded to include two interacting activity systems as the basis for analysis, providing conceptual tools to understand dialogue, multiple perspectives, and networks of interacting activity systems (Engeström 2001). Boundaries within and between activity systems act as vital forces for change and development (Roth and Lee 2007, Akkerman and Bakker 2011). “Boundary crossing” refers to a person’s transitions and interactions across different activities, sites, and practices, and “boundary objects” are artifacts that serve a bridging function and facilitate boundary crossing (Star and Griesemer 1989). These become ambiguous yet productive sites for learning (Akkerman and Bakker 2011). Roth and Lee (2007) propose the idea of boundary-crossing “laboratories,” drawing from the work of Engeström (2000), as a CHAT-inspired method in which researchers and practitioners from different fields work across boundaries to engage in collaborative work and envision new types of activity. The collaborative work then becomes an activity system in its own right that can be used both as a unit of analysis in research as well as a catalyst for change in practice (Roth and Lee 2007).

Multiple activity systems are often at play in conservation and natural resource management contexts, particularly within collaborative and participatory approaches where stakeholders coming from different backgrounds and settings engage with each other through complex social arrangements. Jansujwicz et al.’s (2013) study on “community-based citizen science” relating to vernal pool mapping and assessment in Maine provides a salient example. The authors assert that citizen science (when non-professional scientists engage in scientific research or monitoring in collaboration with professional scientists) created new opportunities for interaction between program coordinators, municipal officials, and private landowners. They also document

individual changes in understanding amongst both municipal officials and landowners, focused primarily on increased awareness of local ecological complexity. Perspectives from CHAT would open new areas for inquiry and answer questions that are left unaddressed in their study. For instance, a focus on boundary crossing within the activity system of the citizen science work might lead researchers to ask what types of interactions fostered learning across the activities of municipal officials and landowners. How did contextual factors such as the subjects, rules, community, division of labor, tools, and objects relate to what individuals learned from participating in the initiative, and how did they or did they not translate upward into larger activity system reorganization and collective learning?

Participatory initiatives like the one in Jansujwicz et al.’s (2013) study often occur under a shared vision, but stakeholders usually have their own independent goals that can be quite divergent. Boundaries and boundary crossing amongst stakeholders thus become a specific area for analysis within and across activity systems. By turning the lens toward these areas, CHAT provides the conceptual tools to make sense of how different actors learn through collaborative work in real-world, multi-institutional contexts in which there are complex considerations at play. Given that social learning is fundamentally a multi-stakeholder process that helps participants identify a common vision to address social-ecological problems, CHAT lends itself as a relevant framework that can allow researchers to better understand how the learning context and environment plays a role in these processes.

Next steps for sociocultural learning theories

As with all theoretical approaches, sociocultural theories of learning receive critiques that are important to examine as the field continues to evolve. As an example, critical scholars in the learning sciences have recently called attention toward areas where other perspectives would bring further richness to sociocultural theories of learning (Esmonde and Booker 2017). Bang (2017), for instance, draws from Indigenous perspectives to note the lack of attention to non-human actors in sociocultural learning theory, arguing that in focusing primarily on human interactions, these perspectives often do not attend sufficiently to the natural context when it comes to learning. Nasir and McKinney de Royston (2013) identify how sociopolitical analyses, alongside sociocultural analyses, can further enrich studies of learning by attending to concerns of race, identity, and power in a more explicit way. We suggest that applications of sociocultural learning theories in conservation and natural resource contexts should take up this increased engagement with critical theory and other fields of research in order to better address questions of power and privilege. Extending these perspectives to research on social learning will continue to advance the field in novel directions.

And yet, despite these important critiques, sociocultural learning theories remain powerful frameworks that challenge conventional views of learning as the unilateral acquisition of fact-based knowledge, instead providing alternative conceptualizations that emphasize the relationship between the individual and their historically constructed social world. Indeed, learning is fundamentally a social process and failing to account for the complex environments and components that mediate how learning occurs may lead conservation social scientists to draw

Table 1. Applying sociocultural learning theory to social learning research.

Tenets of sociocultural learning theory adapted from Esmonde (2017)	Considerations for social learning research in conservation and natural resource management
Cultural artifacts (both tools and signs) mediate human activity.	Attention should go to artifacts not just as bearing a causal relationship with social learning, but rather as an inextricable part of learning processes.
Learning should be studied as it occurs in everyday life, not just in the laboratory.	Because context is fundamentally a part of social learning processes, social learning should be studied in real-world cases of conservation and natural resource management. Or, laboratory and simulation studies should similarly be recognized as contexts in and of themselves.
As people cross boundaries between different contexts, their learning both endures and shifts.	Researchers should select a unit of analysis beyond the individual (e.g., a community of practice, figured world, or activity system) because doing so helps account for context and can allow for studying learning at the group level.
Multiple historical timescales are relevant for the study of learning.	Individuals and collectives learn and develop over lengthy periods of time. The sociocultural context of a practice or activity is shaped by and shapes cultural history.
Learning should be studied using a genetic (developmental) method that allows insight into the processes of learning, not just the outcomes.	Research methodologies should attend to learning in process rather than solely the endpoint or distinct stages of learning.
As they participate in joint activity, people simultaneously exercise agency and are constrained.	Although context may constrain individuals' and groups' opportunities for learning, it also provides people with the resources to alter their situations.

overly narrow conclusions in studying social learning processes. We argue that researchers studying social learning in conservation and natural resource management contexts who choose to take up sociocultural learning theory should attend to both their foundations and critiques so as to produce more nuanced insights for the field.

SUMMARIZING THE CONTRIBUTIONS OF SOCIOCULTURAL LEARNING THEORY

In conclusion, we argue that theoretical and conceptual clarity can help identify the processes and outcomes of social learning in participatory and collaborative approaches to conservation and natural resource management, and resultantly, the development of more effective strategies to promote social learning and work toward resilient social-ecological systems. By facilitating the study of both individual and collective learning as part of the same process, as well as the role of context in learning, we suggest sociocultural learning theories are a way to root empirical studies of social learning in rigorous theoretical foundations. This has been identified as a need for the field (Rodela 2013, Suškevičs et al. 2018, Gerlak et al. 2019). By drawing on perspectives from the learning sciences, scholars of conservation and natural resource management can develop novel insights that continue to inform the practice of community-based, participatory approaches to conservation and natural resource management. Increased transdisciplinary engagement with educational research will provide researchers with the capacity to better identify specific policies, tools, and strategies within conservation and natural resource management approaches to result in more effective social learning for social-ecological resilience. This can help guide the design of learning environments that promote equitable social learning, in which diverse perspectives can be taken up, across social-ecological contexts. This is a key area for future research.

Situated learning (Lave and Wenger 1991), learning through the lens of identity and agency (Holland et al. 1998), and cultural-historical activity theory (Engeström 2001) are examples of sociocultural perspectives that are well-established theoretically

and methodologically in the learning sciences and can provide a starting point for researchers in conservation and natural resource management to study social learning. Framing learning as a constitutive element of communities of practice, figured worlds, and activity systems within conservation and natural resource management settings can provide frameworks for understanding how learning happens at both the individual level and collective level embedded within unique sociocultural contexts. Although sharing common elements, such as a focus on artifacts and attention to history, each of these perspectives has unique dimensions that make them useful frameworks for different research questions and contexts as illustrated above. Other sociocultural theories of learning, such as that of distributed cognition (Hutchins 1995), may similarly provide useful perspectives.

What might taking a sociocultural approach to studying social learning look like in a conservation and natural resource management context (Table 1)? If the goal is to conceptualize learning as a collaborative process that occurs through shared practice or participation in joint activity, rather than treating it as the unidirectional flow of information from expert to novice, there is a need to recognize how knowledge and information may be held and shared amongst different actors, not just originating from those who are conventionally considered experts. One could do this by explicitly gathering and analyzing evidence of learning amongst all stakeholders in a participatory or collaborative process, as well as evidence of collective learning or the co-creation of shared knowledge that becomes situated within and across these wider groups. Concepts such as legitimate peripheral participation, identity and agency, and participation in activity systems provide relevant theoretical tools for this endeavor and can guide analytic frameworks and coding schemes that document how individuals within these processes learn and how the broader systems change through the co-construction of shared knowledge. Future research that attends to these multiple levels of analysis, as well the role of broader contexts (social, cultural, political, natural, etc.) in learning, would yield rich insights into social learning processes and outcomes.

We do not suggest the three specific sociocultural learning theories described here as a prescription for all social learning research going forward; rather, we offer this overview of sociocultural perspectives on learning and introduce key tenets to guide future research on, and practices that promote, social learning in conservation and natural resource management contexts. Researchers in conservation and natural resource management might consider collaborations with learning scientists and educational researchers in scoping out theories, frameworks, and methodologies appropriate for the contexts they are investigating and the questions they are asking.

Ultimately, increased opportunities for social learning between scientists, natural resource managers, and communities, learning that is both mutual and equitable, will contribute to greater resilience of social-ecological systems in the face of ongoing environmental change. Because collaborative and participatory processes facilitate social learning, different groups who engage in these practices and activities can share and contribute their understandings, values, and interests to inform conservation and natural resource management processes that are responsive to multiple perspectives rather than those solely of scientists and natural resource managers as is often the case in more centralized management approaches. Sociocultural learning theory can provide a framework for scholars to continue generating new knowledge in this rich area of scholarship so as to inform the design of conservation and natural resource management initiatives that promote social learning for social-ecological resilience.

Responses to this article can be read online at:
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Data Availability:

Data/code sharing is not applicable to this article because no data/code were analyzed in this study.

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