

It's time to learn about learning: Where should the environmental and natural resource field go next?

1. Introduction

Questions around learning have piqued the interest of environmental policy and natural resource management scholars over the past two decades. Researchers have asked: what factors support our capacity for learning within our decision-making processes to govern complex environmental problems? To what extent do governance processes designed for learning result in better social and ecological outcomes?

Learning in environmental governance often refers to a *process* of acquiring, translating, and disseminating new information among policymakers, managers, and key stakeholders (Heikkila and Gerlak 2013), which can occur through different modes (e.g., sequentially versus simultaneously) (Newig et al. 2016). Learning also refers to *outcomes*, such as changes in beliefs and behaviors among governance actors (Leach et al. 2013) and the adoption of new policies or programs (Heikkila and Gerlak 2013). It is through such learning processes and outcomes, both at the levels of individuals and collectives, that scholars see opportunities to develop more effective and robust environmental management and governance, or more informed decision making under complexity (Huntjens et al. 2011; Bodin and Crona 2011; Bos et al. 2013).

This Commentary reflects on the state of the scholarship on learning for environmental and natural resource policy and governance. We argue that despite the proliferation of recent research in this field, the multiple approaches to studying learning that exist remain largely disconnected, which leads to missed opportunities for cumulative insight building. Additionally, we argue that the current understanding of the individual and collective level factors that shape learning in environmental governance is underdeveloped. To address the limitations and improve both theory and practice, we offer recommendations for 'learning about learning'. These include: an infusion of ideas from outside to advance the field; more deliberate bridge building across the environmental and natural resource learning research community; and engaged scholarship with governance institutions and venues where we study learning.

2. What have we learned about learning?

The research on learning in environmental and natural resource governance has grown rapidly in the past two decades (see Figure 1). This research has explored cases across every continent, multiple levels of governance, and diverse environmental and natural resource settings including water, forestry, fisheries, urban areas, agricultural communities, energy, and biodiversity (see Gerlak et al. 2017).

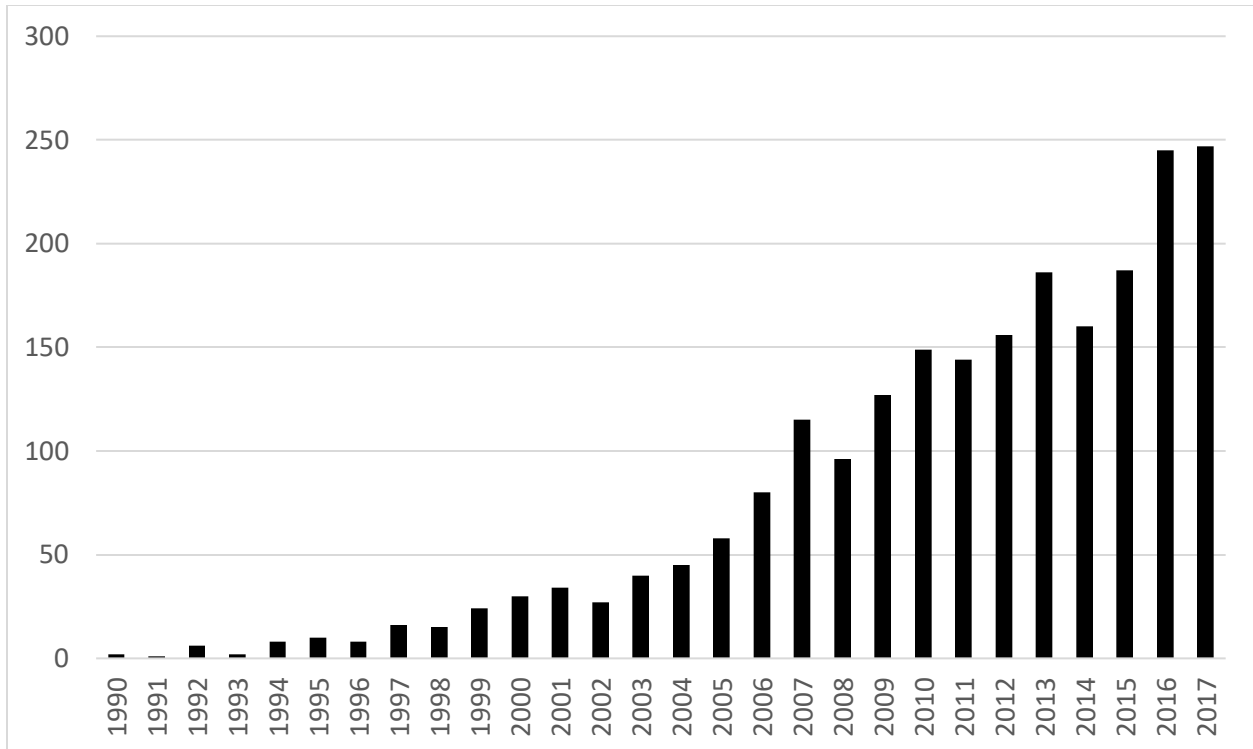


Figure 1: The number of learning and environmental management/governance documents published per year in the Scopus database between 1990 and 2017¹

Within this literature, a number of scholars focus on learning that occurs among the individuals involved in a governance process – as identified through new knowledge or belief change (e.g., learning about the nature of environmental issues) (Leach et al. 2013; Pattison 2018). This research finds that the characteristics of individuals, such as their core values or organizational affiliations, play a critical role in shaping learning. Some scholars have begun to connect the cognitive and behavioral outcomes of learning, by examining how new beliefs inform environmental management decisions (Measham 2009). Researchers recognize that such learning can result in worse outcomes or the reinforcement of existing beliefs or practices that are incorrect (Dunlop and Radaelli 2018).

Many studies emphasize organizational-level or collective level features of governance processes that influence whether and to what extent learning occurs (e.g., Armitage et al. 2008; Lee and van de Meene 2012). One of the more influential bodies of literature that focuses on learning for environmental governance in this vein is *social learning theory* (Reed et al. 2010). Social learning refers to processes that involve active deliberation and engagement by diverse actors in environmental governance, which can lead to new understanding or shared meaning. Further, when such deliberation and engagement is designed appropriately, it can increase adaptive capacity (Dana and Nelson 2012), build trust and collaborative problem solving (Eakin et al. 2011), and result in better working

¹ We searched the Scopus database using search terms related to environmental governance and learning drawn from previous research (Gerlak et al., 2017). From this search and subsequent analysis, we identified 2,218 documents which addressed learning in environmental management or related topics.

relationships for stakeholders (Van der Wal et al. 2014). Social learning also emphasizes the need for systems thinking, which can be enabled through more diverse participants who understand different features of environmental issues (e.g., social, economic, biophysical) (e.g., Ison et al. 2013). Such systems thinking is seen as essential to learning about the complex dynamics of environmental systems.

While much of the learning literature in environmental and natural resource governance looks at what *fosters* learning (e.g., participation, openness to different types of knowledge), researchers also have identified factors that *challenge* learning. These include: diversity of values, cognitive biases, and belief systems that make it difficult for groups to create shared understanding or agree on collective strategies (e.g., Diduck et al. 2012), to mitigate power differentials (Roome and Wijen 2006), or to sustain learning over time (e.g., Schusler et al. 2003) and across multiple jurisdictional or spatial scales (e.g., Gerlak and Heikkila 2011). Learning in environmental governance can also be impeded by institutional rules that constrain diversity in participation or decision-making processes, by rules that limit access to information, or by rules that impede an open discussion about the governance choices available (Heikkila and Gerlak 2018).

3. Critiques and limitations of the learning literature

Several scholars have examined the evolution of the *conceptual debate* on learning in the environmental and natural resources governance literature, offering valuable critiques (Blackmore 2007; Armitage et al. 2008; Reed et al. 2010; Rodela 2013; Gerlak et al. 2017). These analyses acknowledge that learning scholarship lacks consistent theoretical and empirical development of core concepts to guide empirical assessment. For instance, some of the key terms, and theoretical strands, found in the literature include social learning (e.g., Rodela 2013), collaborative multi-actor learning (e.g., Schmid et al. 2016), governance learning (e.g., Newig et al. 2016), and policy learning (e.g., Radaelli and Dunlop 2013), among many others. Moreover, each of these strands has its own key references, guiding definitions, and analytical and methodological approaches. The divergence in the literature may be explained by the diverse epistemologies and sub-fields of the research community. Yet, the disconnected learning typologies and frameworks may impair our capacity to learn across the sub-fields, and there is a distinct feeling that the wheel gets reinvented (Goyal and Howlett 2018). What is needed is an explicit mapping of learning concepts, their interrelations, and an attempt to gather as much empirical insights from all strands to compare notes.

We also contend that research on the factors that foster learning or that shape learning outcomes remains under-developed (Gerlak et al. 2017; Plummer et al. 2017). In particular, *empirical methods* to establish causality (between particular learning activities or processes and specific outcomes remain poor (Siebenhüner et al. 2016; Armitage et al. 2018). Part of this challenge stems from what cannot be easily measured – such as precisely when and how individuals change beliefs. It is also challenging to observe “who” or “what” is learning in studying environmental governance. For example, attempting to draw insights about collective or group processes using measures based on the responses of individuals (e.g., see Montpetit and LaChapelle 2015) may not always produce valid

indicators of group-level outcomes. Another challenge involves the bounded timeframe within which learning processes are often studied (Measham 2013). Learning as a process is often conflated with changes in policies, decisions, or outcomes (Muro and Jeffrey 2012), making it difficult to tease apart causal relationships.

Researchers have attempted to overcome these limitations. Some have established quantitative approaches to measure learning and connect learning processes to outcomes (Schmid et al. 2016; McFadgen and Huitema 2017; Armitage et al. 2018). Others have tried to improve how the field conceptualizes the complexities of learning environments. Yu et al. (2016) employ novel ways to measure factors, processes, and outcomes to establish causality in a learning experiment. Heikkila and Gerlak (2018) offer a way to use the institutional analysis and development framework to analyze how the rules of a governance process enable or constrain learning. Despite these efforts, the learning literature as it relates to the assessment of environmental and natural resource management outcomes remains disconnected theoretically and conceptually, and with room to enhance empirical rigor.

4. Taking our own advice: intentional learning about learning

Some of the weaknesses in the literature could be addressed by drawing on learning perspectives from fields beyond environmental governance. What better way to start than by looking at the way the education sciences have studied learning? For example, at the individual level, researchers can learn from *adult learning theory*, which offers insights into the role of imagination and reflection in learning (Dirkx 1998), social and cultural perspectives, and non-learning at the individual level (Jarvis 2012). Similarly, social psychologists offer critical insights into the ways in which emotion and cognitive biases can shape decision-making, and thus potentially impede, or foster, learning (Kahneman 2011). Scholars have begun to recognize the importance of building on these micro-level theories to advance the learning scholarship (see Dunlop and Radaelli 2018). Such insights also have been useful in understanding individual resistance to learning around issues such as climate change (Kahan et al. 2012; Clayton et al. 2015), but more work is needed to connect these insights on individuals to environmental governance processes.

In addition, we can draw lessons from organizational theorists about how knowledge can be embedded and transferred within and across individuals and networks to advance our insights around learning within a collective process (Argote 2013). From the disciplines of business and economics, we can learn more about how knowledge is learned and shared in firms through learning networks (e.g., Mariotti 2012; Gibb et al. 2017). Some environmental scholars are beginning to think about learning at this more multi-level scale (Diduck 2010). For example, Vinke-de Kruijf and Pahl-Wostl (2016) develop a framework of multi-level learning that includes individuals, organizations, and network actors. So too are scholars of policy change beginning to explore learning from both individual and collective angles (Moynson et al. 2017). Nonetheless, we argue that environmental and natural resource policy and governance scholarship around learning could benefit from engaging with and learning from more well-developed learning literature.

Of course, when drawing from other disciplines, it is possible to add to the cacophony of concepts and terminology. Thus, it is important to find opportunities to bridge conceptual and theoretical divides across the environmental and natural resource learning research community, while still accommodating the rich insights from diverse disciplines that speak to learning. To support these efforts, scholars may make explicit comparisons across different learning frameworks, including those which may seem to be disparate, to guide the conceptualization and identification of variables (e.g., see Pahl-Wostl 2009; Heikkila and Gerlak 2013). The choices that scholars make in this respect should always be clearly explained in order to advance the literature, which is often not the case (Gerlak et al. 2017). It may also be valuable to develop a systems framework that accommodates insights on learning from multiple disciplines and theories, and guides analysis at multiple levels, while establishing shared conceptual guidance (e.g., akin to the Social Ecological Systems Framework by Ostrom and colleagues). This can enable more rigorous diagnoses of learning in environmental governance across cases.

Practical limitations may limit opportunities to bridge the divides in the field. Simply organizing panels at conferences or reading manuscripts are insufficient. These one-way forms of communication do not engender the deeper learning needed to understand the challenges, the tacit knowledge underlying research projects, and the operational tools required to move a study from start to finish. Rather, we need to sit down face-to-face and engage in the coproduction of knowledge across scholars and practitioners. One possible path forward is demonstrated by the Virtual Learning Community (<http://www.tias-web.info/tias-activities/learning-community/>), an international community of scientists, policymakers, and practitioners with an interest in learning for sustainable development. This virtual group organizes webinars, conference panels, and an online listserv to help create synergies and identify cross-cutting issues. Intentionally designed research and policy workshops can help us understand the commonalities and differences in research findings based on comparative insights across contexts. Further, developing frequent meetings among a group of established and emerging scholars, from multiple sub-fields and countries, could help move the dialogue forward on how to improve our theoretical foundations, while fostering innovation on empirical approaches. While there is no single way to do this, scholars could start by seeking funding opportunities to build these types of efforts. The U.S. National Science Foundation's Research Collaborative Networks program is one potential mechanism for such support. It offers funding for new collaborations to support "coordination in research, training, and educational activities across disciplinary, organizational, geographic and international boundaries" (https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=11691).

Finally, enhancing the coordination across the academic community needs to include partnerships with governance institutions and venues where we study learning (see Bos et al. 2013). Through engaged scholarship, we can create platforms that allow researchers and practitioners to be part of co-learning. We can learn from the communities we engage with, improve our research questions, and create trusting relationships that can improve the likelihood that our research will be useable for governance. Some scholars of learning in environmental governance are using tools of engaged scholarship (e.g., Bos et al. 2013;

Blackmore et al. 2016) but we can work harder to make research more impactful in environmental and natural resource policy. Emerging research examining the learning outcomes (such as critical thinking skills, changing perspectives, and practicing facilitation and decision-making skills) of undergraduate students engaged in university-community partnerships can further inform our work (Tarantino 2017). The payoff of the investment in time and resources will be worthwhile to scholars and practitioners, across environmental and natural resource governance broadly.

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