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Learning effects of interactive decision-making processes for climate change adaptation

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ABSTRACT

Learning is gaining attention in relation to governance processes for contemporary environmental challenges; however, scholarship at the nexus of learning and environmental governance lacks clarity and understanding about how to define and measure learning, and the linkages between learning, social interactions, and environment. In response, this study aimed to advance and operationalize a typology of learning in an environmental governance context, and examined if a participatory decision-making process (adaptive co-management) for climate change adaptation fostered learning. Three types of learning were identified: cognitive learning, related to the acquisition of new or the structuring of existing knowledge; normative learning, which concerns a shift in viewpoints, values or paradigms, and relational learning, referring to an improved understanding of others' mindsets, enhanced trust and ability to cooperate. A robust mixed methods approach with a focus on quantitative measures including concept map analysis, social network analysis, and self-reflective questions, was designed to gauge indicators for each learning type. A participatory decision-making process for climate change adaptation was initiated with stakeholders in the Niagara region, Canada. A pseudo-control group was used to minimize external contextual influences on results. Clear empirical evidence of cognitive and relational learning was gained; however, the results from normative learning measures were inconclusive. The learning typology and measurement method operationalized in this research advances previous treatments of learning in relation to participatory decision-making processes, and supports adaptive co-management as a governance strategy that fosters learning and adaptive capacity.

1. Introduction

How contemporary environmental challenges are understood and the corresponding requirements of governance processes are central issues to global environmental change. Crona and Parker argue that "humanity faces increasingly intractable environmental problems characterized by high uncertainty, complexity, and swift change. Natural resource governance must therefore involve continuous production and use of new knowledge to adapt to highly complex, rapidly changing social-ecological systems to ensure long-term sustainable development" (2012, p. 32). Themes of adaptiveness, flexibility, and learning are receiving growing attention in environmental governance scholarship (Folke et al., 2005; Gerger Swartling et al., 2011; Armitage et al., 2012; Crona and Parker, 2012).

Several social processes which purport to enable learning, confer flexibility and encourage experimentation have emerged in relation to environmental governance. A few among the many potential examples include adaptive governance (e.g., Folke et al., 2005; Pahl-Wostl, 2009), adaptive co-management (Armitage et al., 2008; Berkes, 2009) and deliberative approaches, such as focus groups, round tables, social learning groups, and citizen juries (e.g., Rowe and Frewer, 2000; Huitema et al., 2010). Authors have argued that such innovative governance mechanisms which couple the potential for social learning with collaboration build adaptive capacity of individuals and collectives (Keen et al., 2005; Fazey et al., 2007; Plummer and Armitage, 2010). These mechanisms are especially critical for addressing climate change. As Pelling et al. (2008) argue, considering adaptation in terms of learning makes it clear that institutional alteration is a genuine

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adaptation strategy; also it adds relevance to questions about the processes by which individuals may learn to be adaptive.

As interest in environmental governance mechanisms that confer learning and adaptability is growing, several researchers are raising critical questions about the state of scholarship emerging at the nexus of learning and environmental governance (e.g., Armitage et al., 2008; Muro and Jeffrey, 2008; Diduck, 2010; Crona and Parker, 2012). In summarizing these critical questions, Crona and Parker (2012) point out that there is: a dearth of consensus about how to define or measure learning; limited understanding of the relationship between social interactions and learning; amorphous ideas of how environments shape learning; and, little appreciation for how conflict and power dynamics influence learning. Their summary leads them to argue that "new concepts, methods, and metrics for conceptualizing and measuring learning in support of natural resource governance and testing the conditions under which it can be achieved are therefore badly needed" (Crona and Parker, 2012, p. 32). Given the cost, time and effort involved in designing and implementing interactive environmental governance processes one would expect a significant degree of evaluation activity to assess their outcomes. Recent systematic reviews of the burgeoning literature on social learning in natural resource management by Rodela (2011) and Rodela et al. (2012) find that few studies even attempt to empirically assess learning effects of specific interventions on participants.

This paper responds to the imperative for environmental governance mechanisms to bring about learning, the voids in this area of scholarship as noted by Crona and Parker (2012), and the need to assess learning in relation to interactive decision-making processes.

It specifically aims to: (1) advance, test and operationalize a typology of learning (cognitive, normative, and relational) in an environmental governance context; and (2) examine if an adaptive co-management intervention concerned with climate change adaptation (an informal network in the Niagara region) fosters learning using the typology. The following section positions the research in relation to scholarship on learning and the environment and focuses on the relationship to participatory processes, the call for greater specificity in understanding and measuring learning, and the development of an appropriate typology of learning. These strands are brought together in the methods section where the mixed methods procedures for assessing learning using indicators from the typology in relation to an adaptive co-management intervention concerning climate change adaptation are detailed. Results from the research are presented according to the three-fold typology. The discussion relates the findings from this research to scholarship concerning learning and participatory environmental processes and policies, the value of enhancing specificity about types of learning, and the efficacy of the measurements proposed. Several avenues for future research are set forth in the conclusions.

2. Learning and environmental governance: a selected overview of insights

The breadth and depth of scholarship on learning across disciplines is vast; indeed, even a focus on the conceptual landscape of *environmental* learning is rich and complex, intersecting with theoretical strands and cutting across education, psychology and social psychology (see Lundholm and Plummer, 2010 for an overview). As a result, a review of all learning related literature is beyond the scope of this study, and accordingly this section positions our specific interest in environmental governance and learning within the broader landscape of scholarship concerning the environment and learning. We concentrate on setting forth the strands of scholarship relating most directly to this research, and in pulling together strands from these related areas we advance a typology of learning.

Many discussions on environmental governance start from the notion of 'wicked problems' (Rittel and Webber, 1973), that is, problems that defy easy definition and thus solutions. It is now almost commonplace that dealing with wicked problems requires an approach that is focused on learning (Stirling, 2006; Voß et al., 2006), and it should thus not be a surprise that several concepts have emerged in this context. Examples include 'social learning' (e.g., Parson and Clark, 1995), 'collaborative learning' (e.g., Vernooy, 2010), 'learning communities' (Kilpatrick et al., 2003) and 'communities of practice' (Wenger, 1998). Social learning has been singled out in particular for "...becoming a normative goal in natural resource management and policy" (Reed et al., 2010, p. 15). Muro and Jeffrey observe that, "despite the lack of a coherent theoretical foundation and a clear definition, a common understanding of the process social learning entails, its outcomes and contributions to natural resource management emerges from the literature. At the core of these models is a process of collective and communicative learning, which may lead to a number of social outcomes, new skills and knowledge" (2008, p. 330). Learning, as generally understood in this area of scholarship, complements the shift in focus from management to governance as well as the contemporary emphasis on conditions of complexity, uncertainty and value conflicts. Social learning thus is said to come about through an inclusive, communicative and participatory process; take a systems and integrative orientation; be action oriented and anticipate iterative adjustments; and, develop an understanding of change through multiple means (Leeuwis and Pyburn, 2002; Keen et al., 2005; Diduck et al., 2005; Pahl-Wostl et al., 2007; Muro and Jeffrey, 2008).

Analyses of learning in environmental governance draw on a range of disciplines, from psychology to management, organization theory, and the policy sciences (e.g. Bandura, 1977; Argyris and Schön, 1980; Bennett and Howlett, 1992). Authors use slightly different dimensions to characterize various forms of learning (see Haug et al., 2011). Yet most tend to focus on levels of learning, often distinguishing between a technical level of learning and one or two conceptual levels at which learning can take place (e.g. Fiol and Lyles, 1985; Hall, 1993; cf. Gerger Swartling and Nilsson, 2007). Similarly, the unit of analysis across different studies varies from the level of the individual to groups and networks or even the socio-ecological system as a whole (Diduck, 2010; Rodela, 2011).

Against this background it is perhaps not unexpected that recent efforts to review and synthesize the insights gained from more than a decade of work in this burgeoning area point to a continuous struggle with conceptual imprecision and conflation of positive and normative elements (Reed et al., 2010). Moreover, there are few studies that systematically appraise and evaluate social learning outcomes from the interventions studied (Reed et al., 2010; Rodela, 2011). Indeed, there has been a healthy dose of criticism leveled against the various ways in which social learning is understood (Armitage et al., 2008; Lundholm and Plummer, 2010; Diduck, 2010; Reed et al., 2010); its employment in contradictory ways (Blackmore, 2007; Muro and Jeffrey, 2008); its conflation with other learning concepts (Armitage et al., 2008; Diduck, 2010; Reed et al., 2010); and, abundance of unsubstantiated claims of its existence (Reed et al., 2010; Rodela, 2011).

The scholarship on adaptive management and, more recently, adaptive co-management is of particular relevance to our agenda here because it is identified as a way to make environmental governance operational (Armitage et al., 2009; Plummer et al., 2012) and emphasizes the importance and roles of learning therein (Armitage et al., 2008; Berkes, 2009). Adaptive co-management draws upon the overarching narratives in environment and resource studies of adaptive management (i.e., learning)