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Diversity, Trust, and Social Learning in Collaborative Governance

Abstract: *Scholarship on collaborative governance identifies several structural and procedural factors that consistently influence governance outcomes. A promising next step for collaborative governance research is to explore how these factors interact. Focusing on two dimensions of social learning—relational and cognitive—as outcomes of collaboration, this article examines potential interacting effects of participant diversity and trust. The empirical setting entails 10 collaborative partnerships in the United States that provide advice on marine aquaculture policy. The findings indicate that diversity in beliefs among participants is positively related to relational learning, whereas diversity in participants' affiliations is negatively related to relational learning, and high trust bolsters the positive effects of belief diversity on both relational and cognitive learning. In addition, high trust dampens the negative effects of affiliation diversity on relational learning. A more nuanced understanding of diversity in collaborative governance has practical implications for the design and facilitation of diverse stakeholder groups.*

Practitioner Points

- Designers of collaborative processes should consider which types of participant diversity will be most beneficial, recognizing that belief diversity promotes learning, but affiliation diversity can impede learning.
- To promote learning in highly diverse stakeholder groups, conveners should seek to build interpersonal trust, establish processes that treat all parties fairly, and consider enlisting mutually respected mediators.
- Participants should expect relational learning, but not necessarily cognitive learning, to increase gradually through the duration of the collaborative process.

Diversity presents opportunities and challenges for collaborative governance (Milliken and Martins 1996; Varda and Retrum 2015). Collaborative governance is used to address complex public policy issues or public service delivery tasks. Issues and tasks are deemed complex when the causal linkages between the challenges underlying them and related solutions are uncertain and contested, when the multiple dimensions that make up issues and tasks naturally elicit various sectoral and disciplinary perspectives, or when there is substantial disparity among relevant stakeholders in beliefs about how an issue or task should be managed (Gerlak and Heikkila 2011). In complex policy and managerial environments, convening diverse sets of knowledgeable stakeholders brings resources and expertise to inform on issue or task technicalities. Further, it can lead to holistic and contextually appropriate approaches that acknowledge how policies and programs affect different stakeholder groups and facilitate shared understanding of public policy problems and solutions (Beierle and Cayford 2002; Maggioni, Nelson, and Mazmanian 2012; Weible and Sabatier 2009).

Although diversity can be promising, gaining agreement among diverse stakeholders can be costly and difficult. Stakeholders from different disciplines or sectors may rely on field- or profession-specific language and culture, challenging interpersonal communication (Huxham 2000; O'Brien, Marzano, and White 2013). Resource disparities among participants in collaborative processes can suggest imbalances in power, which, in turn, can threaten group efficacy (Ospina and Saz-Carranza 2010; Tschirhart, Christensen, and Perry 2005). Further, individuals may be less trusting or open to building new relationships with others with different backgrounds or affiliations.

Recognizing the opportunities and challenges of diversity for collaborative governance prompts analyses of how diversity links to important collaborative governance outcomes, such as social learning. Social learning occurs as a result of social interaction or deliberation (Pahl-Wostl et al. 2007). It can manifest in cognitive learning as knowledge gains (Koontz 2014; Leach et al. 2014) or in relational learning as improved interpersonal relations

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(Koontz 2014; Muro and Jeffrey 2012; Schusler, Decker, and Pfeffer 2003). Cognitive and relational learning are both salient outcomes in collaborative arrangements, in which individuals are engaged in deliberative processes with knowledgeable others from different backgrounds and presented with information germane to the work of the collaborative. The likelihood of being exposed to new ideas and information is high, as is the potential to forge new relationships.

Diversity alone, however, may not be sufficient to promote learning. Perhaps reflecting both the enabling and challenging influence of diversity in collaborative settings, scholarship yields inconsistent findings about the relationship between diversity and learning. Inconsistent findings motivate further investigation into how different types of diversity influence learning. They also raise questions about factors that could moderate the relationship between diversity and learning.

This article advances scholarship on learning in collaborative governance by addressing two main questions: (1) What is the relationship between diversity and perceptions of social learning? (2) Do perceptions of trust among participants in collaborative processes moderate the relationship between diversity and perceived social learning? Diversity is measured in terms of affiliation and belief diversity, and social learning in terms of cognitive and relational learning.

Scholarship on collaborative governance is ready for an analytical shift. A robust body of scholarship has identified structural and procedural factors that consistently influence outcomes of collaborative groups and their participants. For example, at the participant level, perceptions of trust are fostered by procedural fairness (Leach and Sabatier 2005), and participant learning is facilitated by perceptions of interpersonal trust (Resh, Siddiki, and McConnell 2014) and the presence of respected leadership (Heikkila and Gerlak 2005). Participant diversity is sometimes found to enable learning (Brummel et al. 2010) and other times to hamper it (O'Brien, Marzano, and White 2013). Positive group-level outcomes are enabled by resource availability (Imperial 2005) and institutional design (Siddiki et al. 2015). A promising next step in research on collaborative governance is to explore interactions between explanatory factors of individual and group outcomes. This article helps illuminate critical interactions between participant diversity and trust in shaping perceptions of social learning in collaboration.

Social Learning and Collaborative Governance

Schusler, Decker, and Pfeffer define social learning as "learning that occurs when people engage one another, sharing diverse perspectives and experiences to develop a common framework for understanding and basis for joint action" (2003, 311). Muro and Jeffrey (2012, 3–4) define social learning as changes in relational, cognitive, or technical outcomes resulting from communicative action processes engaging multiple stakeholders. They define relational changes as the development of new or strengthening of existing relations, cognitive changes as the generation of new knowledge or transformation of existing views, and technical changes as transformation in technical skills or competencies. Similarly, Koontz (2014, 1573–74) conceives of social learning as a transfer of knowledge among individuals or as improvements in the relational elements of individuals' interactions, for example, increased network connections and the development of shared goals or agreement regarding a vision for dealing with salient issues (Koontz 2014, 1574).

This article conceptualizes social learning as gains in knowledge or interpersonal relations resulting from social interaction. Consistent with previous scholarship, learning based on knowledge transfer is cognitive learning and learning regarding relational elements is relational learning.

A critical question for scholars studying learning in collaborative venues is: what factors facilitate cognitive and relational learning? Implicit in the definition of social learning posited by Schusler, Decker, and Pfeffer (2003) and Muro and Jeffrey (2012) is that diversity matters. Others, too, have found that the inclusion of diverse stakeholders in collaboratives facilitates learning (see Koontz 2014). However, diverse stakeholder engagement may not be sufficient for promoting some of the outcomes characteristic of social learning. Other factors have also been found to influence dimensions of social learning (Beierle and Konisky 2000). Next, we review the scholarship on diversity and a variety of these other factors.

Diversity

Diversity is often studied as a determinant of collaborative outcomes (Brummel et al. 2010; Leach et al. 2014; Varda and Retrum 2015). Recent research highlights the unity/diversity paradox, pointing to the respective benefits and challenges of homogeneity and heterogeneity among collaborative group participants and strategies for overcoming challenges stemming from heterogeneity. Ospina and Saz-Carranza (2010) suggest that heterogeneity among participants often implies differences in resource capacity and power and that these imbalances can compromise group efficacy. According to the authors, effective leadership can help subdue negative effects of diversity.

Extant scholarship specifically examining the link between diversity and learning in collaboratives yields inconsistent findings. Some find that membership diversity promotes learning (Brummel et al. 2010; Leach et al. 2014; Muro and Jeffrey 2008). According to Bodin and Crona, membership diversity "may enhance (1) the development of knowledge itself by providing opportunities for high degrees of interaction among similar others, and (2) contribute to the development of a diversity of knowledge by enabling different knowledge to develop in different groups" (2009, 368–69). Others observe negative consequences of diversity on learning (Newig, Günther, and Pahl-Wostl 2010; O'Brien, Marzano, and White 2013; Tsai 2005). Newig, Günther, and Pahl-Wostl (2010) argue that although less redundant and more diverse networks may be beneficial for obtaining new information, they may be less beneficial for developing shared values or effective deliberation. Similarly, O'Brien, Marzano, and White (2013) show that diverse participation in collaborative resource management leads to misunderstanding or distorted knowledge sharing between stakeholders as a result of differences in perspectives and terminology.

Varying operationalizations of diversity could explain inconsistent findings on the relationship between it and learning. Diversity is operationalized differently across studies, often in broad or

unidimensional terms. Moore and Koontz (2003) examine whether diversity in collaborative partnerships' stakeholder composition is linked to group accomplishments by classifying partnerships broadly as agency based, citizen based, or mixed and looking for significant differences in group outputs and outcomes by group type. While Moore and Koontz offer a useful way to categorize collaboratives by participant type(s), their accounting of individual participants within the groups is limited. Brummel et al. (2010) account for representation of different government and nongovernment entities in qualitative case studies and find an association between diversity and learning. While Brummel et al. contribute valuably to an understanding of the role of diversity in facilitating collaborative outcomes, the ability to assert causal relationships is limited.

Management research on group diversity in organizations (Milliken and Martins 1996) can inform research on collaboration. Milliken and Martins (1996) identify observable and nonobservable characteristics by which group participants differ. Observable characteristics include organizational cohort or subunit affiliations, race, and gender. Nonobservable characteristics include personality traits, values, views on key issues, or knowledge. Diversity in nonobservable characteristics is salient in public sector collaboration, which often engages core beliefs and values. Differing perspectives about nature and science are particularly important in collaborative natural resource management because they are closely linked to degrees of representativeness, power differentials, or conflict in collaboration (Bonnell and Koontz 2007; Leach 2006; Lubell and Lippert 2011). Bonnell and Koontz (2007) note that participants' shared beliefs about scientific management in watershed partnerships facilitates open communication and deliberative decision making but can inhibit openness to information based on differing perspectives.

To better understand how diversity contributes to collaborative outcomes, causal analyses should account for diversity in terms of the number of different types of stakeholder groups represented in collaborative processes, the relative representation of different types of stakeholder groups represented, and differences in the normative orientations of stakeholders participating in collaborative processes. Operationalizing diversity in such ways, and modeling nuanced measures of diversity in combination with other variables, such as those described in the remainder of this section, yields useful information about how diversity contributes to collaborative outcomes.

Trust

Trust is a key relational outcome of collaboration (Agranoff 2007; Beierle and Konisky 2001; Imperial 2005; Provan and Kenis 2008). Trust is manifest in interpersonal behavior, confidence in the competence of fellow stakeholders, and shared expectations among stakeholders of goodwill (Bryson, Crosby, and Stone 2006, 2015). Trust building is often a critical first step in the foundational stages of collaboration (Murdock, Wiessner, and Sexton 2005). Perceived trust among participants can influence their commitment to a collaborative process, which, in turn, has implications for the production of outputs and outcomes (Ansell and Gash 2007).

Interpersonal trust can facilitate frequent exchanges between collaborative participants to promote knowledge acquisition and collaborative learning (Klijn, Edelenbos, and Steijn 2010). Cochran and Ray (2009) find at the community level that symbolic capital, a recognized commitment to the community, can encourage successful cooperation among community members even when they hold divergent interests.

Interpersonal trust may moderate the relationship between diversity and collaborative learning. Trust can have a paradoxical relationship with diversity. Members in heterogeneous groups tend to face more challenges in building trust because they often rely on different languages and cultures (Garrison et al. 2010). Tsai (2005) proposes that trust, as a key element of social capital, may interact with diversity in membership composition in predicting learning. More specifically, Tsai hypothesizes that trust buffers the negative effects of diversity on knowledge sharing by reducing a sense of insecurity and increasing a unified identity among collaborating members.

No empirical study, to our knowledge, has examined how trust moderates the relationship between diversity and learning in collaborative contexts. However, organizational research provides empirical support for the moderating role of trust when diversity affects team-level outcomes. Peter and Karren (2009) report that the negative effect of diversity in members' areas of expertise on team performance decreases when team members perceive a higher level of trust. Wu, Liao, and Dai (2015) show that trust among team members moderates the relationship between diversity in both members' past departments and ways of thinking (e.g., problem-solving) and knowledge sharing.

Having adequate and valid scientific information to dispel uncertainty relating to deliberated issues lays the foundation for effective dialogue.

This article assesses the influence of participant diversity (modeled as participants' affiliation and belief diversity) in combination with interpersonal trust on participant learning. *It is hypothesized that perceived trust among participants in collaborative governance arrangements will moderate the relationship between participant diversity and social learning.* The analysis incorporates other key procedural and participant oriented factors that may also affect learning, each of which is described here.

Perceived Scientific Deficit

Collaborative governance can stall when there is a deficiency in shared scientific or technical knowledge. Having adequate and valid scientific information to dispel uncertainty relating to deliberated issues lays the foundation for effective dialogue. Applied to learning in collaborative groups specifically, policy-oriented learning is expected to be greater for issues on which there is sufficient accepted scientific information (Weible, Sabatier, and McQueen 2009). Further, having adequate scientific resources and information to inform collaborative processes can facilitate relational learning by neutralizing decision-making processes. Siddiki and Goel argue that the ability to mobilize scientific and technical resources, so long as those resources are viewed as unbiased and legitimate, can "introduce neutrality to the [collaborative] decision process that oversteps existing rifts between opposing stakeholders and possibly restructure relations between them" (2017, 267).

Procedural Fairness

Procedural justice is positively associated with collaborative outcomes (Leach and Sabatier 2005; Tyler, Degoey, and Smith 1996). Procedural justice refers generally to fair and democratic decision-making processes (Thibaut et al. 1973). Processes are deemed fair when they are consistent across parties, neutral and unbiased, based on accurate information, based on ethical standards, representative of relevant stakeholders, and allow for correction of decisions (Leventhal 1980). Recent research emphasizes that these processes also must enable meaningful participation by all relevant stakeholders (Schlosberg 2009). It also offers finer characterizations of process oriented justice; for example, distributive justice refers to a fair distribution of process outcomes and interactional justice refers to fairness in communication processes and interpersonal relationships.

Procedural justice can shape personal attitudes toward, and experiences within, social processes (Rubin 2009). Procedural justice can influence how individuals identify with each other and thus their propensity to work together and learn. In the context of watershed partnerships, Lubell and Lippert (2011) find that lower perceptions of procedural justice challenge goal attainment and coordination. Similarly, Perkins and Mitchell (2005) assert that procedural justice in natural resource management fosters participation in deliberative processes. Democratic deliberation helps consensus building in decision making processes without coercion, but also creates new knowledge through open information sharing (Agger and Löfgren 2008). Muro and Jeffrey (2012) suggest that one aspect of procedural justice in particular, process control, affects learning in collaborative partnerships.

Respected Mediation

The role of leadership in facilitating positive outcomes in collaborative settings is well established. Imperial et al. (2016) discuss three specific types of leadership observed in multistakeholder networks engaged in landscape conservation: collaborative leadership, distributive leadership, and architectural leadership. They describe collaborative leaders as those who broaden participation by dispersing power among network participants, distributive leaders as those who provide leadership opportunities to individual network participants to advance collective interests, and architectural leaders as those who establish structures. Leaders bring stakeholders to the table, secure resources to support the collaborative effort, establish clear ground rules for the collaborative process, maintain "technical credibility" of the process and work of the collaborative, facilitate consensus building, and promote positive relational dynamics (Ansell and Gash 2007; Emerson, Nabatchi, and Balogh 2011; Heikkila and Gerlak 2005; Lasker and Weiss 2001; Ryan 2001; Vangen and Huxham 2003).

Leadership can also manifest in the form of mediation, whereby an individual from inside or outside a collaborative process effectively manages conflict arising from stakeholder interaction, decision making, or output production (Mostert et al. 2007; Susskind and Cruikshank 1987). Given that collaborative processes deliberately involve heterogeneous stakeholders, often with differing problem definitions, beliefs regarding public policy issues, and sectoral orientations, conflict is not uncommon. Positive outcomes can follow when mediating leaders are respected by fellow participants in a collaborative process (Sabatier and Weible 2007).

Beliefs

Beliefs influence individual behavior and outcomes (Ajzen 1991; Stern 2000). Individuals interpret the world based on existing beliefs (Peffley and Hurwitz 1985). Beliefs are thus likely to temper how individuals interpret new information and learn (Munro et al. 2002). Assumptions about beliefs acting as cognitive filters of information suggest that they can either facilitate or challenge the proclivity of individuals participating in collaborative arrangements to learn.

Extended Participation

Successful collaboration takes time. Time affords collaborators opportunities to engage, share information, build trust, and arrive at common understandings of relevant problems. Numerous studies have verified the influence of time on individual learning outcomes (Leach, Pelkey, and Sabatier 2002; Schusler, Decker, and Pfeffer 2003).

Assumptions about beliefs acting as cognitive filters of information suggest that they can either facilitate or challenge the proclivity of individuals participating in collaborative arrangements to learn.

Considering each of the above factors, figure 1 depicts our analytical framework.

Methods

This study examines the relationship between trust, diversity, and two dimensions of social learning in U.S. marine aquaculture collaboratives. The National Oceanic and Atmospheric Administration defines aquaculture as "the breeding, rearing, and harvesting of plants and animals in all types of water environments including ponds, rivers, lakes, and the ocean" (NOAA 2014, para. 1). The development of the aquaculture industry in the United States is associated with a number of challenges. Aquaculture development occurs within a highly complicated policy environment (Firestone et al. 2004; Wirth and Luzar 1999). The complexity of the policy environment indicates that aquaculture production involves the consideration of related sets of environmental, social, and economic issues (Firestone et al. 2004). The public has expressed skepticism about the safety and health implications of farmed seafood (Amberg and Hall 2010; Mazur and Curtis 2006). Commercial fishers, real estate owners and developers, and natural resource users have engaged in conflict about aquaculture development (Kaiser and Stead 2002). Environmentalists worry

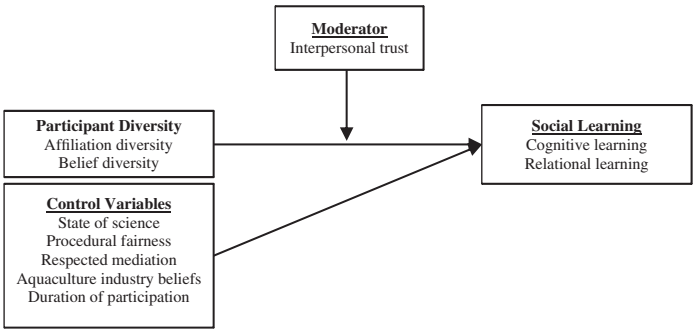


Figure 1 Research Framework

about disease control and degradation of marine ecosystems (Mazur and Curtis 2006; Naylor et al. 2000; Treece 2002).

Multistakeholder groups have formed across the United States to develop policy strategies to address these challenges. In this research, these groups are called "aquaculture partnerships." Aquaculture partnerships are composed of some mix of aquaculture producers, commercial fishers, consultants, environmental advocates, public administrators from all levels of government, and university scientists. They are typically housed at the state level. Many partnerships formed under a regulatory or legislative mandate, sometimes following a call from industry to have a forum in which to engage in aquaculture policy discussions. These mandated groups typically function as advisory committees to one or more administrative agencies.

Aquaculture partnerships are appropriate study cases because they involve stakeholders that vary in their sectoral representation and beliefs about how the aquaculture industry should be managed. Aquaculture partnerships are comparable to collaborative governance groups in other environmental contexts.

Data Collection

Aquaculture partnerships are defined as local, state, or regional organizations composed of some blend of aquaculture industry, government agency, and nongovernment organization representatives who collaborate on policy or research or both, relating to local, state, or regional marine aquaculture issues in the United States. Nationwide partnerships lacking a geographic focus were excluded. Also excluded were Hawaii and Alaska for budgetary reasons. With these exceptions, 10 partnerships were identified using extensive web research and consultation with a project advisory committee comprised of aquaculture experts. Coordinators of the 10 partnerships were contacted, and each group agreed to participate in this study.

Together, the 10 partnerships represent each major coastal region of the United States, with three located along the Pacific Coast, five located along the northeastern Atlantic Coast, and two located on the southeastern Atlantic Coast. The partnerships are similar in composition, scope, and focus. All are composed of vested stakeholders representing diverse aspects of the aquaculture industry. Individual partnership names are kept confidential to protect the anonymity of study participants.

An online survey was administered to all of the participants in the 10 partnerships to collect individual and partnership-level data. Participants were defined as anyone currently participating in one of the partnerships or anyone that closely followed the work of the partnership. Lists of active partnership members were obtained from online membership lists or partnership coordinators. Information regarding participants who were not officially members but closely followed the work of the partnership was obtained from partnership participants and/or partnership coordinators. Across the 10 partnerships, 198 participants were identified and sent a survey invitation. Sixty-two percent, or 123 participants, responded to the survey.[1] The survey contained questions about aquaculture policy, the functioning of partnerships, and attitudes and experiences relating to partnership participation. Specific survey items corresponding to the dependent and independent variables included in our analysis are described next.

Dependent Variables: Cognitive Learning and Relational Learning

Our dependent variables are perceived cognitive learning and perceived relational learning. Perceived cognitive learning was operationalized using a survey question that asked respondents to express their level of agreement (−2 = strongly disagree to 2 = strongly agree) with the following three statements: (1) "The [partnership] has given me a better understanding of aquaculture science"; (2) "The [partnership] has given me a better understanding of aquaculture policy, law, or regulations"; (3) "The [partnership] has given me a better understanding of aquaculture economics or business." Responses to these three statements were averaged to create a single cognitive learning measure (Cronbach's alpha = 0.84).

Perceived relational learning was operationalized using a survey question that asked respondents to express their level of agreement (−2 = strongly disagree to 2 = strongly agree) with the following two statements: (1) "The [partnership] has given me new long-term professional relationships"; (2) "The [partnership] has given me a better understanding of other stakeholder's perspectives." Responses to these two statements were averaged to create a single relational learning measure (Cronbach's alpha = 0.79).

Independent Variables: Affiliation Diversity and Belief Diversity

Diversity variables are partnership-level variables that reflect variation in partnership participants' sectoral affiliations (affiliation diversity) and perceptions relating to an environmental belief statement (belief diversity).

Affiliation diversity was measured using the Blau heterogeneity index to reflect how many different types of stakeholders are represented in each partnership. The index was constructed from complete partnership membership rosters at the time the survey was conducted rather than relying on data from survey respondents. Stakeholder categories used for constructing the index for partnerships consist of government (local, state, or federal), aquaculture industry, commercial fisher/shoreline developer (i.e., those who have nonaquaculture commercial interests in using marine areas), university, consultant/scientist, environmental group, and other (e.g., general public). The formula for the Blau heterogeneity index is as follows:

$$1 - \Sigma p^2_i$$

where p is the proportion of members in a given category and i is the number of possible categories. Larger heterogeneity scores indicate greater diversity of stakeholder categories represented in a partnership.

Belief diversity was measured as the partnership-level standard deviation of respondents' level of agreement (−2 = strongly disagree to 2 = strongly agree) with this environmental belief statement: "Plants and animals exist primarily for use by people."

Moderating Variable: Interpersonal Trust

Interpersonal trust was operationalized using a scale developed by Leach and Sabatier (2005) that asked respondents to indicate whether they felt the following statements were applicable to none

(1), few (2), half (3), most (4), or all (5) of the participants in their partnership: (1) "are honest, forthright, and true to their word"; (2) "have the same values and priorities that [respondent] does; (3) have reasonable motives and concerns"; (4) "are willing to listen and sincerely understand other points of view"; (5) "reciprocate acts of goodwill or generosity"; and (vi) "are trustworthy." Responses to the six statements were averaged to create a single interpersonal trust measure with high internal reliability (Cronbach's alpha = 0.88).

Control Variables

Perceived lack of adequate science was based on participants' perceived seriousness of the following problem (1 = not a problem to 5 = very serious problem): "There is a lack of good science to make sound decisions regarding the siting and operation of aquaculture facilities."

Perceived procedural fairness was captured by asking respondents to indicate their level of agreement with the following statement (–2 = strongly disagree to 2 = strongly agree): "The [partnership] process treats all parties fairly and consistently."

Respected mediator was measured based on participants' agreement with the following statement (–2 = strongly disagree to 2 = strongly agree): "There is at least one participant who mediates conflict and is respected by other members."

Beliefs about the aquaculture industry were measured based on a question that asked survey respondents to indicate their level of agreement with the following four statements (–2 = strongly disagree to 2 = strongly agree): (1) "Marine shellfish aquaculture must be expanded in U.S. waters"; (2) "Marine finfish aquaculture must be expanded in U.S. waters"; (3) "Existing marine shellfish aquaculture facilities in the United States are ecologically sustainable"; (4) "Existing marine finfish aquaculture facilities in the United States are ecologically sustainable." The statements were averaged to produce a single combined measure of individual participants' pro-aquaculture beliefs (Cronbach's alpha = 0.86).

We measured pro-aquaculture beliefs because this reflects a commitment to, or general support of, the aquaculture industry. Support of the industry can have positive or negative implications for the different dimensions of social learning. On the one hand, individuals may be more open to relationship building or accepting of new information to advance the development of the industry. One the other hand, a high level of commitment to the industry could compromise individuals' ability to accept information that portrays aspects of the industry in a negative way despite being constructive or valid.

The individual-level belief measure contrasts with the partnership-level belief diversity measure as the latter is intended to capture variation in general environmental beliefs across all participants in a given partnership, that is, a general belief measure that is not specific to a particular policy issue or domain.

Duration of participation was captured by asking participants about the numbers of years they had participated in their partnership.

Data Analysis and Results

A first step in the analysis was to describe the partnerships' composition. Table 1 reveals that all 10 partnerships include at least one member of the aquaculture industry (n =10). Similarly, government representatives (n = 9), commercial fisher/shoreline developers (n = 7), and university researchers (n = 7) are present in the majority of partnerships. On the other hand, some stakeholder groups are less well represented, including environmental groups (n = 4) and consultant/scientists (n = 4). Government representatives (M = 7.89, SD = 5.53) and aquaculture industry members (M = 5.10, SD = 5.32) are well represented in partnerships relative to other groups. Although commercial fisher/shoreline developers are engaged across most aquaculture partnerships (7 of the 10 partnerships include at least one member from this stakeholder group), they are generally not well represented (M = 1.43, SD = 0.79).

Descriptive Statistics and Correlations

Descriptive statistics and correlations among all variables included in the regression analysis are presented in table 2. The mean for perceived relational learning (M = 0.94, SD =0 .73) is slightly higher than that for perceived cognitive learning (M = 0.79, SD = 0.82) on a scale from –2 to 2. Partnership participants generally reported a high level of interpersonal trust (M = 4.01, SD = 0.49) on a scale from 1 to 5. Belief diversity, measured as the standard deviation of beliefs within each partnership, averaged 1.01 (SD = 0.34) across the 10 partnerships. Affiliation diversity, measured with the Blau heterogeneity index, ranges from 0.22 to 0.78 (see table 1). Its overall mean across the partnerships is 0.61 (SD = 0.19), suggesting that partnerships are generally heterogeneous.

Table 2 shows that interpersonal trust is positively correlated with both perceptions of cognitive learning (r = .44, p < .001) and

Table 1 Stakeholder Affiliations of Partnership Participants

	Government	Aquaculture industry	Commercial Fisher/ Developer	University	Consultant/ Scientist	Environmental group	Other	Affiliation Diversity Scores (Based on Blau Heterogeneity Index)
Partnership A	10	2	2	0	0	2	3	.66
Partnership B	3	1	1	3	1	1	0	.78
Partnership C	6	3	1	3	0	0	2	.74
Partnership D	8	3	3	3	0	0	0	.69
Partnership E	5	1	0	2	1	0	0	.62
Partnership F	1	4	0	0	0	0	0	.32
Partnership G	17	4	1	6	0	2	1	.64
Partnership H	16	19	0	5	4	0	7	.73
Partnership I	5	7	1	1	1	1	1	.73
Partnership J	0	7	1	0	0	0	0	.22
Mean (SD)	7.89 (5.53)	5.10 (5.32)	1.43 (.79)	3.29 (1.70)	1.75 (1.50)	1.50 (.58)	2.80 (2.49)	.61 (.19)

perceptions of relational learning ($r = .35$, $p < .001$). Belief diversity is not significantly correlated with learning, but affiliation diversity has a small negative correlation with cognitive learning ($r = -.14$) and relational learning ($r = -.22$, $p < .05$), meaning that learning tends to decrease as stakeholder affiliations become heterogeneous.

Perceptions of cognitive and relational learning are correlated with control variables, including stakeholders' perceptions of procedural fairness, respected mediation, and inadequate science. Perceived relational learning also increases with a stakeholder's duration of participation in the partnership ($r = .20$, $p < .05$).

Significant correlations exist among several of the independent variables. Most notably, interpersonal trust is negatively correlated with belief diversity ($r = -.35$, $p < .001$), and the two diversity measures are themselves highly correlated ($r = .72$, $p < .001$). However, no serious multicollinearity was detected based on Variance Inflation Factors (VIFs). Across all variables, the VIF scores ranged from 1.07 to 2.39. A VIF of 6 is considered indicative of serious multicollinearity (Keith 2014).

Regression Analysis

Table 3 displays four regression models for perceived cognitive learning. The first model includes only control variables: partnership participation duration, perceptions regarding adequate science, pro-aquaculture beliefs, procedural fairness, and respected mediator. The second model adds the main effects of the three independent variables—affiliation diversity, belief diversity, and interpersonal trust—leading to a significant improvement in model fit ($\Delta R^2 = .066$, $p < .01$). Of these variables, only interpersonal trust is statistically significant ($\beta = .48$, $p < .01$). In other words, respondents tend to perceive higher cognitive learning—or learning on aquaculture science, policy, and economics—when they report trusting more of their fellow partnership participants. Model 2 also indicates that participants' perceptions of cognitive learning are significantly enhanced by a perceived lack of adequate science for aquaculture decision making ($\beta = .13$, $p < .05$), perceived procedural fairness ($\beta = .37$, $p < .001$), and perceptions that a respected mediator is present within the partnership ($\beta = .18$, $p < .05$). In contrast, cognitive learning is negatively associated with an individual's pro-aquaculture beliefs ($\beta = -.24$, $p < .01$).

Models 3 and 4 use the PROCESS tool developed by Hayes (2013) to examine moderating effects of interpersonal trust on the relationships between diversity and cognitive learning. A significant moderating effect is detected for the interaction between belief diversity and interpersonal trust ($\beta = .93$. $p < .05$),

Table 2 Descriptive Statistics and Correlations ($N = 111$)

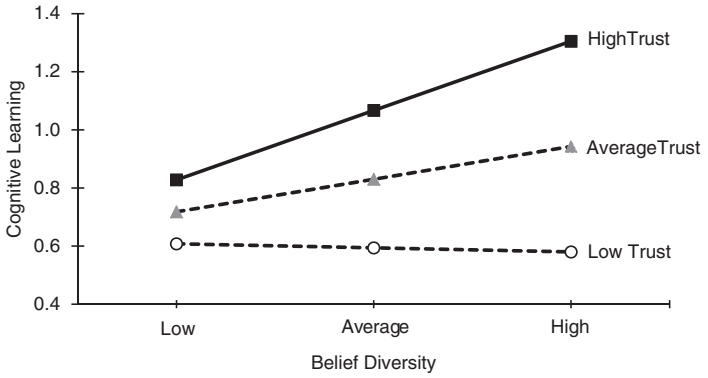
	Variables	M	SD	1	2	3	5	6	7	8	9	10	11
1	Cognitive learning	.79	.82	1.00									
2	Relational learning	.94	.73	.70***	1.00								
3	Duration of participation	5.36	4.99	.01	.20*	1.00							
5	Lack of adequate science	2.58	1.28	.31***	.27**	.08	1.00						
6	Pro-aquaculture beliefs	1.05	.81	–.18	–.12	.20*	–.23*	1.00					
7	Procedural fairness	.95	.85	.53***	.47***	.03	.09	.17	1.00				
8	Respected mediator	.72	.71	.21*	.28**	–.06	.00	.08	.19*	1.00			
9	Belief diversity	1.01	.34	–.08	–.03	–.11	.11	–.14	–.17	.08	1.00		
10	Affiliation diversity	.61	.19	–.14	–.22*	–.10	.07	.00	–.11	.10	.72***	1.00	
11	Interpersonal trust	4.01	.49	.44***	.35***	.05	.05	.14	.52***	.03	–.35***	–.17	1.00

*$p < .05$; **$p < .01$; ***$p < .00$.

Table 3 Models of Cognitive Learning (OLS Regression)

	Model 1		Model 2		Model 3		Model 4	
	β	SE	β	SE	β	SE	β	SE
Control Variables								
Duration of participation	.04	.01**	.00	.01	.01	.01	.01	.01
Lack of adequate science	.09	.05	.13	.05*	.12	.05*	.12	.05*
Pro-aquaculture beliefs	–.21	.07**	–.24	.08**	–.23	.08**	–.24	.08**
Procedural fairness	.39	.07***	.37	.08***	.34	.08***	.36	.08***
Respected mediator	.24	.08**	.18	.08*	.18	.08*	.19	.09*
Independent Variables								
Belief diversity			.45	.33	.41	.32	.58	.33
Affiliation diversity			–1.15	.64	–1.37	.64*	–1.81	.75*
Interpersonal trust			.48	.15**	.48	.15**	.49	.15**
Interaction Terms								
Belief diversity * Trust					.93	.45*		
Affiliation diversity * Trust							1.62	.98
F	14.72***		11.69***		11.18***		10.88***	
df	5,105		8,102		9,101		9,101	
R^2	.412		.478		.499		.492	
ΔR^2	—		.066**		.021*		.014	

*$p < .05$; **$p < .01$; ***$p < .001$.



Notes: Dotted lines indicate nonsignificant relationship between belief diversity and cognitive learning. Average = mean; high = mean plus one standard deviation; low = mean minus one standard deviation.

Figure 2 When Interpersonal Trust Is High, Belief Diversity Promotes Cognitive Learning

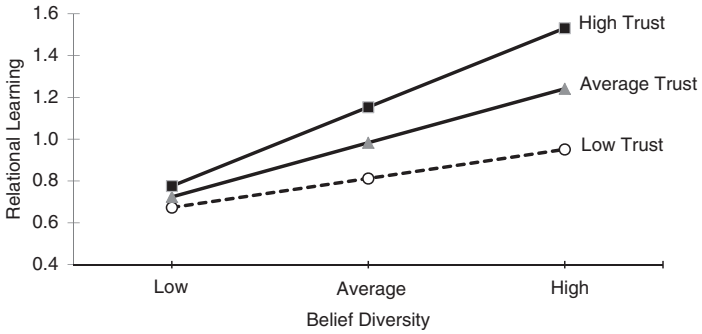
even though belief diversity does not have a significant direct effect on cognitive learning. This means that the effect of belief diversity on cognitive learning differs significantly depending on the level of interpersonal trust.

To probe this significant interaction effect, two follow-up analyses suggested by Hayes (2012) were used: the pick-a-point approach (an analysis of simple slopes) and the Johnson-Neyman technique. Figure 2 shows the results of the pick-a-point approach and graphs the conditional effects of belief diversity on cognitive learning at particular values of interpersonal trust (i.e., low trust equals the mean minus one standard deviation, moderate trust equals the mean, and high trust equals the mean plus one standard deviation).

As the graph shows, a high level of interpersonal trust enhances the positive relationship between belief diversity and cognitive learning (conditional effect = .86, $p < .05$). The Johnson-Neyman technique, which investigates the conditional effects at the entire range of a moderator, reveals that the region of significance for the moderating effect ranges from 4.38 to 5.0 (the maximum possible score on the scale). To sum up, these results imply that belief diversity becomes a significant factor in enhancing perceptions of cognitive learning only when stakeholders express high levels of trust in their fellow partnership participants.

Table 4 depicts regression models for perceived relational learning. In the main effects model, belief diversity ($\beta = .93$, $p < .01$) and interpersonal trust ($\beta = .34$, $p < .01$) are positively associated with relational learning, whereas affiliation diversity ($\beta = -2.32$, $p < .001$) is negatively associated with the relational learning. Relational learning is also significantly and positively associated with all control variables, expect pro-aquaculture beliefs. Again, the moderating effects of interpersonal trust are examined using the PROCESS tool. The results presented in models 3 and 4 indicate that interpersonal trust interacts with both diversity variables to influence perceived relational learning (belief diversity $\beta = .88$, $p < .05$; affiliation diversity $\beta = 1.79$, $p < .05$).

As can be seen in figures 3 and 4, interpersonal trust strengthens the positive relationship between belief diversity and relational learning



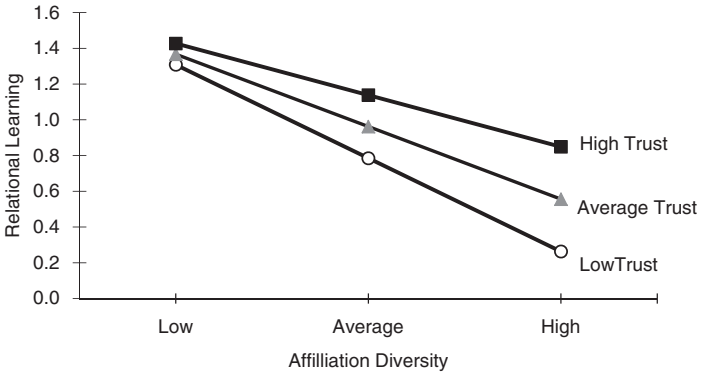
Notes: Dotted line indicates nonsignificant relationship between belief diversity and relational learning. Average = mean; high = mean plus one standard deviation; low = mean minus one standard deviation.

Figure 3 Interpersonal Trust Amplifies the Positive Influence of Belief Diversity on Relational Learning

Table 4 Models of Relational Learning (OLS Regression)

	Model 1		Model 2		Model 3		Model 4	
	β	SE	β	SE	β	SE	β	SE
Control Variables								
Duration of participation	.04	.01**	.03	.01**	.04	.01**	.04	.01**
Lack of adequate science	.10	.05*	.09	.04*	.08	.04*	.08	.04
Pro-aquaculture beliefs	–.19	.08*	–.18	.07*	–.17	.07*	–.18	.07*
Procedural fairness	.37	.07***	.29	.07***	.26	.07***	.28	.07***
Respected mediator	.25	.08**	.26	.07**	.26	.07***	.28	.07***
Independent Variables								
Belief diversity			.98	.28**	.93	.28**	1.11	.29***
Affiliation diversity			–2.32	.56***	–2.52	.56***	–3.05	.65***
Interpersonal trust			.34	.13**	.35	.13**	.36	.13**
Interaction Terms								
Belief diversity * Trust					.88	.40*		
Affiliation diversity * Trust							1.79	.85*
F	13.88***		12.94***		12.49***		12.40***	
df	5,105		8,102		9,101		9,101	
R^2	.398		.504		.527		.525	
ΔR^2	—		.106***		.023*		.021*	

*$p < .05$; **$p < .01$; ***$p < .001$.



Note: Average = mean; high = mean plus one standard deviation; low = mean minus one standard deviation.

Figure 4 Interpersonal Trust Dampens the Negative Influence of Affiliation Diversity on Relational Learning

and dampens the negative relationship between affiliation diversity and relational learning. For belief diversity, the moderation effect occurs when interpersonal trust is average (conditional effect = .93, $p < .01$) and high (conditional effect = 1.36, $p < .001$) but not when trust is low (conditional effect = .50, $p = 159$). The Johnson-Neyman technique suggests that the region of significance for the moderating effect occurs when interpersonal trust ranges from 3.75 to 5.0 (the upper end of the trust scale). For affiliation diversity, the pick-a-point analysis demonstrates that interpersonal trust dampens the negative influence on relational learning at all levels of trust (see figure 4).

Discussion

Stakeholder diversity can enable or hamper social learning in collaborative governance settings. Diversity exposes participants to new information and new perspectives, which can lead them to understand issues differently, possibly culminating in newfound consensus on scientific controversies or policy debates. Diversity can also be threatening, leading stakeholders to react to new information defensively, which impedes knowledge assimilation and belief change and potentially thwarts collective action that could have resulted from shared understanding cultivated through the collaborative process (Nyhan, Reifler, and Ubel 2013).

Assuming diversity cuts both ways, can we predict which effect is likely to prevail? To what extent does the answer depend on interactions between diversity and other characteristics of a particular collaborative process? To explore these questions, this study builds on prior research through two main innovations—one conceptual and one analytical. Conceptually, this study focuses on two types of learning outcomes (cognitive and relational) combined with two types of stakeholder diversity (belief diversity and affiliation diversity). Analytically, it treads new ground by applying Hayes's (2013) PROCESS tool in ordinary least squares (OLS) regression models to examine how the influence of diversity on learning is moderated by a third factor, interpersonal trust.

The statistical models indicate significant interactions between trust and diversity. Overall, trust is a potent elixir that amplifies the positive and dampens the negative influences of diversity. Diversity in policy-relevant beliefs generally has a salutary effect on both types of learning, and the effect is facilitated by interpersonal trust. More specifically, when trust is low or middling, belief diversity is not a significant predictor of *cognitive* learning, but when trust is high, belief diversity does help explain learning. Similarly, belief diversity is not a significant predictor of *relational* learning when trust is low, but when trust is average or high, belief diversity correlates with learning, and *increasing levels of trust amplify this positive influence.*

Conversely, diversity in stakeholders' sectoral affiliations generally retards both types of learning. For *cognitive* learning, trust fails to moderate the negative influence of affiliation diversity. For *relational* learning, however, interpersonal trust is a significant moderating variable that dampens the pernicious effects of affiliation diversity.

How can we explain the discrepant effects of belief diversity and affiliation diversity? To speculate, it is possible that exposure to stakeholders with different ideologies and experiences provides new opportunities for learning without threatening one's own worldview, especially in the context of a collaborative policy process in which social norms generally value the sharing of diverse viewpoints in an explicitly welcoming environment. By contrast, affiliation diversity might serve as a tangible signal of administrative, legal, or economic threats. For example, from the perspective of the aquaculture industry, the active engagement of federal agencies implies potential regulatory enforcement. Similarly, state agencies might withhold necessary permits. Environmental groups could sway public opinion against farmed seafood products. Commercial fishing interests represent market competition. University researchers (although potential allies if engaged in aquaculture research and development) are potential threats if their research and development uncovers unforeseen environmental problems. Whereas ideological diversity cuts new paths for learning, affiliation diversity cuts the other way, possibly by raising the specter of tangible political threats that elicit defensive cognitive and relational postures.

The finding that stakeholder diversity carries potential downsides is unusual but not unique in research on collaborative governance. For example, in their study of hydroelectric dam relicensing, Ulibarri and Scott (2016) found that a more collaborative process was also more exclusive, and its participants had social networks with stronger *but fewer* connections. This insight is consistent with best practices in mediation of public policy disputes, in which professional facilitators emphasize the importance of getting the "right" stakeholders to the table, and keeping the forum to a manageable number of participants (Kaner 2014; Straus 2002).

Control variables performed similarly in models for both kinds of learning, with one exception. Duration of participation is a significant predictor of relational learning ($p < .001$) but not cognitive learning. This suggests that acquisition of new knowledge about relevant science, policy, or economics happens relatively early in the collaborative process, whereas forming new professional relationships and learning about other stakeholders' perspectives happens gradually and continues through the duration of the

process. Because relational learning is partly a function of time, conveners of collaborative groups should expect relational learning to grow roughly in proportion to the number of months that stakeholders continue to interact.

Other significant factors associated with learning include participation by one or more individuals who mediate conflict and garner the respect of other participants and, above all, stakeholders' perception that the partnership process treats all parties fairly. Taken together, these findings suggest a practical implication for conveners of highly diverse stakeholder groups. Namely, care should be taken in selecting a capable mediator who can help build interpersonal trust as well as confidence in the fairness of the deliberative process. We acknowledge that current partnership participants may have different perceptions of procedural fairness than former participants who stopped participating in a partnership because they were dissatisfied with the process. Future research is necessary to investigate whether perceptions of procedural fairness and social learning differ among current and former participants.

Because relational learning is partly a function of time, conveners of collaborative groups should expect relational learning to grow roughly in proportion to the number of months that stakeholders continue to interact.

A perceived lack of adequate science for decision making is a significant predictor of cognitive learning and, to a lesser extent, relational learning. Although contrary to the hypothesis that policy-oriented learning requires sufficient, accepted scientific information (Weible, Sabatier, and McQueen 2009), this finding is consistent with that of Leach et al. (2014), who posit that stakeholders are less receptive to new information if they feel that existing science is already adequate.

Limitations and Future Research

Although this study suggests that diversity and trust are significant predictors of learning, it provides limited insight into their causal relationship because of the use of cross-sectional data. As Newig, Günther, and Pahl-Wostl (2010) note, structural and relational aspects of networks and learning can influence each other in cyclical ways. Thus, longitudinal data would be useful for better identifying clear causal relationships among diversity, trust, and learning. A related limitation stems from the self-reported measures of learning. Although partnership members ought to be able to accurately self-assess the knowledge they gained through the collaborative process, longitudinal research could produce objective measures of learning by documenting changes in members' knowledge or beliefs over time. Third, although cognitive learning is operationalized as knowledge acquisition, we acknowledge that learning can also involve knowledge application or knowledge sharing, which involve slightly different processes and outcomes than knowledge acquisition (Tsai 2005), and could be examined in future research.

Finally, this study used OLS regression, which may underestimate standard errors and overestimate the significance of regression coefficients given that individual respondents were nested with particular partnerships. To address this issue, multilevel modeling is suggested when the intraclass correlation coefficients (ICC) are greater than 5 percent; otherwise, a simple regression would suffice (Heck, Thomas, and Tabata 2010). ICC scores for cognitive learning and relational learning were about 1 percent and 10.5 percent, respectively. Although the ICC scores suggest using multilevel modeling for relational learning, a simple regression analysis was used for several reasons. First, an unconditional model for relational learning showed that relational learning did not substantially differ across the partnerships ($Z = 1.254$, $p = .110$). Second, to test the risk of biased results, we conducted multilevel modeling to see whether the results of our simple regression were substantially different from those of multilevel modeling for relational learning. The significant results reported in this study remained the same with multilevel modeling, although the significance levels were slightly lower in the multilevel models. Finally, although multilevel modeling produces accurate estimates in analyzing nested data, it can result in biased results if the overall sample size is not large, especially at the higher-level units (e.g., 10 groups or fewer). We recommend that future research should strive for larger data sets to enable accurate multilevel modeling.

Conclusion

This article advances the literature beyond its common, overly simplistic message of "the more participation, the better." Specifically, the empirical results suggest stakeholder diversity can have positive or negative effects on learning depending on how diversity is conceptualized, the type of learning examined, and the presence or absence of a moderating factor, interpersonal trust. More generally, the analysis demonstrates the danger of treating nuanced, multidimensional concepts, such as diversity and learning, as if they were monolithic, and it highlights the importance of exploring interactions between structural and procedural factors that previous studies have consistently shown to influence governance outcomes. Future research on collaborative governance should be vigilant to the possibility of interaction effects among key variables, including modulating variables that accentuate or dampen the influence of other factors.

This article also provides clear guidance for designers of collaborative processes. They should consider which types of diversity will most productively contribute to the goals of the process, recognizing that belief diversity promotes learning, but affiliation diversity can impede learning. If learning among stakeholders is a priority outcome or instrumental goal for a collaborative process, conveners should consider excluding members of organizations that are not directly relevant to the work of the group, so as to avoid needlessly triggering any adverse influences on learning. Stakeholders should anticipate that cognitive learning may occur quickly whereas relational learning is likely to develop gradually throughout the duration of the collaborative process. To further promote learning among diverse stakeholders, designers of collaborative processes should foster the stakeholders' trust in one another and their confidence in the procedural fairness of the forum. A neutral, respected mediator can help the parties establish such a process conducive to learning.

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Note

1. Response rates per partnership (responses/total): partnership A = 13/22, 59 percent; partnership B = 10/14, 71 percent; partnership C = 12/23, 52 percent; partnership D = 10/17, 59 percent; partnership E = 8/10, 80 percent; partnership F = 6/7, 86 percent; partnership G = 16/25, 64 percent; partnership H = 25/43, 58 percent; partnership I = 18/28, 64 percent; partnership J = 5/9, 56 percent.

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