



Values shift in response to social learning through deliberation about protected areas

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ABSTRACT

Salient, long-term solutions to address global environmental change hinge on management strategies that are inclusive of local voices and that recognize the array of values held by surrounding communities. Group-based participatory processes that involve deliberation of multiple stakeholders with varying perspectives—particularly social learning—hold promise to advance inclusive conservation by identifying and creating a shared understanding of the landscape. However, few studies have empirically investigated how the value basis of stakeholder deliberation changes over time in relation to social learning. This study provided a novel platform for local stakeholders from Interior Alaska to deliberate on landscape change and associated management practices in ways that shifted their value orientations. In particular, we used a pre-test, post-test experimental design involving mixed methods to measure how different types of values changed as a result of social learning through an online discussion forum. We found evidence that social learning: 1) activated shared values that were previously hidden through building a relational understanding of others, and 2) shifted values that spanned three levels of psychological stability. As hypothesized, social values that represented expressed preferences for landscape change were most likely to shift in association with social learning. Conversely, shifts in individual values towards self-transcendence required learning to go beyond the discussion forum and be situated within the participants' broader communities of practice. Overall, this longitudinal study highlights how social learning facilitated through deliberation presents opportunities to identify shared values and spark value shifts across stakeholder groups, thus incorporating diverse viewpoints into decision-making about global environmental change.

1. Introduction

The inclusion of local communities in decision-making—especially in ways that consider the margins of collective interests or historically

excluded groups—has been an ongoing challenge for conservation initiatives in the face of rapid environmental change (Mace, 2014). The perceived underrepresentation and exclusion of local stakeholders can create conflict between residents and decision makers, even within

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participatory frameworks that are intended to be democratic (Allmendinger & Haughton, 2012; Goodson et al., 2022). The concept of inclusive conservation was introduced as a mechanism to understand and reduce these tensions by actively engaging the diverse perspectives of multiple stakeholders to create a socially inclusive framework for management actions tied to conservation (Tallis & Lubchenco, 2014). At the heart of an inclusive conservation framework is a functional process of deliberation among residents, decision makers, and other stakeholders that involves learning from one another and challenging dominant perspectives to more effectively inform decision making across a range of diverse values (Matulis & Moyer, 2017; McDougall et al., 2013; Raymond et al., 2022).

Meaningful participation across stakeholder groups through community deliberation confers a number of benefits, including the facilitation of social learning amongst participants (Subirats, 1995; Eriksson et al., 2019). Here, we consider deliberation to be a values-based exchange of different and diverse perspectives (Kenter et al., 2016a), as well as the careful consideration of potential solutions given points of alignment, divergence, and pluralism (Blacksher et al., 2012; Van Riper et al., 2017). The concept of social learning through deliberation has received increased attention given evidence of its potential to influence resource management and sustainability across a range of systems (Schusler et al., 2003; Scholz et al., 2014). Likewise, learning to achieve sustainability in practice is shaped around a myriad of interactions, experiences, and interpretations across varying stakeholder groups (Schultz et al., 2018). Originally introduced by Bandura (1971) and subsequently conceptualized as an iterative reproduction of competing external and internal forces that impact behaviors, social learning considers how individual learning is situated within broader social contexts through engagement with others (e.g., Pahl-Wostl & Hare, 2004; Garmendia & Stagl, 2010; Tam et al., 2021). Through this lens, previous research has posited that social learning leads to societal and environmental transformations in support of inclusivity (Cundill & Rodela, 2012).

For the purposes of our study, we define social learning as the change in multiple types of understanding that occur through interactions within a social network—such as the deliberation of conflicting values and trade-offs—which become situated within broader communities of practice (Reed et al., 2010). Building on earlier work that has characterized social learning as a multi-dimensional concept (Haug et al., 2011; Baird et al., 2014; Bentley Brymer et al., 2018; Eriksson et al., 2019; Diduck et al., 2020), we consider social learning to be comprised of cognitive knowledge acquisition, normative expectations, and a relational understanding of others for the purposes of our research. The cognitive, normative, and relational knowledge exchanged through learning is not a “thing” but rather a process elicited by the dialogues and sometimes contentious negotiations that occur through deliberation (Stern et al., 2021). The social learning processes that occur through community deliberation, and from consideration of transaction costs and benefits, have the potential to catalyze change across multi-level values (Kenter et al., 2016b). Both learning and values have internal (or personal) versus external (or social) components (van Riper et al., 2018). Thus, individual learning through engagement may have varying associations with multi-level (individual or social) value shifts alongside external learning that goes on to be situated within broader communities of practice (Reed et al., 2010).

Despite evidence that has been generated to illustrate the benefits of social learning, it remains unclear how multiple values may or may not converge or change because of deliberation. Previous research has suggested deliberation can alter normative standards (Farrow et al., 2018), the framing of ecosystem service valuation (Irvine et al., 2016; Orchard-Webb et al., 2016), and equity considerations that go beyond monetary benefit (Lliso et al., 2020). Though, it can also lead to preference uncertainty, value incommensurability, and interpersonal conflicts that cannot be expressed as trade-offs (Lina et al., in press). Understanding multi-level value shifts as an outcome of social learning

is particularly important because values are instrumental in shaping decisions and defining priorities for life, as well as reflecting the expressed preferences for landscape change (van Riper et al., 2018). Here, we focus on “social values” that have multiple meanings in the academic literature (see Raymond et al., 2019; Kenter et al., 2019 for the different lenses). For the purpose of our study, we refer to social values as the aggregation of individual place-based qualities assigned to a specific landscape that provides benefits to society (Brown & Reed, 2000; Cervený et al., 2017). In contrast, “individual values” extend beyond any given context and serve as guiding principles in life, as well as modes of conduct for behavior (Schwartz, 1994; Stern et al., 1999). Finally, “eudaimonic values” are enduring core beliefs that motivate individuals to further autonomy, self-actualization, and excellence (Ryff & Singer, 2008; van den Born et al., 2018; Shin et al., 2022).

Social, individual, and eudaimonic values have been linked to behaviors that influence the biophysical environment (van Riper et al., 2019). Although bi-directional influences exist in human-nature relationships (Kendal & Raymond, 2019; Braitto et al., 2017), values are an important basis for understanding well-being through the ways people perceive and engage with benefits provided by nature-based settings (Johnson et al., 2019). Past research has demonstrated variation in the psychological stability of these value types and, thus, suggested different values are affected by learning to varying degrees (Fig. 1; van Riper et al., 2018). For instance, social values are posited to be the least psychologically stable because they can be influenced and modified when minor disruptions are introduced, such as acquiring new knowledge (Dietz, 2013). In contrast, individual values are relatively more stable because they transcend contexts and, through the process of deduction, can be used to explain preferences for places (Brown, 1984; Schroeder, 2013). While the literature related to the psychological stability of eudaimonic values is nascent, recent studies have called into question how eudaimonia interfaces with Schwartz’ (1994) Theory of Basic Human Values (Winkler-Schor et al., 2020). Indeed, scholars have argued that eudaimonic values are a ‘higher-order value’ that represents the pursuits of living a good life to shape individual values (Shin et al., 2022). Thus, eudaimonic values are considered the most stable of the three value types presented in our study. These values may be shared and diffused into broader communities of practice as part of a social learning process (Kenter et al., 2015; Tam et al., 2021). However, it remains unclear how social learning links to trackable shifts across different value types.

Our research responds to questions about the role of social learning to support inclusive conservation and catalyze changes in multi-level values through community deliberation. We investigated multiple value shifts in relation to social learning vis-à-vis deliberation within an online space. Virtual interactions are ubiquitous in everyday life and becoming increasingly prominent in social interactions that foster connections between groups that may otherwise be geographically or socially disconnected (Browning et al., 2020). The use of virtual spaces to foster social and professional connections has recently become even more evident due to the rapid shift to online platforms during the COVID-19 pandemic. Therefore, it is interesting to consider how interactions that occur in online spaces such as forums, wiki pages, and social media can further facilitate social learning. Though, the effects of online-based deliberation on social learning processes—or whether values can change in response to what is learned from in-depth interactions—have yet to be empirically tested. We asked the following research questions to test how social learning may act as a driver of transformative change through value shifts: (1) How does deliberation influence the process of social learning? (2) How does social learning influence multi-level value shifts?

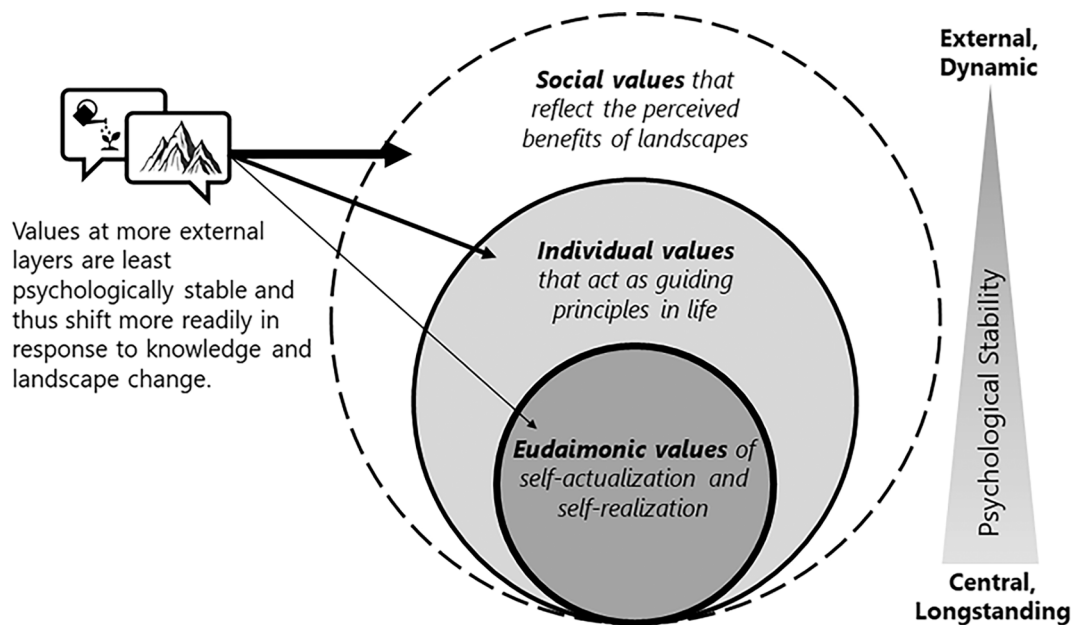


Fig. 1. Theoretical relationship between social learning through deliberation and multi-level value shifts. Social values at external levels are more likely to shift as a result social learning, and are guided by increasingly internal, but long-standing values.

2. Methods

2.1. Study area

Our study takes place in Interior Alaska and the Norther Matanuska-Susitna Valley (Fig. 2). The region encompasses a large extent of public lands, including Denali National Park and Preserve and Denali State Park, as well as adjacent rural communities (see [Supplementary material](#) for study area description). Our study engaged residents from the communities of Fairbanks, Nenana, Anderson, Clear, Healy, McKinley Village, Cantwell, Trapper Creek, and Talkeetna. The meanings assigned to the Denali region's landscape vary across communities and stakeholder interest groups ([Johnson et al., 2022](#)), which calls for broad and inclusive engagement of local communities ([Knapp et al., 2014](#)).

Likewise, multiple visions for the future are expressed by different stakeholders, including resource management agencies, and challenge the process for responding to rapidly changing conditions ([Goodson et al., 2022](#)).

2.2. Participant recruitment

Our study was part of a five-year research project that co-produced knowledge with local communities and regional decision makers. We identified the sample through a household survey administered from June to August 2020 to examine resident's landscape values and visions for the future of the region. The final sample size for the survey was 332 with a response rate of 11.1 %. To recruit participants, we asked respondents at the end of the survey if they would be interested in

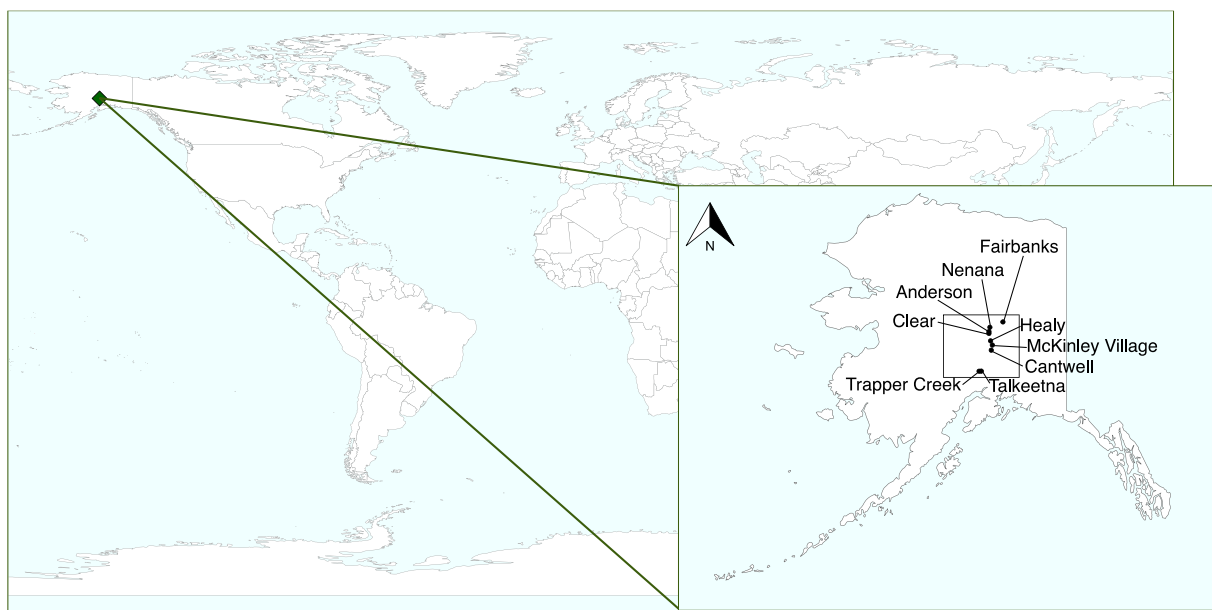


Fig. 2. Map of case study area located in Interior Alaska, U.S.A. Residents from seven communities stretching from Fairbanks to Talkeetna engaged in a deliberation about values through an online discussion forum from 2020 to 2021.

participating in future research. A total of 47 residents were recruited for the study after the recruitment process to determine interest in the discussion forum and study eligibility. Of these, a final sample of 35 residents participated in the full discussion forum and the post-test we used to calculate value shifts. Residents who participated in the research study were given a \$100 incentive split between two \$50 payments. Participants were organized into one of three discussion subgroups that were defined according to their individual and eudaimonic value orientations (e.g., value profiles), measured as part of the household survey. Two groups were created to have similar value profiles (Groups A, B), with the third group having a mixed-values profile (Group C). These smaller subgroups were used as a basis for in-depth and personalized engagement that encouraged conversation around shared values, as recommended in previous research (Genoe et al., 2016).

The final sample of 35 participants had an average age of 48.3 (Supplementary Table 1), compared to 43.8 years in the Denali Borough. Thirty-four percent had a household income between \$50,000–99,000, and 28 % had an income of \$25,000–49,000. The median household income in 2020 for the Denali Borough of Alaska was \$76,364. Seventy-nine percent held a bachelor's degree or higher, which is greater than the Denali Borough 2020 number of 39.1 %. Thirteen participants were men and 22 (40.0 %) were women. The Denali Borough is 44.1 % female as of the 2020. Residents racially identified as White (83 %), followed by Indigenous/Native Alaskan (11 %), which is compared to 82.9 % and 5.1 % in the borough. About half of the participants identified as subsistence users, indicating that they relied on natural resources (e.g., fish, wildlife, plants) to sustain their livelihoods and live a rural lifestyle.

2.3. Administration of the discussion forum

We included a pre-post treatment in our research design to test the effects of social learning on multi-level value shifts. The pre-post treatment was made possible by first developing a baseline understanding of respondent values during the regional household survey used for recruitment in Fall 2020 and then asking identical questions at the conclusion of the discussion forum in Spring 2021. After an initial meet and greet held virtually to establish a shared sense of place (Sampson & Goodrich, 2009) and to outline technical aspects of the online platform, participants began the four-week online discussion program in January 2021. At the conclusion of the program, participants were asked to retake the regional household survey as part of the pre-post treatment research design. We then hosted a final webinar that took place in April 2021 to provide participants with an opportunity to reflect on their experiences and share additional feedback on our interpretation of the study results presented herein.

Each week of the discussion forum, participants responded asynchronously to weekly prompts using a private discussion forum built in Wordpress (see Supplementary Table 2 for weekly discussion prompts). Participants were expected to submit an original post that answered the weekly prompt, as well as respond to at least three separate posts from their peers. To wrap up each week, we sent participants a summary of findings generated during the week prior and asked for feedback on our interpretation of results. Discussion topics included resident evaluations of benefits and threats to the landscape (week 1), visions for how resource management agencies should address threats and preserve benefits (week 2), an account of personal values and how value differences may influence management practices (week 3), and a reflection on learning that occurred from deliberation (week 4). Qualitative data from the discussions were inductively analyzed with open and axial coding to the summary statements throughout the forum (Charmaz, 2014).

2.4. Mixed-methods approach

We employed a mixed methods approach to answer our research questions about social learning and multi-level value shifts. We formatted the weekly discussion prompts to facilitate the integration of

the quantitative and qualitative data and complement the questions asked during our regional household survey. We employed a qualitative data analysis to answer our first research question about how learning occurred from the participant responses using NVIVO 11 Plus (QSR International Pty Ltd, 2018), followed by a multivariate analysis of the pre-and post-survey questions to address our second research question focused on understanding shifts in multi-level value associated with participation in the social learning forum using R software (R Core Team, 2020).

2.4.1. Coding and analyzing qualitative discussions: How did social learning occur?

We first identified *learning dimensions* from the qualitative data collected during the discussion forum to address our first research question. Participants were presented with the following prompt in the last week of the forum, with each sentence in the prompt aimed to capture the respective cognitive, relational, and normative dimensions of social learning:

“What – if anything – have you gained through the [discussion forum]? How did other people play a role in your learning process and what do you hope they learned in turn? How did your expectations for public land management change after engaging in the discussions?”

We aligned codes from the posted responses in week four within a social learning framework following Baird et al. (2014) and Diduck et al. (2020) into three dimensions: 1) cognitive (i.e., stated beliefs of facts, perceptions, and experiences), 2) relational (i.e., perceptions of others, alignment, divergence, and trust), and 3) normative learning (i.e., exchanges that focus on visioning how decision making should ideally function). A summative score that ranged from 0 (no social learning reported) to 3 (social learning reported across all three categories) was developed and used for subsequent analysis (Table 1). We then tested if learning dimensions varied between the three subgroups because value composition has been shown to influence deliberation (Kenter et al., 2016b) using an analysis of variance (ANOVA).

2.4.2. Quantitative data analysis: How did social learning influence multi-level value shifts?

We used a multivariate analysis of distance to measure value shifts between pre-and post-survey responses, followed by a piecewise Structural Equation Model (SEM) to determine how learning was related to any observed changes in multi-level values. Our model predicted three variables that reflected multi-level value shifts in response to social learning, including changes in social, individual, and eudaimonic values.

Following Reed et al. (2010) we measured two endogenous variables to examine the extent to which social learning occurred at individual versus group levels by adapting an established scale of learning indicators in the post-survey questionnaire (Frymier & Houser, 1999). We used a survey scale with eight questions to measure individual and situated learning (Table 2). *Individual learning* indicated the level of participant engagement in the forum, whereas *situated learning* measured how participants situated their learning in broader contexts and communities of practice. We developed a mean value score for each

Table 1
Dimensions of social learning modified from Baird et al. (2014).

Learning Dimension	Definition
Cognitive Learning	Knowledge, beliefs, and perceptions of facts or experiences
Normative Learning	The way things should be, norms, expectations for decision-making
Relational Learning	Understanding of others, shared positions, trust, exclusion, dis/agreement

Table 2

Survey scale used to measure individual and situated learning.

Survey items	M (SD)
<i>Social Learning: Individual and Situated ($\alpha = 0.83$)</i>	3.99 (0.51)
<i>Individual learning¹</i>	4.07 (0.59)
I thought about the [discussion forum], even when I was not online participating	3.91 (0.82)
I took the time to review and think about the responses and links shared by others	4.23 (0.60)
I actively participated in the [discussion forum]	4.03 (0.71)
I was comfortable volunteering my opinion to my discussion group members	4.14 (0.85)
<i>Situated learning¹</i>	3.89 (0.51)
I talked about the [discussion forum] with friends, family, or other community members	3.71 (0.96)
I took the time to review and think about the summary documents	3.97 (0.75)
I compared the topics my group discussed in the Forum with things I have learned elsewhere	4.03 (0.66)
I would like to participate in public land management with my discussion group members in the future	3.86 (0.77)

¹ Measured on a five-point Likert scale: Strongly Disagree (1), Disagree (2), Neither Disagree nor Agree (3), Agree (4), Strongly Agree (5).

battery of questions for further analysis in our path model.

We then calculated multi-level value shifts for three types of values situated along a gradient of psychological stability: social values, individual values, and eudaimonic values (Table 3; Supplementary Fig. 1). We first calculated the changes in participant responses to the pre-versus post-forum surveys in multivariate space using a Euclidean distance matrix. We used Euclidean distance as a calculation of dissimilarity between the participants' responses before and after participating in the discussion forum. Larger values indicated greater differences—or value shifts—after engaging in the discussion forum. We assigned directionality to the value shifts to indicate if the participant had an overall increase or decrease in the mean values between the two surveys, standardized from negative one (-1) to one (1). Negative value shift scores indicated participants ranked the value items as less important after stakeholder deliberation. Conversely, positive value shift scores indicated that participants rated the value items as more important post-forum. For individual values, the shifts occurred along the self-enhancement to self-transcendence axis. In particular, positive shifts reflected a change towards self-transcendence (e.g., biospheric and altruistic values), whereas a negative shift reflected a change towards self-enhancement values (e.g., egoistic and hedonic values).

2.5. Piecewise structural equation model (SEM)

We used a piecewise structural equation model (SEM) to analyze the relationship between social learning and multi-level value shifts. Piecewise SEM allowed us to control for any effects that emerged from the nested design of discussion subgroups determined by their shared value profiles. Specifically, piecewise SEM is an extension of SEM that allows for smaller sample sizes and the implementation of random effects based on local versus global estimation (Lefcheck, 2016). We fit a linear mixed-effects model within the piecewise SEM to regress multi-level value shifts on social learning in the discussion forum as fixed factors. Thus, we accounted for the participants' value profiles and discussion group membership, which may have otherwise influenced the process and outcomes of group deliberation and social learning (Kenter et al., 2016a). We accounted for value profile and group membership as nested random effects in our analysis. We based our predicted model structure from scholarly literature on social learning (Reed et al., 2010; Stern et al., 2021) through deliberation (Kenter et al., 2016a) to activate

Table 3

Survey scales used to measure social, individual, and eudaimonic values before and after the discussion forum.

Survey items	Pre-test M (SD)	Post-test M (SD)
<i>Social values¹ ($\alpha = 0.74$)</i>		
Economic: A place to earn income for employment	2.97 (1.10)	3.06 (1.14)
Subsistence: A place to harvest food or other resources to sustain my life and that of my family	4.23 (0.73)	4.14 (0.91)
Education: A place to learn about, teach, or research the environment and people	4.34 (0.73)	4.29 (0.62)
Recreation: A place where I can pursue recreation activities	4.63 (0.49)	4.66 (0.54)
Family: A place where I can spend time with my family	4.29 (0.83)	4.17 (0.92)
Rejuvenation: A place where I can feel better physically and/or mentally	4.66 (0.54)	4.74 (0.44)
Sense of community: A place where I have close relationships with other members of my community	4.03 (0.75)	4.29 (0.79)
Heritage: A place with history and traditions that are passed down to future generations	3.66 (1.03)	3.71 (0.99)
Spirituality: A place that is sacred, religious, or spiritually significant	3.94 (1.08)	4.23 (0.94)
Aesthetics: A place that has attractive scenery, sights, sounds, or smells that cannot be experienced anywhere else	4.71 (0.52)	4.74 (0.51)
Ecological integrity: A place that has intact ecosystems with the ability to support and maintain ecological processes	4.66 (0.64)	4.34 (0.91)
Wildlife: A place inhabited by wildlife unique to Alaska	4.74 (0.56)	4.60 (0.60)
<i>Individual values² ($\alpha = 0.68$)</i>		
Protecting the environment: preserving nature	4.81 (0.39)	4.86 (0.43)
Unity with nature: fitting into nature	4.61 (0.54)	4.60 (0.55)
A world of beauty: beauty of nature and the arts	4.40 (0.79)	4.57 (0.56)
Equality: equal opportunity for all	4.53 (0.63)	4.57 (0.70)
Social justice: correcting injustice, care for others all	4.60 (0.69)	4.63 (0.65)
A world at peace: free of war and conflict	4.61 (0.73)	4.69 (0.53)
Authority: the right to lead or command	2.31 (1.02)	2.34 (1.06)
Social power: control over others, dominance	1.53 (0.74)	1.63 (0.69)
Influential: having an impact on people and events	3.09 (1.07)	3.11 (1.13)
Fulfillment of desire: food, fun, pleasure	3.70 (0.88)	3.54 (0.92)
Enjoying life: pursuing hobbies, leisure, socializing	4.16 (0.70)	4.09 (0.92)
Reducing worries: seeking comfort and relaxation	4.10 (0.86)	3.91 (0.70)
<i>Eudaimonic values² ($\alpha = 0.64$)</i>		
Personal growth: development of new skills, learning, or gaining insight into something	4.53 (0.59)	4.63 (0.55)
Satisfaction with life: finding meaning, value, and relevance to a broader context	3.90 (1.00)	4.11 (0.83)
Pursuit of excellence: attaining a personal ideal in life	4.26 (0.87)	4.46 (0.66)
Autonomy: deciding your own future and doing what you believe in	4.54 (0.91)	4.54 (0.70)

¹ Measured on a five-point Likert scale: Very Rarely (1), Rarely (2), Occasionally (3), Frequently (4), Very Frequently (5). Scale modified from Brown and Reed (2000); Cerveny et al. (2017).

² Initially measured on a nine-point scale and recoded to a 5-point Likert scale. Survey items were measured using a five-point scale ranging from Unimportant (1), Of Little Importance (2), Moderately Important (3), Important (4), Very Important (5). Scale modified from Schwartz (1994); Stern et al. (1999); Steg & Groot (2010); van Riper et al. (2019).

value change (van Riper et al., 2018). Following these theoretical conceptualizations of social learning, we placed the cognitive, normative, and relational dimensions of social learning—which can be internalized (e.g., individual learning) or externalized (e.g., situated learning)—as antecedents to multi-level value shifts.

We assessed goodness of fit for our piecewise SEM using a Fisher's C statistic. We also reported the conditional R^2 that describes the proportion of variance explained by both fixed and random factors (R_c^2), as well as marginal R^2 (or R_m^2) that includes the proportion of variance explained by fixed factors alone (Nakagawa and Schielzeth, 2013). In our model, reporting marginal R_m^2 reflects the variance in value shifts explained by only fixed factors of social learning, whereas the conditional R_c^2 value includes the variation explained by both social learning and the nested random effects of the participant's value profile and discussion group membership. Using the conditional and marginal R^2 metrics addresses some of the previous issues of reporting pseudo- R^2 values to interpret variance explained by mixed models by separating random and residual variability. We used the piecewise SEM (or 'psem') and 'nmlme' packages in R to estimate our mixed-effects ('lme') model (Lefcheck, 2016; Pinheiro et al., 2020).

3. Results

3.1. Dimensions of social learning

Residents largely identified relational learning as the prominent outcome of the discussion forum, followed by normative and cognitive learning (Fig. 3). A relatively small portion indicated they did not learn anything new. Prevalence of learning dimensions varied across the discussion groups, with an equal distribution of the three dimensions in the mixed-value group. However, differences across subgroups were not significant (Relational: $F = 2.67$, $P > 0.05$; Normative: $F = 1.57$, $P > 0.1$, and Cognitive: $F = 1.09$, $P > 0.1$).

3.1.1. Relational learning

Relational learning was one of the most frequently cited benefits of participation in the discussion forum. Relational learning included participants stating that their perspectives of others changed as a result of social interaction. Others stated they learned about shared values. Many of the participants were surprised to have more in common with others than they would have originally assumed. These points of alignment led to feelings of empowerment and connectedness at a regional scale about shared values:

"Hearing about shared values for the area in which we choose to live was empowering, creating shared experiences and goals. I feel more connected to my greater Denali region because I heard voices from

Nenana to Talkeetna instead of just my little neighborhood around mile 230 and the Park entrance."

Although many participants were encouraged by what they had learned, they also acknowledged their tendencies to group people into discrete categories and disregard complexities that come to light through social interaction. For example, one participant indicated that they had previously reduced the various stakeholders in the region into distinct groups:

"Conceptually, I have always tended to group such opinions into a few discrete categories; i.e., 'development priority,' 'preservation priority,' or 'balanced rehabilitation priority.' Through our interactions I have come to discover that as usual, the real world is a bit more complicated than what my abstract reductionist tendencies might mislead me into believing."

This evidence of relational learning was positively received, though some participants were concerned about the large degree of variation in stakeholder interests, even amongst people "on the same side." Specifically, residents were worried that a lack of agreement on specific issues would present challenges for achieving more inclusive conservation goals.

3.1.2. Normative learning

Normative learning was common, occurring in about 33 % of the total posts about learning, but was less frequently cited than relational learning. Residents who had not previously participated in civic engagement activities were especially likely to change their expectations and prescriptions about the future. Normative learning was also tied to how management decisions should operate, as illustrated by one resident that reflected on their learning process by stating, "The biggest change in my perception of public land management was in its scope. I had never considered that land management could affect so many things that I didn't see or interact with. I never really had cause to sit down and think about it." This individual went on to explain that decision makers should be making much more of an effort to engage with and understand the values of local communities. Others who had been more active in civic engagement over the years did not think their expectations changed as a result of participation in the forum. Instead, they said that the discussions largely fortified and supported their original positions. These residents were deeply committed to their goal—and for some, lifetime goal—of affecting change in the region, even if that change was slow and incremental.

3.1.3. Cognitive learning

Cognitive learning about facts or knowledge acquisition were least common among participants. Residents explained that they did not

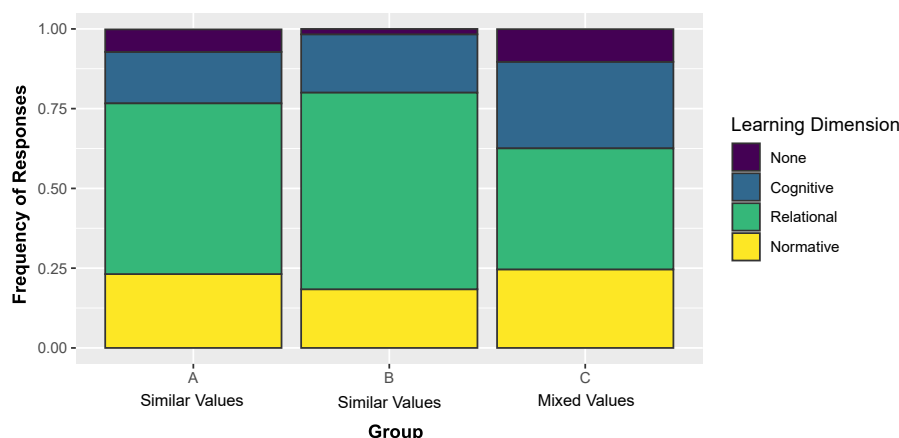


Fig. 3. Patterns of social learning across cognitive, relational, and normative dimensions for three sub-groups of participants in the discussion forum.

report learning new information because many lived within the same geographic area and had similar experiences. They indicated cognitive learning would be more likely if the group had included industry experts or people from outside of the region. When cognitive learning did occur, it was largely in response to specific planning and resource management regulations. For example, one participant reflected on what they had learned about property taxes, exclaiming: “Just learned from [name withheld] that the Denali Borough doesn’t have property tax!? I don’t know why I didn’t pick up on that until now... We have always paid fairly high property tax...and I somehow assumed [it was] the same.” Other instances of cognitive learning related to planning in neighboring communities, trail designations, and policy outcomes.

3.2. Multi-level value shifts

We detected multi-level value shifts among residents who participated in deliberation through the discussion forum (Fig. 4). As expected, shifts occurred to different degrees in accordance with the assumptions of psychological stability across our three value concepts. Overall, our model fit the data well (Fisher’s $C = 6.03$, $P = 0.64$), and showed that social learning that occurred through deliberation influenced degrees of individual and external learning among individuals and groups, which in turn explained why changes in values may have occurred. Specifically, the prevalence of social learning indicated from the qualitative discussions was positively related to individual learning ($R_m^2 = 0.21$, $R_c^2 = 0.21$) and learning situated within broader contexts ($R_m^2 = 0.23$, $R_c^2 = 0.26$) measured through the post-discussion survey. Additionally, individual and situated learning scales were correlated ($r_{\text{partial}} = 0.61$, $P < 0.01$).

We observed that value shifts occurred to different degrees in accordance with the degrees of psychological stability embodied by our three value concepts. Our social learning variables accounted for the most variation in social value shifts ($R_m^2 = 0.22$, $R_c^2 = 0.26$), followed by individual value shifts towards self-transcendence ($R_m^2 = 0.17$, $R_c^2 = 0.22$), and finally eudaimonic value shifts ($R_m^2 = 0.06$, $R_c^2 = 0.06$) indicating that the longer lasting values tied to human well-being and formed through acculturation were less likely to change than aggregated, expressed preferences for landscapes because of learning. Neither individual nor situated learning were significantly related to eudaimonic value shifts. Likewise, we found no significant relationship between eudaimonic value shifts and shifts towards individual values of self-transcendence. Instead, situated learning was positively related to changes in values towards self-transcendence ($\beta = 0.48$, $p < 0.05$), whereas individual learning was more likely to increase social values (β

$= 0.45$, $p < 0.05$). Additionally, as individual values increasingly changed, so too did social values associated with the landscape of Interior Alaska ($\beta = 0.42$, $p < 0.05$).

4. Discussion

Our work advances interdisciplinary dialogues about how to support inclusive conservation in the face of global environmental change (Raymond et al., 2022) through the study of social learning as a process (Reed et al., 2010; Bentley Brymer et al., 2018) facilitated by deliberation (Kenter et al., 2016a). We found that social learning primarily took place in a relational realm that involved the identification of shared values. That is, residents learned in multiple ways, though primarily by coming to understand how their perspectives both aligned with and differed from their peers. Similarly, Siddiki et al. (2017) found that relational learning was a particularly important aspect of social learning to support collaborative governance. In some cases, residents’ values were not pre-formed, and the social learning process helped participants describe their values for the landscape in a more nuanced and coherent manner. But for others, relational learning helped participants identify points of convergence and divergence in management priorities that were previously under-recognized. Both align with previous studies that have demonstrated the role of deliberation in influencing values through social learning (Raymond & Raymond, 2019). We also bring empirical evidence to bear in support of the conceptual framework established by van Riper et al. (2018) that posits an association between social learning and shifts in multi-level values corresponding to degrees of psychological stability. Overall, our findings underscore the conservation applications of social learning as a catalyst to change values through in-depth engagement of local stakeholders.

4.1. Social learning in response to community deliberation

We first examined the role of deliberation as a mechanism to facilitate social learning. Collective or group-based processes have been previously shown to strengthen ties amongst residents across rural communities (Bloomfield et al., 2001). Our research drew from established theory to create opportunity for uncovering values that would otherwise remain “silent” (Raymond & Kenter, 2016), and critically examine the implications of plurality and stakeholder negotiations that influence values (Kenter, 2016). Our results illustrate how social learning may interface with the sharing and shaping of values, and how stakeholders acquire an advanced understanding of the aligned, divergent, or conflicting values through deliberation.

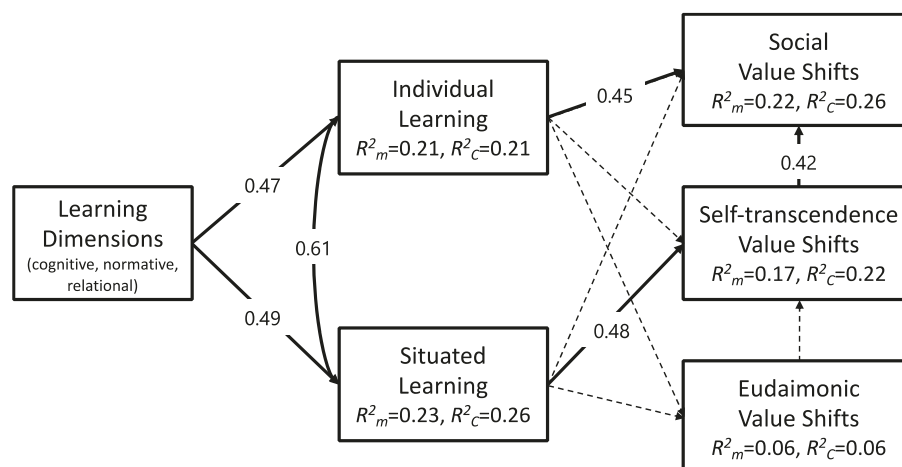


Fig. 4. Results from a path model of the relationship among multi-level value shifts, individual and situated learning, and the range of social learning dimensions (cognitive, normative, and relational) that arose from the deliberation. Dashed arrows show non-significant relationships. Standardized regression coefficients are reported.

A common critique of inclusive conservation is that value pluralism or alternative perspectives at the margins are further obscured under the guise of consensus (Peterson et al., 2005; Matulis & Moyer, 2017). In our study, residents appreciated that many of their values were held by people from different communities and consequently felt more connected to a larger geographic region than what they normally experienced in their day-to-day lives. However, they also grappled with the immense range and dynamism of values—even amongst a fairly small collection of residents—which underscores studies such as Jepson & Canney (2003) that highlight the difficulties of equitably incorporating values into decision making. In this sense, the discussion forum helped residents to recognize how their values were situated in a broader context and positioned as a necessary consideration for iterative deliberations on global environmental change. Similarly, some of the prominently cited benefits of social learning are the creation of common purpose and collaborative relationships that go beyond the individual (Schusler et al., 2003; Johannessen & Hahn, 2013).

One important complexity of social learning is that existing values guide how deliberation plays out within stakeholder constellations, but that values may also shift over time (Kendal & Raymond, 2019; van Riper et al., 2018). Our study engaged three sub-groups delineated by their individual values to consider how social learning may have been influenced by consistency in group value compositions. Interestingly, we did not find statistical evidence for differences in social learning across the three subgroups, which is a departure from arguments in the literature around value shifts in response to deliberation (Kenter et al., 2016b). Additionally, relational learning was more prevalent than expected across all three subgroups, whereas cognitive learning was surprisingly limited. One possible explanation is that our participants were all local experts with a deep understanding and appreciation for the area in which they lived. Thus, cognitive learning and the acquisition of new information about the landscape would logically be minimal. Additionally, many of our participants already knew each other due to the tight-knit community dynamics that characterize the region (Andrade et al., 2020), which may have reinforced the potential for relationship building.

Strong ties among actors in a social network are likely to foster communication, trust, and shared social norms, all of which link to the relational aspects of social learning amongst actors within a network (Eriksson et al., 2019). These strong ties, however, can also limit the introduction of new information or ideas flowing into a group (Crona & Bodin, 2006). Indeed, disagreement has been shown to influence social learning (Ernst, 2019), perhaps because ‘conflict, struggle, and vigorous debate’ are necessary for the recognition of diverse values for conservation (Matulis & Moyer, 2017). However, there is no consensus on the degree to which conflict is conducive to or hinders social learning, and in turn, how social learning provides a platform for agreement as a basis for action (Muro & Jeffrey, 2008). We therefore suggest that the relationships between conflict and social learning would be an interesting line of inquiry for future research.

4.2. Social learning influenced multi-level value shifts

Our second research question asked how multi-level values would shift as a result of social learning through deliberation in a discussion forum. Our model tested the notion of psychological stability indicating that changes are more likely among values existing at external layers that are sensitive to context, as compared to values akin to core beliefs and that define the moral basis of one-self (Fig. 1). Indeed, we found that social learning explained the greatest degree of shifts in social values (i.e., aggregated preferences for a landscape), followed by individual values (i.e., guiding principles in life) towards self-transcendence and away from self-enhancement. We also observed that changes in individual values reciprocally influenced social values, reinforcing previous multi-level value research that has indicated social values are guided by deeper structures among individuals and cultures (van Riper

et al., 2019). However, shifts in eudaimonic values, which were most psychologically stable as abstract, philosophical ideals of happiness and self-actualization, were not related to learning. Building on previous research that has suggested individual values hold across contexts (Schwartz, 1994), and debated whether values can (or should) be changed for the sake of conservation (Ives and Fischer, 2017; Manfredi et al., 2017), we generated empirical evidence showing that place-based, shared social values are especially sensitive to new informational cues and deliberative research approaches, at least in the short term. Thus, social learning processes through deliberation hold promise for shifting external values, such as those representing benefits from the landscape. In turn, social learning may be less likely to change deeply held values that reflect foundational facets of human well-being and quality of life.

We found that different aspects of social learning had varied influence on multi-level values shifts. In particular, we found that learning that was internalized through individual engagement versus externalized within communities of practice (Stern et al., 2021) had different effects on multi-level value shifts. As changes in understanding increased through participation in the discussion forum, so too did the importance of social values of the landscape. Perhaps residents gained a wider awareness of the full range of benefits, threats, and management practices through deliberation, which or may not have been previously identified. Conversely, participants who situated their deeper learning into broad social units were more likely to increase priorities for altruism and biospheric values, which reflect greater care for other human and non-human species versus self-interest. Thus, the discussion forum created adequate conditions for fostering creativity and critical personal reflections necessary for aspects of social learning situated within their broader communities of practice (Reed et al., 2010). Externalized learning whereby residents problematize with others to exchange knowledge (Stern et al., 2021) have been shown to amount to more sustained outcomes (Whalen et al., 2018). Likewise, we found that learning situated within the broader community or regional context was necessary to spark shifts in more stable, long-standing individual values that act as antecedents to human behaviors and decision making.

4.3. Limitations of the research

Our study has several key limitations. First, we advise caution when extrapolating our findings beyond the context of the study region. There are many internal and external processes guiding how learning occurs and the manifestations of learning outcomes for understanding response to global environmental change (Suškevičs et al., 2018; Jiggins et al., 2007). Additionally, all residents who participated in the discussion forum knew their locale well and had already given much thought to why they cared about the historical, cultural, and socio-political context of Interior Alaska. The emphasis placed on relational (rather than cognitive or normative) learning may have consequently been more pronounced as an artifact of the study sample versus broader commentary on patterns of social learning. Therefore, interpretation of our findings should also be considered in light of the specialized and knowledgeable sample of local residents who volunteered to participate. However, our theoretical arguments are more generalizable, and our research design may be emulated to guide future experimental and participatory research involving values and social learning.

The effects of the COVID-19 pandemic were pronounced in our study area given the significance of industrial tourism in supporting the local economy of the study region. Pre-pandemic, close to 600,000 visitors traveled to Denali National Park and Preserve in 2019 alone, but this number dwindled to 54,000 in 2020. Residents observed changes in how people were engaging with the landscape as a result of the pandemic within their discussions, such as commenting on increased subsistence use through activities such as berry harvesting. Outside of our study region, this global event was shown to have changed the ways residents interacted with the landscape and associated values with places (e.g., Spotswood et al., 2021). As a corollary, Lo et al. (2022) found that while

values for nature remained largely stable mid-pandemic, perceived drivers of change may have differed because of the pandemic. Without a control group, we are unable to definitively say how our results were influenced by the COVID-19 pandemic, but period effects likely played into the findings reported herein. Specifically, relational learning may have been more pronounced in the context of our study given increased interests in expressing political support and heightened needs for social interaction stimulated by the coronavirus crisis (Reeskens et al., 2021).

Finally, the conclusions drawn about long-term changes in multi-level values are limited to our study period. Though we did examine longitudinal interactions among study participants between December 2020 – April 2021, the shifts observed may not be sustained over longer periods without reinforcement from the institutions and technologies of the community and its embedded system (Clark & Harley, 2020). To this end, social learning that occurs at local levels could be complemented by vertical learning that takes place between scales ranging from local and regional to global or through bridging actors and organizations (de Kraker, 2017). Future longitudinal research involving multiple decision-makers should evaluate how value shifts that are energized by social learning may diffuse over time outside of the deliberative settings in which they are formed (Irvine et al. 2016).

4.4. Conservation implications

4.4.1. Using online spaces for inclusive conservation

Much attention has been given to the creation of social spaces for face-to-face learning, which can facilitate sustainable governance of natural resources (e.g., Rist et al., 2007; Schneider et al., 2009). However, the use of online or virtual spaces has been less explored. To address this knowledge gap, we developed a novel online (virtual) forum to engage residents in deliberation with the goal of establishing a more inclusive space for deliberation. There are many benefits of using online spaces, but also a unique set of challenges that need to be weighed when making decisions about whether to rely on websites, forums, blogs, or other digital forms of media to foster dialogue. One of the benefits of online participatory research is that participants can engage anonymously, which, when compared to in-person focus groups, can balance power relationships, reduce social desirability effects, and promote openness amongst participants (Meho, 2006). When engaging in face-to-face participatory processes, participants are sometimes constrained by roles and hierarchies that emerge within groups (Hessler et al., 2003). As a result, online spaces can become effective modes for collecting qualitative data and facilitating participant discussions that are sincere and honest, without the worry of retaliation (Brüggen and Willems, 2009). Additionally, some people are not able to quickly articulate their thoughts with in-person engagement, which could increase the tendency for “groupthink” and reflect a lack of critical analysis in decision-making (Hassan, 2013). Indeed, some participants in our study explicitly shared an appreciation for the time to ponder and draft their responses throughout the day.

The potential convenience of online interactions may be diminished by technological restrictions, both of which impact who is willing and able to participate (Genoe et al., 2016). On one hand, the opportunity to meaningfully engage in discussions from home was beneficial given our rural study area. If deliberations would have been in-person, some residents who would have driven an hour or more to the meetings may not have participated. Conversely, barriers such as a lack of technological skills or internet bandwidth may impede an individual’s ability to use an online platform (Schmidt, 2007; Man, 2014). To overcome such barriers, dedicated personnel to help with initial login efforts and offering continued technical assistance were a critical part of our research process. As more resource managers look to online spaces for engaging residents and stakeholders, flexibility with and facilitation of technical issues would enhance the inclusiveness of such forums (Fielding & Macintyre, 2006).

4.4.2. Public engagement in natural resource management

Social learning has been posited as a key component of successful natural resource management in addition to consultation and participation to inclusively navigate issues associated with global environmental change (Rist et al., 2007; Collins & Ison, 2009; Orchard-Webb et al., 2016). Our results highlight the usefulness of online spaces to facilitate iterative learning (Gerlak et al., 2018) in ways that could be embedded at a regional scale to identify more pluralistic conservation solutions (Gavin et al., 2018). Our study also underscored the importance of knowledge exchanges for strengthening trust and mutual understandings (Selin et al., 2007), especially across communities of practice in a region (Cummings & van Zee, 2005). This approach to building inclusivity through relational connections may have created new opportunities and platforms for collaborative learning processes to support decision-making and adaptive management in the future (Dietz, 2013), and may have even shifted multi-level values into more permanent, conservation-oriented states (van Riper et al., 2018).

To ensure that changes in values remain fixed over short time periods, decision-makers should strive to link informal and formal spaces for social learning (see also de Kraker 2017). For instance, Tran and Rodela (2019) found that local level exchanges through informal processes were key to supporting relationships between stakeholders and adaptive knowledge about flood management in the Vietnamese Mekong Delta. Similarly, sustainability and planning scholars have called for the development of both formal and informal mechanisms to foster a sustained ability and capacity for learning (Pahl-Wostl & Hare, 2004), as well as an openness to consider new perspectives (Clark & Harley, 2020). For instance, knowledge co-production has been considered to foster social learning in deeper ways as part of adaptive management (Armitage et al., 2011). Likewise, such knowledge co-production processes likely enhanced learning in our own study by bringing together stakeholders with divergent perspectives and values (Slater & Robinson, 2020). Hence, creating successful learning conditions and outcomes requires that deliberation and social learning become explicit objectives for researchers, practitioners, and stakeholders engaged in inclusive conservation (López-Rodríguez et al., 2019), as well as adopting a reflexive process-oriented management approach that is supported by financial resources, infrastructure, and social skills (Fernández-Giménez et al., 2019).

4.4.3. Future research directions to support natural resource management

We consider the following questions to be applicable to future research aimed at supporting the use of social learning through deliberation in natural resource management settings: How do multi-level values shift in other geographic contexts? Under what circumstances do values become more entrenched or positioned in opposition with others? How, and to what extent, should online deliberation be favored over in-person exchanges to best support inclusive conservation? Could online and in-person deliberations be combined within management settings to include a broader array of stakeholders? Are government institutions willing and ready to incorporate social learning processes (online and in-person) into discussions involving value negotiations? What tools and resources are needed to activate value shifts? Under what time horizon does social learning need to occur for value alignment to effectively respond to global environmental change?

5. Conclusions

Our research highlights the importance of disentangling the process of social learning and its role in catalyzing shifts in stakeholder values that govern management of natural resources. We showcase several innovative tools to build greater inclusivity, including the use of online spaces and an experimental design to answer longitudinal research questions that address global issues such as environmental change and biodiversity loss. We contend the relational aspects of social learning, including trust and relationship building, are particularly prominent in

rural contexts that include socially tight-knit communities. We also show that social values ascribed to landscapes will more readily shift in response to learning, whereas more long-standing values require learning beyond the bounds of deliberative exchange to be situated within communities of practice. Building on these results, social learning interventions that are meaningfully integrated into both research and practice can assist with the identification of shared values, and even change to underlying values that guide how stakeholders frame and engage with the biophysical world.

CRedit authorship contribution statement

Riley Andrade: Conceptualization, Formal analysis, Writing – original draft. **Carena J. van Riper:** Conceptualization, Project administration, Funding acquisition, Writing – review & editing. **Devin J. Goodson:** Data curation, Writing – review & editing. **Dana N. Johnson:** Data curation, Writing – review & editing. **William Stewart:** Supervision, Writing – review & editing, Funding acquisition. **María D. López-Rodríguez:** Supervision, Writing – review & editing. **Miguel A. Cebrián-Piqueras:** Supervision, Writing – review & editing. **Andra Ioana Horcea-Milcu:** Supervision, Writing – review & editing. **Veronica Lo:** Supervision, Writing – review & editing. **Christopher M. Raymond:** Supervision, Writing – review & editing, Funding acquisition.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

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