

Sticking with Citizen Science: People-Place Bonds that Glue Learning



Benjamin K. Haywood*, Julia K. Parrish**, Sarah Inman**, Jackie Lindsey**

*Furman University **University of Washington

benjamin.haywood@furman.edu; jparrish@uw.edu; sinman1@uw.edu; jackielindsey@gmail.com



PROJECT OVERVIEW

This research draws from scholarship on **bonds between people and places** to help understand the growing knowledge, community, and personal outcomes **linked to place-based citizen science experiences**.

Following an analysis of the **place attachment (PAT)** (an emotional bond between a person and a place) of participants in the Coastal Observation and Seabird Survey Team (COASST) citizen science program, an adapted three-dimensional model of PAT is proposed as a framework from which place-based citizen science experiences and outcomes might be examined in depth to probe for links to **program engagement, retention, and learning outcomes**.



Left: COASST participants work to identify a bird carcass found on a local beach – sites which often elicit attachment due to natural environment, communal, and personal dimensions of the place. Photo Credit: Clark Fair.

BACKGROUND AND PROCESS

[Raymond, Brown, & Weber \(2010\)](#) developed a theoretical framework to describe three primary means through which people attach to places – including personal, communal, and natural environment dimensions. This project sought to determine whether these three dimensions of PAT were evident in citizen science participants and how that attachment might influence program outcomes around science learning and literacy.

Housed at the University of Washington, the **COASST** program is a citizen science program over 20 years old featuring hands-on, monthly data collection on beaches throughout the Pacific Northwest and Alaska focused on the identification of dead marine birds and marine debris. Data from COASST participants was used in this project.

A mixed-methods strategy was employed, involving four datasets collected from COASST participants: 1) in-depth interviews with over 80 participants; 2) program evaluation questionnaire data (from two separate points in time); 3) free-write survey responses on motivation to join and remain in the program; and 4) a participant survey on PAT and participation.

INITIAL ANALYSIS

Earlier interviews with participants in the COASST program indicated that a significant portion of participants have some degree of PAT to their data collection site ([Haywood, 2019](#); [Haywood et al. 2016](#)).

We recently adapted the original PAT framework proposed by [Raymond, Brown, & Weber 2010](#) (Figure 1, p. 425) based on these interviews so that it is more relevant to hands-on out-of-doors citizen science (see Figure 1). This includes separating a sub-set of statements that reveal if and how attachment exists (nonspecific identity (NI) & nonspecific dependence (ND)) from those focused on the personal, community, or natural environment motivators for that attachment. For more about how our framework revisions emerged from our initial analysis, see [Haywood, Parrish, & He \(2021\)](#).

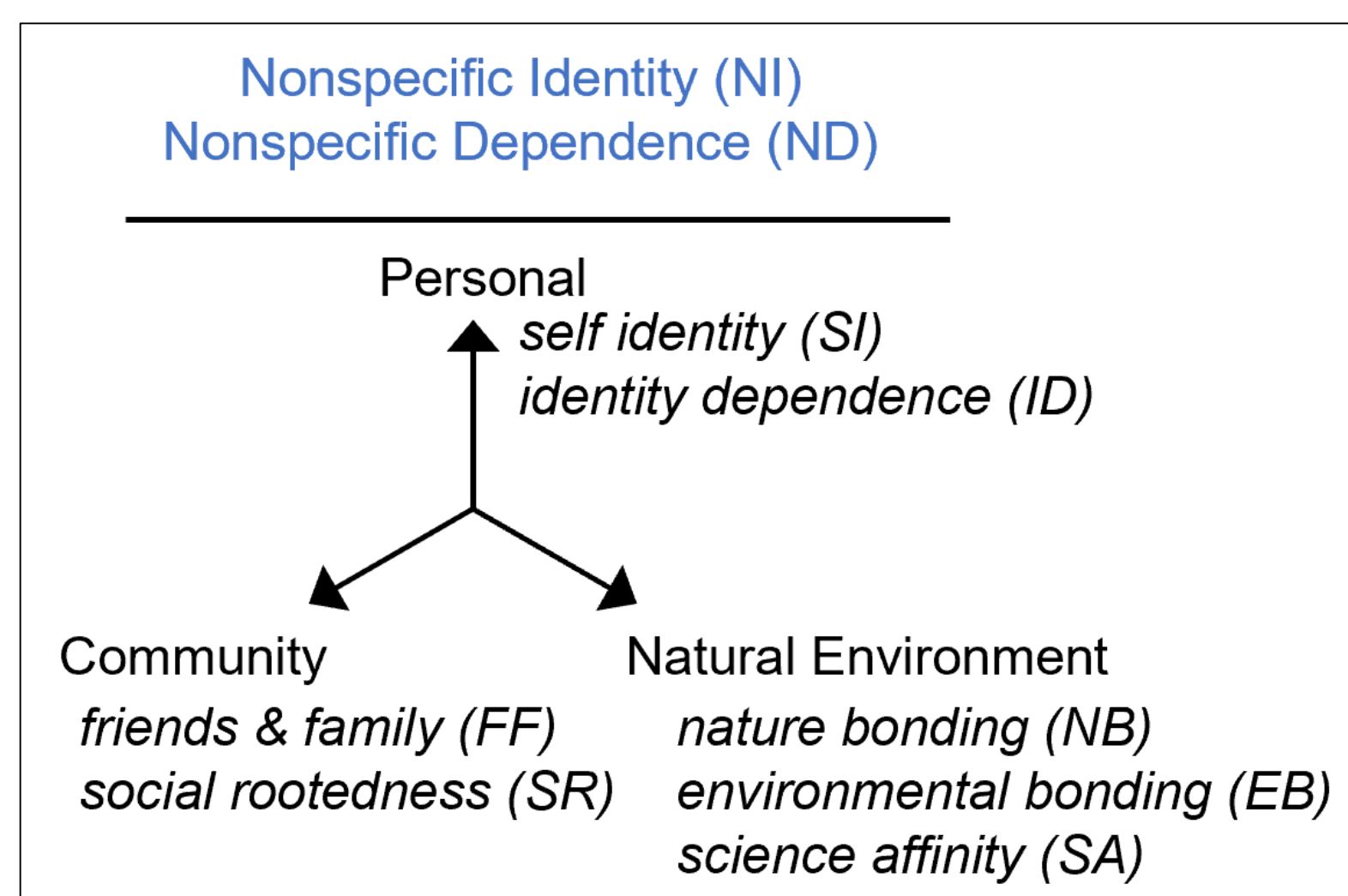


Figure 1 (right): At least seven attachment constructs were evident within the COASST population. See [Table 2 here](#) for definitions of each attachment construct. The personal identity category has been renamed self identity and the place dependence category has been renamed identity dependence from the original model.

WHAT HAVE WE FOUND?

We developed an expansive set of statements (n=52) to evaluate attachment among COASST participants within the three PAT dimensions (personal, community, natural environment). A survey was constructed with these statements around seven specific and two nonspecific attachment constructs (see Figure 1). A total of 265 COASST participants completed this survey in October of 2020. A sample of statements for each major PAT construct is included in Table 1.

Statement
NI * [BEACH NAME] means a lot to me. * I feel attached to [BEACH NAME].
ND * No other place can compare to [BEACH NAME]. * [BEACH NAME] is the best place for all of the beach activities I engage in.
ID [BEACH NAME] provides me with unique health and well-being benefits. * I get more satisfaction doing citizen science on [BEACH NAME] than I imagine I could anywhere else.
SI * [BEACH NAME] is an important part of who I am. * I learn about myself when I spend time on [BEACH NAME].
SA Doing science at [BEACH NAME] has deepened my attachment to the beach. [BEACH NAME] is important to me because of the citizen science I do there.
EB When I spend time on [BEACH NAME], I feel connected to the physical environment (e.g. wind, waves, sand, etc.). When I spend time at [BEACH NAME], I feel connected to the beach.
NB Working on the COASST project at [BEACH NAME] helps me feel more connected to nature. * When I spend time on [BEACH NAME] I feel like I am a part of nature.
FF * [BEACH NAME] is important to me because of friendships I have developed there. I do COASST activities at [BEACH NAME] because I can spend time with family there.
SR I feel attached to [BEACH NAME] because it is a part of my heritage. When I visit [BEACH NAME], I feel connected to my ancestral roots.

Table 1 (above): A sample of statements developed to measure PAT among COASST participants in each of the two nonspecific (NI and ND) and seven specific attachment construct categories. Asterisks indicate those statements that were adapted from the original set found in [Raymond, Brown, & Weber, 2010](#).

As Table 2 (below) indicates, after separating NI and ND statements, very strong NB and EB attachment emerge as the most highly ranked attachment types (constructs). SI and SA follow next, although a sizable gap between these two and NB and EB exists. ID and FF comprise a third tier, followed significantly by the lowest ranking category of SR.

Construct (statement count)	Average	StDev	Rank Min	Rank Max	Order (Avg. Rank)
NI (6)	4.18	0.20	2	8	(4.17)
ND (3)	2.67	0.06	16	17	(16.3)
NB (7)	4.37	0.14	1	4	1 (2.29)
EB (5)	4.26	0.22	2	7	2 (3.4)
SI (4)	3.78	0.22	6	10	3 (8)
SA (7)	3.70	0.64	3	16	4 (8.14)
ID (4)	3.45	0.61	6	16	5 (10.25)
FF (10)	3.48	0.43	7	15	6 (10.3)
SR (6)	2.20	0.39	14	20	7 (18)

Table 2 (above): Statement category averages (based on responses using a 1-5 scale from strongly disagree to strongly agree), standard deviations, and rank/order scores for the two nonspecific and seven specific pole-based attachment constructs. 52 statements were included in this analysis. To create ranks, statements were ordered by average Likert scores across the surveyed population limited to one decimal point (e.g., 3.9) which created rank ties.

To translate participant responses into a PAT shape model for COASST participants, we utilized the average Likert scores reported above for all statements within each of the seven specific place attachment constructs and collapsed those into the three primary PAT dimensions (Table 3). Figure 2 (right) displays a graphic depiction of the overall “shape” of the average place attachment among COASST participants in the survey.

Attachment Dimension	Construct (# statements)	Construct Average (1-5 scale)	Dimension Average (1-5 scale)	% of 100
Personal	Self Identity (4)	3.775	3.61	72.2%
	Identity Dependence (4)	3.450		
Community	Family/Friend Bonding (10)	3.480	2.84	56.8%
	Social Rootedness (6)	2.200		
Natural Environment	Nature Bonding (7)	4.371	4.11	82.2%
	Environment Bonding (5)	4.260		
	Science Affinity (7)	3.700		

Table 3 (above): The three attachment dimensions, types (constructs), averages for Likert scale responses for each, and total average for each of three main PAT dimensions. Dimension averages are sums of construct averages within each dimension, divided by number of constructs in the dimension to equalize the weighting, and then divided by 5 (i.e., a perfect score or 100%). Nonspecific identity and dependence statements have been removed, leaving 43 statements for the analysis.

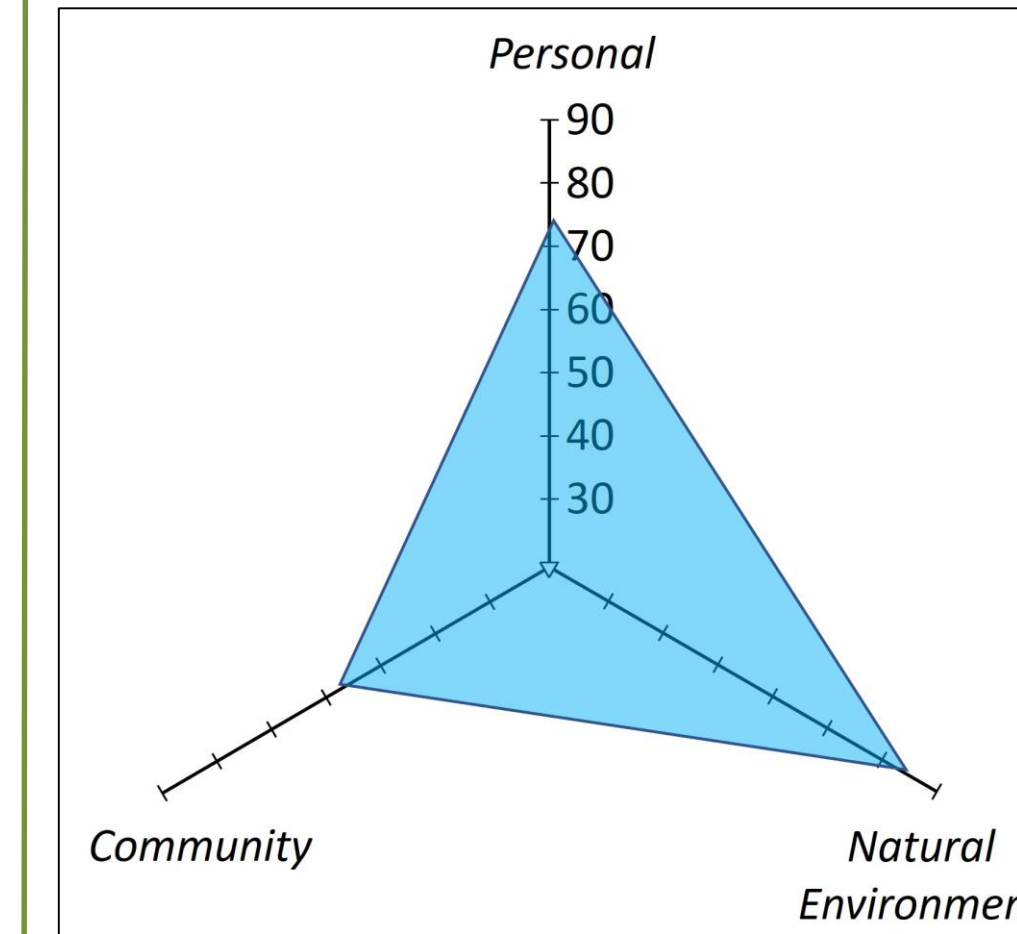


Figure 2 (left): Overall place attachment shape for all COASST respondents. Scores include Personal (72.2%), Community (56.8%), and Natural Environment (82.2%) elements of attachment. The shape of attachment among COASST participants is more strongly associated with elements of the natural environment, followed by connections based on personal identity, and least associated with connections to community components.

Our survey included statements to gauge PAT at three spatial scales. COASST participants displayed distinct attachment shapes (Figure 3) among three different spatial scales including the local beach (L), the geographic region (R), and the global ocean (G). At all three dimensions, intensity of attachment increased with scale.

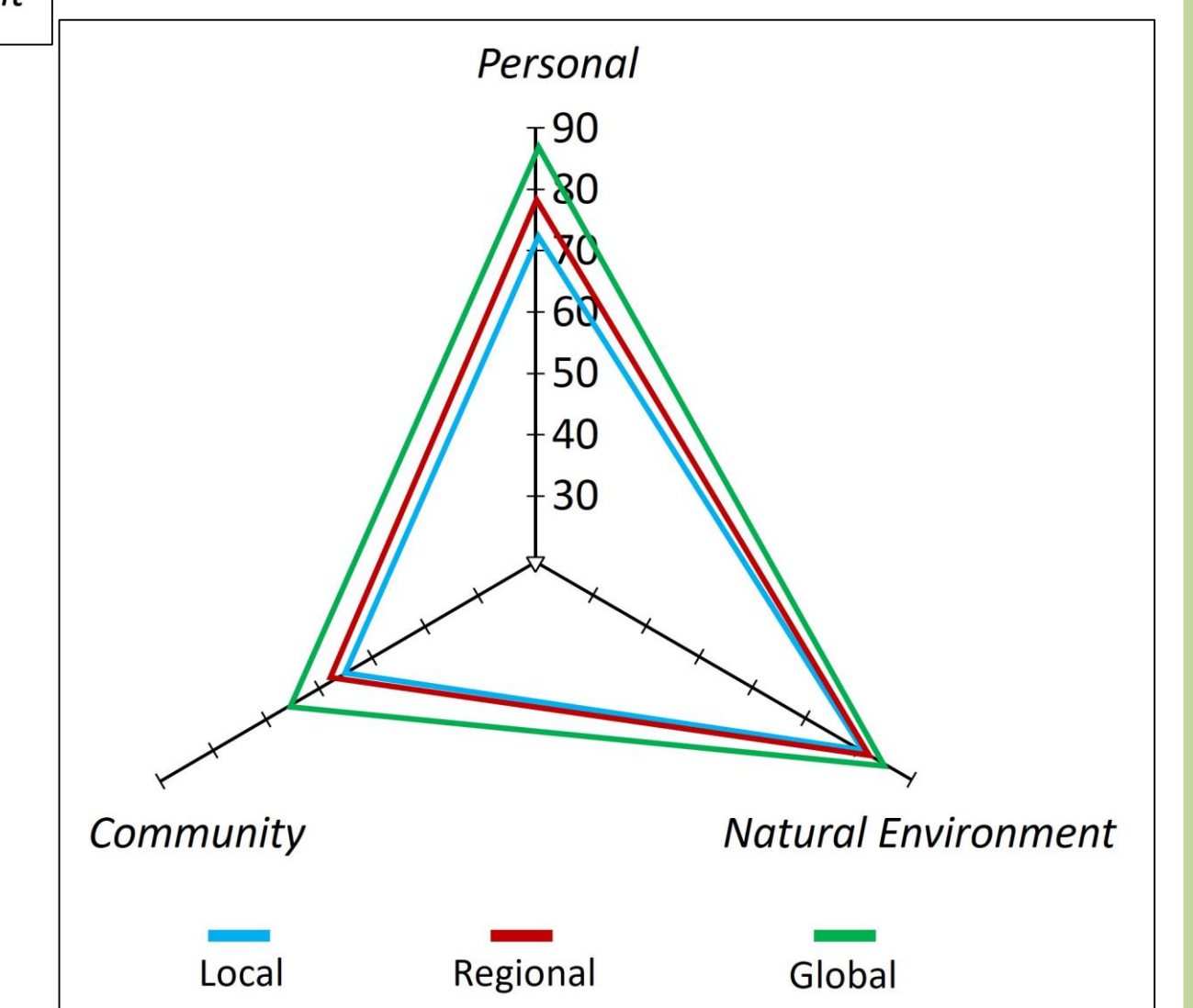


Figure 3 (above): Overall place attachment shape for all COASST respondents at three spatial scales. Scores were calculated as described in Table 2 at each scale. Numerical scores are Personal: L 72.2, R 78.8, G 88.0; Community: L 56.8, R 57.8, G 66.2; Natural Environment: L 82.2, R 84.0, G 85.4.

CONCLUSIONS & ONGOING RESEARCH

This research has revealed that:

- COASST participants demonstrate broad attachment to the places they survey that **increases at geographic scale**.
- Attachment due to dimensions of the **natural environment are shared widely** among COASST participants, followed by elements of self identity. Communal aspects of attachment are the least salient.
- An affinity for and desire to engage in **science** is an important mediator of PAT among COASST participants, ranking among the top four contributors to attachment.
- Unlike other groups (e.g. landholders) COASST participants **do not** demonstrate functional place dependence (ND), but **do** exhibit high rates of nonspecific place meaning and connection (NI).

Our current work (NSF AISL #2031884) is exploring additional research questions ([outlined here](#)). Two of our central questions involve:

- Whether the PAT shape of COASST participants **changes over time** (see Figure 4 below) and whether this **differs by scale**, including what program variables might influence that process.
- The degree to which the place attachment profile of citizen scientists may facilitate and sustain citizen science engagement and **lead to specific outputs or outcomes**, especially with regard to **critical scientific thinking and learning**.

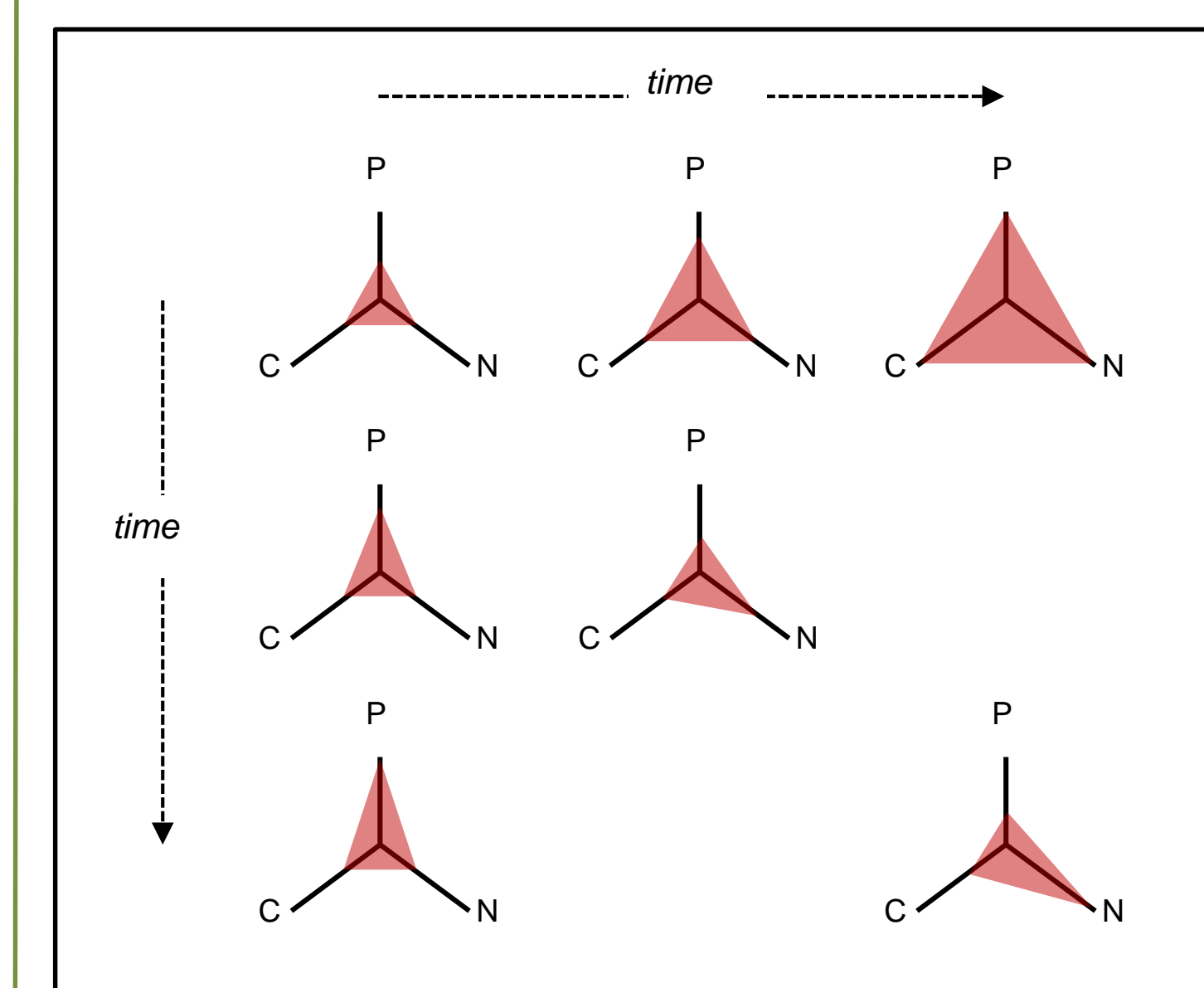


Figure 4 (left): Our conceptual model highlighting directionality in PAT shape change over time in place-based citizen science, where three individual trajectories are laid out from a singular starting point in the upper left corner. Growth in attachment strength or intensity along all dimensions is possible (horizontal axis), or growth in only one dimension (vertical: personal; diagonal: natural environment).