"Professor Anna Leading the Crew": Citizen Science Programs as a Community of Practice

Kevin A. Nguyen, Sonoma State University, nguyenkevi@sonoma.edu

Abstract: Citizen science programs use a unique design that is different from other communities of practice and traditional apprenticeships. I examine the structure of one water quality monitoring citizen science undergraduate program, the River Team. Drawing from situated learning theory, I use ethnographic methods to depict how both the structuring resources of the program as well as how one learner's (Anna) individual practices quickly moved her from the periphery, into, and eventually leading the program.

Introduction

Citizen science programs provide a different type of community of practice (CoP) (Lave & Wenger, 1991; Wenger, 1998) not commonly seen in the existing literature. Broadly, citizen science programs involve public volunteers that conduct scientific work and contribute to research projects (Shirk et al., 2012). I suggest that citizen science programs are a unique CoP because of their accessibility and how quickly they move learners from the periphery to full participation. These atypical characteristics are relative to a more traditional CoP, where there is a more exclusive practice or an apprenticeship model that takes years to complete (Lave & Wenger, 1991).

In this poster then, I show how one citizen science program, the River Team, is designed around specific *structuring resources* (Lave & Wenger, 1991) that shape learners' participation and quick development in the CoP. To do this, I analyze the learning trajectory and practices of one student, Anna, as she moves from the periphery to full participation. Taken together, we know not only more about how citizen science programs are designed to quickly connect the public with science but also how the practices of individuals within these programs work to deepen their participation.

Theoretical framework

I draw on the analytical perspectives of legitimate peripheral participation and communities of practice (Lave & Wenger, 1991; Wenger, 1998). In addition to these broader perspectives, I use two fine-grained theoretical constructs from Lave and Wenger's (1991) work: structuring resources and developmental cycles. Structuring resources are how a community provides and shapes opportunities for members to engage in the practice. Development cycles is time it takes for to newcomers become old-timers, and this period of development varies across different communities. These two constructs help depict how the River Team is designed.

However, the design of a program does not fully explain why certain learners move from the periphery to full participation. I also consider the role of interactions (Jordan & Henderson, 1995) and sociocultural practices (Nasir & Hand, 2006) when evaluating how individuals are moving through the CoP.

Methods

The River Team is a volunteer water quality monitoring organization that contributes to a public stream health database. The organization is located at large Southwestern public research university and is an undergraduate and interdisciplinary student organization.

I joined the River Team as a regular member in Fall 2015, and I started data collection in Spring 2016. Data collection lasted three years and ended in Spring 2019. I collected ethnographic data (Wolcott, 1999) by using participant observation, interviews, fieldnotes, and video recordings. I recorded over 42 hours of videos with wearable cameras (GoPros) and watched 40 students go through the program.

Most of my analysis involved watching and scrutinizing the collected videos. I created brief activity logs for all the videos, and these were timestamped spreadsheets that recorded the main activity, discourse, and participants. I used Google Sheets to make the activity logs, and I played back and lightly edited video in Adobe Premiere Pro. While I was watching and logging the videos, I used a case-based approach to applying and testing theory (Becker, 2014). Through analytical induction (Katz, 2001), I tested smaller units of video cases against initial theories and explanations, such as whether structuring resources explained how the team was designed.

Analysis and results

To examine the structuring resources and individual sociocultural practices of the River Team, I followed the development of one member, Anna, from her entry into the team towards her eventual leadership role in the team. This occurred across a period of two years.

To begin, the River Team is bound by its participation within a larger statewide citizen science program. The River Team is provided specific structuring resources, artifacts, and technologies from the parent organization. The first structuring resource new members and Anna are exposed to is the formal training and certification led by the parent organization. New members spend a few hours on a Saturday morning attending a water quality science lecture and data collection demonstration. By the end of the formal session, new members are provided access and given the main artifacts and technologies of the citizen science program, the water quality data sheet and probes. Within a period of just three hours, the development cycle to become a citizen scientist is quite short.

In addition to the structuring resources provided by the parent organization, the placement of River Team within a university provides other design constraints and affordances. Since the student organization knows there will be constant turnover of students due to graduation or other reasons, the River Team works to recruit new students and develop leadership each academic year. To help with this, the River Team created an in-house formal leadership role called the science captain. The science captain is in charge of making sure all River Team members follow routinized steps during calibration and data collection. New River Team members work with the science captain to ensure their practice of using the water quality probes and data sheets.

Anna eventually became science captain. Anna joined the River Team in Fall 2015 and was a "newbie," or what team members called newcomers. After an academic year, when the new set of "recruits" or newbies come in, Anna was then positioned as a "veteran" or old-timer. While it is clear that the River Team used the relative positioning and timing of members to identify "newbies" versus "veterans," this does not explain why Anna continued her development towards a unique leadership role. From examining her interactions with other members, Anna early on had a practice of working closely with the previous science captain, Natalie. Through repeated questions on how the water quality probes worked, how the water quality data was being used, and her consistent practice of volunteering to do data collecting and monitoring, Anna had staked her claim for becoming science captain through her practices on the River Team. This was cemented when Anna started a practice of helping new members use and calibrate the water quality probes immediately as a veteran member. The first time this occurred, a member commented that, "we got Professor Anna leading the crew" (Video, October 2016). In Spring 2017, Anna easily took on her new identity and role as the science captain.

In this short poster, I argued and showed two main takeaways: (1) citizen science programs are a unique CoP characterized by accessible and short developmental cycles as well as statewide and local structuring resources; (2) individual practices of members provide further explanation on how and why members move through the program, and it is the combination of examining both program design and individual practices that we can depict a clearer picture of learner development and participation in citizen science.

References

Becker, H., S. (2014). *What about Mozart? What about murder?: Reasoning from cases*. Chicago, IL: University of Chicago Press.

Jordan, B., & Henderson, A. (1995). Interaction analysis: Foundations and practice. *Journal of the Learning Sciences, 4*(1), 39-103. doi:10.1207/s15327809jls0401_2

Katz, J. (2001). From How to Why on Luminous Description and Causal Inference in Ethnography (Part 1). *Ethnography, 2*(4), 443-473.

Lave, J., & Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. Cambridge, UK: Cambridge University Press.

Nasir, N., & Hand, V. (2006). Exploring sociocultural perspectives on race, class, and learning. *Review of Educational Research, 74*(4), 449-475.

Shirk, J., Ballard, H., Wilderman, C., Phillips, T., Wiggins, A., Jordan, R., . . . Krasny, M. (2012). Public participation in scientific research: a framework for deliberate design. *Ecology and Society, 17*(2).

Wenger, E. (1998). *Communities of practice: learning, meaning, and identity*. Cambridge, England: Cambridge University Press.

Wolcott, H. F. (1999). *Ethnography: A way of seeing*. Lanham, MD: Rowman Altamira.

Acknowledgments