

# COMMUNITY SCIENCE AS ADULT LEARNING: USING THEORY TO UNDERSTAND VOLUNTEERS' EXPERIENCES

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## INTRODUCTION & CONCEPTUAL FRAMEWORK

Native Bee Watch (NBW), an Extension community science program, has goals of 1) learning about bee abundance and diversity in urban areas and 2) providing and assessing informal adult STEM education. To support these goals and build capacity for pollinator conservation, NBW trains volunteer community scientists to identify and monitor bees in public and backyard gardens (Figure 1).



Figure 1. A volunteer collecting data.

NBW originated as an in-person program and transitioned to an online format in 2020. This shift fundamentally changed the learning context and how volunteers engage with bee monitoring and program supports (Table 1), necessitating new ways of understanding volunteer learning.

Component	In-Person	Online
Training	2-hours, with specimen boxes	2-hour webinar, live or recorded
Assessment & feedback	1:1 field-mentoring with program coordinator, researcher, or experienced volunteer Opportunities for direct feedback	Online photo insect ID quiz (85% or greater) No field-mentoring Limited feedback (photos only)
Monitoring context	Designated public gardens (4) in Larimar & Arapahoe counties Partnered-monitoring, direct instruction	Home gardens statewide Primarily individual monitoring, self-directed learning
Data collection	Paper form	Survey123, an ArcGIS application
Resources & supports	NBW field guide Email & e-newsletter Volunteer appreciate event	NBW field guide Email & e-newsletter Online resource repository Photo flashcards Supplemental webinars (2) Facebook group

Table 1. Comparison of NBW's in-person and online program components impacting learning context.

While community science has made important contributions to research, less empirical attention has been paid to programs as a context for adult learning (Follett & Strezov, 2015) and few studies utilize learning theory (Hajibayova, 2020). Given that NBW's online format asks volunteers to operate independently and conduct multiple monitoring sessions throughout the summer, self-directed and experiential learning theories are well suited for understanding volunteer learning.

### Self-Directed Learning

The process by which individuals take control of their learning by assessing their needs, identifying resources, implementing strategies, and evaluating outcomes (Leong, 2022).

### Experiential Learning

Conceptualizes learning as a cyclical meaning-making process where individuals engage in an experience (e.g., monitoring session), reflect on the experience, construct new knowledge based on reflective processes, and apply the new knowledge to subsequent experiences (Kolb, 1984).

## STUDY PURPOSE & RESEARCH QUESTION

To explore volunteer learning in an online community science program guided by the research question: How did volunteers' experiences align with self-directed and experiential learning?

## METHODS

**Participants and Data Collection.** In this qualitative study, we recruited 2020 NBW volunteers who (1) completed a pre-season survey, (2) passed an online photo ID quiz, and (3) submitted data by mid-July. We interviewed participants on Zoom in late summer 2020 with separate protocols for new and past volunteers, as shown in Figure 2. We collected demographics from pre-season surveys.

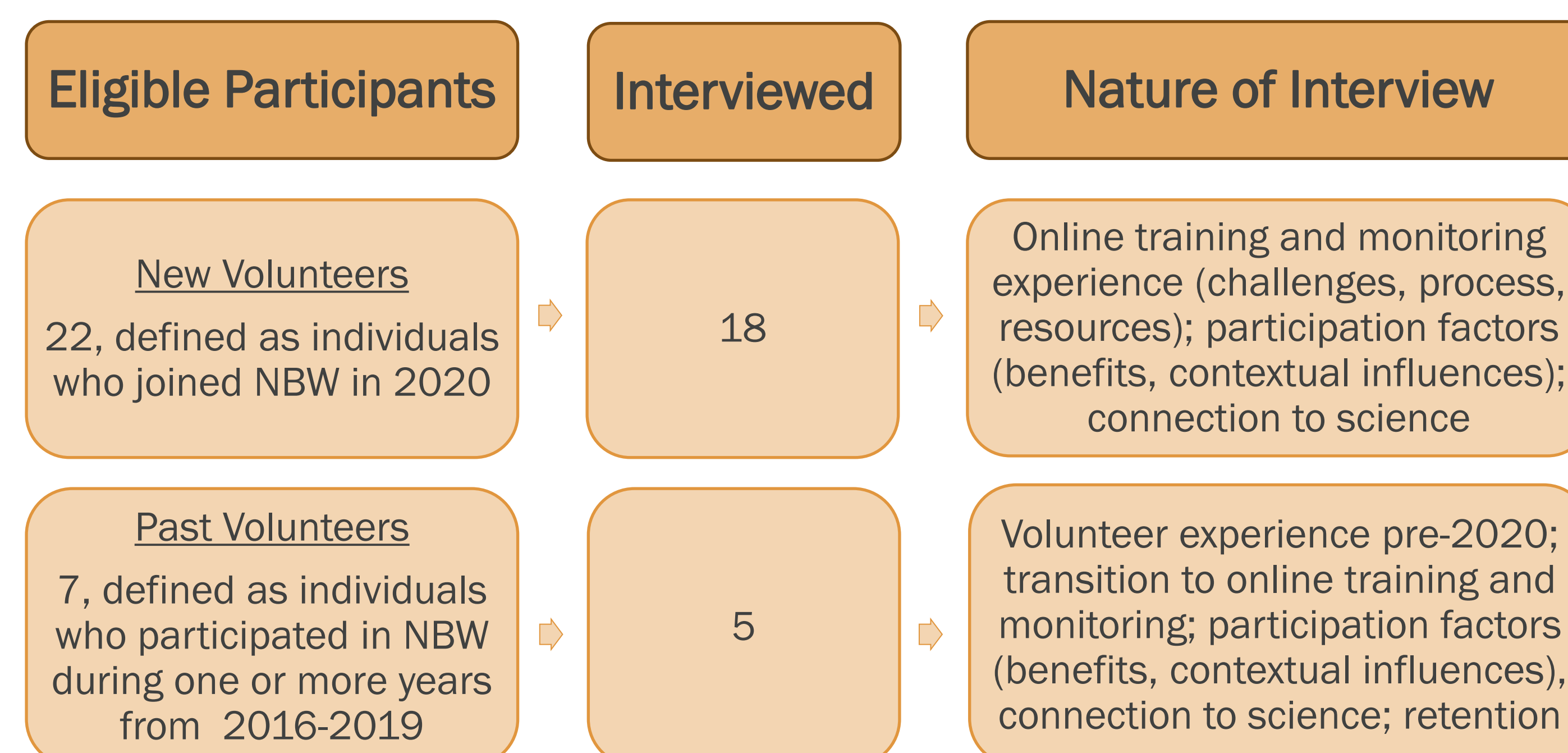


Figure 2. Participant recruitment and data collection procedures.

**Participant Demographics.** Most participants identified as female (83%), ages 55 years or older (83%), white (96%), and have earned a bachelor's (43%) or master's degree (39%,  $n = 23$ ).

**Data Analyses.** We transcribed interviews verbatim. Three researchers unitized and applied *a priori* codes; average interrater reliability was 74%. Vilen revised the codes, conducted a second round of coding, and analyzed coded categories and demographic data in Excel.

## FINDINGS

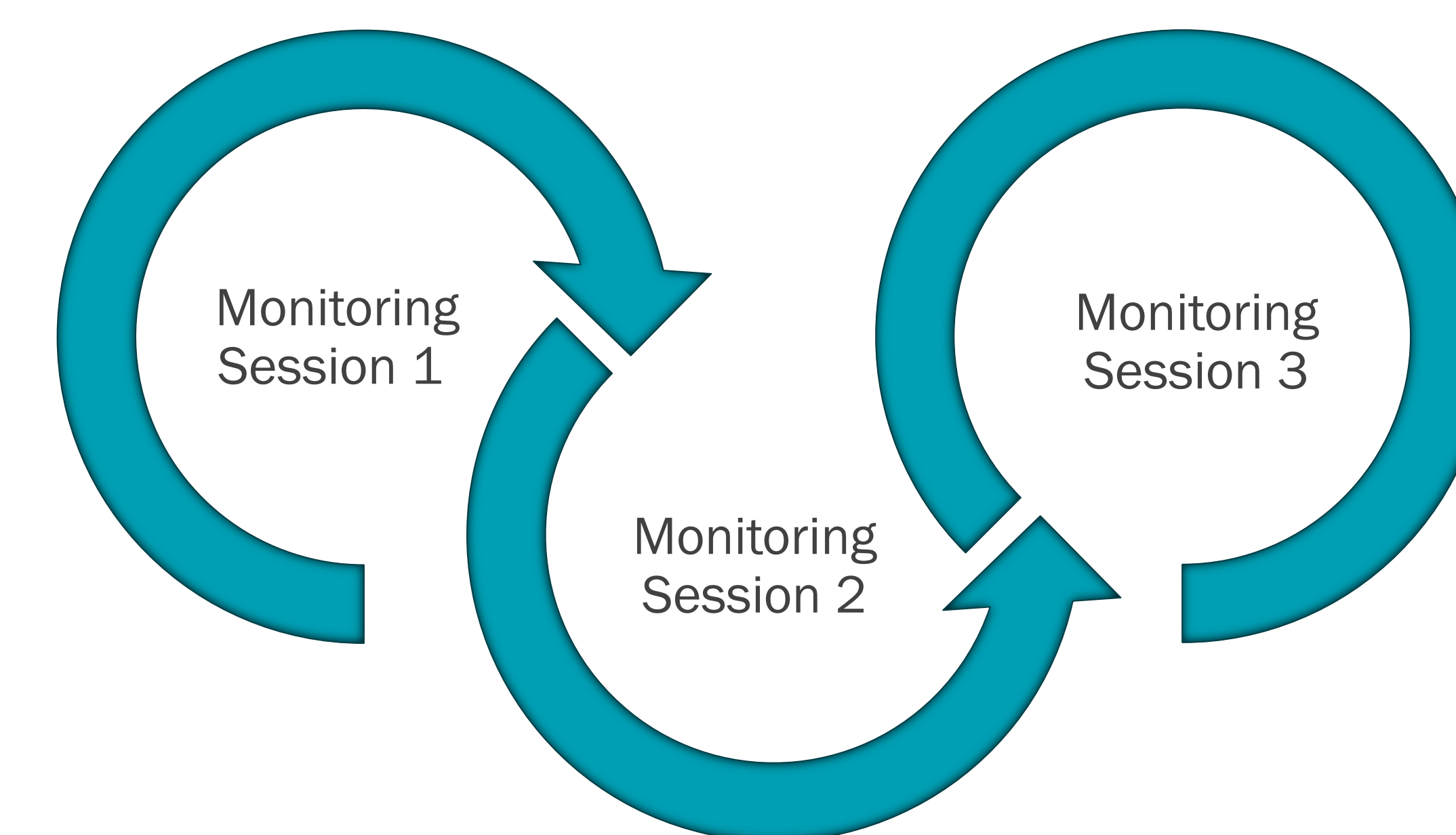
- Past and new volunteers had favorable reactions to the training webinar and shared similar experiences in 2020 (Figure 3), although new volunteers relied more heavily on self-assessment.
- Some past volunteers expressed skepticism about data accuracy and learning bee identification in the online format, which limited the availability of immediate and direct feedback compared to the prior in-person format.

## Figure 3. Monitoring is an Experiential, Self-Directed Process

*The first time it was confusing, but it was doable. And with practice, it's working. ~ Anne*

*It's kind of like an open book test and you can go out and take data and then come back and do some further research to get it right...That was my mode of operation...I got more familiar with the species that we were dealing with here in my particular geographic location. And so I was more confident of identifying them...my time doing the research for identification was much reduced as we got into those later of observations. ~ James*

## Building Confidence and Skills Through Practice and Self-Assessment



### Recognizing Challenges, Identifying Resources

*Being able to see the bee well enough in the short amount of time you have to identify it. ~ Alan*

*I wasn't able to transfer and say this is equal to that...too many resources where I got confused because things were described differently. ~ Karen*

*Having a camera was handy, that sure did help, so that way you get a picture of what you have a question about. ~ Sharon*

*I have a pretty strong ecology biology background, you know...and so identifying something, even to a species level is something I've done a lot. ~ Erika*

## CONCLUSION & IMPLICATIONS

This natural experiment illuminates the affordances and constraints of an online community science program.

- Requires a high level of self-direction and ability to self-assess.
- Feedback processes are limited, impacting volunteers' motivation and engagement.

Future directions should focus on developing feedback systems that support (a) volunteers' confidence, knowledge, and skills and (b) scientific data accuracy.

## REFERENCES

Follett, R., & Strezov, V. (2015). An analysis of citizen science based research: Usage and publication patterns. *PLOS ONE*, 10(11), e0143687.  
Hajibayova, J. (2020). (Un)theorizing citizen science: Investigation of theories applied to citizen science studies. *Journal of the Association for Information Science and Technology*, 71(8), 916-926.  
Kolb, D.A. (1984). *Experiential learning: Experience as the source of learning and development*. Prentice-Hall, Inc.  
Loeng, S. (2020). Self-directed learning: A core concept in adult education. *Education Research International*, 2020, Article 3816132.