Learning at the Seafloor, Looking at the Sky: The Relationship Between Individual Tasks and Collaborative Engagement in Two Citizen Science Projects

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Abstract: In this study, we explore the relationship between individual and collaborative learning activities as they occur in two online citizen science projects, *Seafloor Explorer* and *Planet Hunters*. Trace ethnography is suggested as a methodology suitable for investigating this relationship. Preliminary findings identify relationships between four types of activities that emerge which support individual and collaborative learning activities and participation.

Introduction

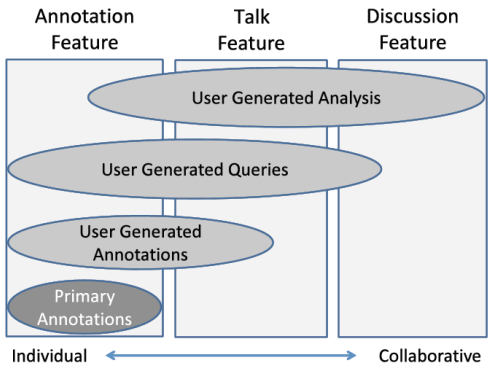
Online citizen science projects provide tools and opportunities that support public engagement in scientific research processes, often involving large data sets (Wiggins & Crowston, 2011). The activities supported by citizen science projects have the potential to lead to significant scientific discoveries and to also support participant learning opportunities (Bonney et al., 2009; Brossard, Lewenstein & Bonney, 2005; Wiggins & Crowston, 2011). Until recently, research investigating citizen science projects has conceptualized learning as a potential consequence of individual participation. Expanding on previous research, we draw on the notion of learning from Lave & Wenger's (1991) theory of legitimate peripheral participation and conceptualize learning not as an outcome, but rather as evolving forms of participation in a community of practice. We use this perspective to explore the relationship between individual and collaborative types of participation in online citizen science projects.

Methods & Findings

The research presented in this poster builds on preliminary findings generated through online participant observation (Hine, 2000) and trace ethnography (Geiger & Ribes, 2011) of two online citizen science projects from the Zooniverse (www.zooniverse.org) suite: Seafloor Explorer (SE) and Planet Hunters (PH). Trace ethnography allows us to draw attention to and use documentary traces to map both individual and collaborative forms of learning. The method compliments online participant observation as it draws attention to the visible traces left as remnants of otherwise invisible activity. Following the way that particular traces (e.g. comments, hashtags) are engaged throughout online activities can help draw attention to the ways that different activities and learning practices are related.

Based on our participant observation and analysis of documentary traces we identify four types of individual and collaborative participant activities that emerge amongst three basic features of the PH & SE projects (see ovals in Figure 1).

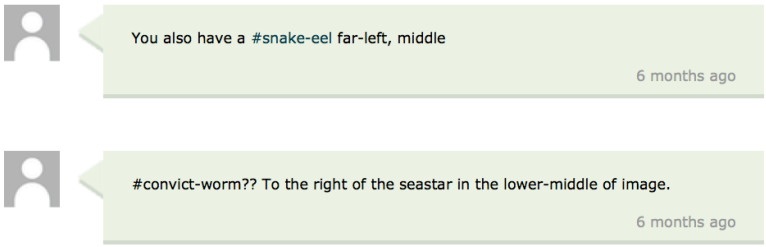
Figure 1. Participant Activity Model



Initial participants respond to prompts by the system annotation feature to annotate particular characteristics in image data, or what we describe as *primary annotation*. Participant primary annotation activities tend to be individual activities, producing individual annotations that are then aggregated and used by scientists in subsequent analyses that fulfill the primary scientific goals of individual projects. As participants become more familiar with the projects, they may begin to engage in *user generated annotation* and *user generated queries* practices. These two practices go beyond the primary annotation goal of the citizen science projects and when

enacted, often represent more collaborative activities. Participants with extensive experience with the projects may also begin to engage in advanced conversations and collaborations with other participants about the data, or what we refer to as *user generated analysis*. During each of the four activities participants can leave various types of traces of their engagement. Participant traces can take many forms. For example, they can be comments connected to specific image data objects or self-curated image data collections to name a few. Examining the activities that emerge around one particular type of trace, a hashtag, highlight the connections between individual and collaborative learning within the two projects. In SE & PH, hashtags are used to emphasize the presence of characteristics or properties within individual image data objects (see Example 1).

Example 1. Species Identification Hashtag (SE)



In the above example, the hashtags are related to individual and collaborative practices of *user generated annotation, user generated queries, and user generated analysis* activities. The #snake-eel hashtag left by Participant 1 is an example of an individual act of species identification (*user generated annotation*), but the hashtag is also presented as a scaffold to assist Participant 2 in subsequent species identification. Participant 2's #convict-worm hashtag draws attention to an image data characteristic and also prompts collaborative feedback (*user generated queries*) in identifying potential species present. Once created, both hashtags are aggregated by the SE system, creating keyword collections of images with comments including the same hashtag names. By contributing the #convict-worm hashtag to the comment, the referent image is automatically included in a searchable collection of all images containing potential convict worm candidates. This is important in the SE project, because this links Participant 2's activity to the larger collaborative activity prompted by the project science team moderators of identifying a potentially new species called a convict worm (*user generated analysis*).

Based on our Participant Activity Model of participation in the PH & SE projects we find that participants engage in more collaborative activities as they move toward sustained participation in the two projects. Following the traces of hashtag activity around one instance of hashtagging allows us to begin exploring the dynamic and complex relationships between different levels of individual and collaborative learning and participation enacted within participant trajectories. Researchers interested in studying online learning activities may benefit from incorporating trace ethnography into their work as it provides a way to identify and understand the interconnections amongst various types and levels of learning that may otherwise be invisible in online environments

References

Bonney, R., Cooper, C.B., Dickinson, J., Kelling, S., Phillips, T., Rosenberg, K.V., & Shirk, J. (2009). Citizen science: A developing tool for expanding science knowledge and scientific literacy. *BioScience, 59*(11), 977-984.

Brossard, D., Lewenstein, B., & Bonney, R. (2005). Scientific knowledge and attitude change: The impact of a citizen science project. *International Journal of Science Education, 27*(9), 1099-1121.

Geiger, R.S., & Ribes, D. (2011). Trace ethnography: Following coordination through documentary practices. In *Proceedings of the 2011 44th Hawaii International Conference on System Sciences (HICSS '11)* (pp.1-10). Washington, D.C: IEEE Computer Society.

Hine, C. (2000). *Virtual ethnography.* Thousand Oaks, CA: Sage Publications.

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

Wiggins, A., & Crowston, K. (2011). From conservation to crowdsourcing: A typology of citizen science. *Proceedings of the 2011 44th Hawaii International Conference on System Sciences (HICSS '11)* (pp.1-10). Washington, D.C: IEEE Computer Society.

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