

Carsten Østerlund, Gabriel Mugar, Corey Jackson, Kevin Crowston (2016):  
Typologies of Learning in Open Online Collaborative Communities.  
In Karin Hansson, Tanja Aitamurto, Thomas Ludwig, Michael Muller (Eds.),  
International Reports on Socio-Informatics (IRSI),  
Proceedings of the CSCW 2016 – Workshop: Toward a Typology of Participation in Crowdwork  
(Vol. 13, Iss. 1, pp. 31-40)

# Typologies of Learning in Open Online Collaborative Communities

Carsten Østerlund,\* Gabriel Mugar, Corey Jackson, Kevin Crowston  
Syracuse University School of Information Studies  
*Email: costerlu@syr.edu\**

**Abstract.** How online community members learn to become valuable contributors constitutes a central question if we want to map participation in crowdwork. The literature tends to highlight participants' access to practice, feedback from experienced members, and relationship building in peer production sites. However, not all crowdsourcing environments offer participants opportunities for access, feedback, and relationship building (e.g., Citizen Science). We study how volunteers learn to participate in a citizen science project, Planet Hunters, through participant observation, interviews, and trace ethnography. Drawing on Sørensen's sociomaterial theories of presence, we extend the notion of situated learning to include several modes of learning. The empirical findings suggest that volunteers in citizen science engage more than one form of presence. Communal relations characterize only one form of learning. Equally important to their learning are authority–subject and agent-centered forms of presence.

# 1 Introduction

How new contributors to open online collaborative projects learn to participate is a long-standing and central question in the context of digital labor. Many of these studies draw on situated learning, which emphasizes learning that is contingent on novices observing and participating in practice as well as interacting with journeymen. For example, Bryant, Forte, & Bruckman (2005) examines how new Wikipedia editors spend their time observing the work of other editors before participating. Halfaker, Kittur, & Riedl (2011) explores how feedback from experienced editors can predict the quality of long-term participation, and Ducheneaut (2005) questions how newcomers' relationships with experienced participants impacts long-term participation.

While many peer production projects like Wikipedia fit nicely within such a learning framework by allowing newcomers to interact with journeymen and observe and participate in practice, this model becomes problematic when applied to online projects where there is limited access for observing practice or interacting with journeymen. We are prompted to ask how learning takes place in projects where newcomers cannot easily interact with journeymen or observe practice and receive feedback.

To explore this question, we turn to Planet Hunters, an online crowdsourced citizen science project at Zooniverse.org. In Planet Hunters, laypeople are tasked with analyzing light curve data from the Kepler space telescope for the presence of orbiting planets (see figure 1). Unlike Wikipedia, participants in Planet Hunters are not able to see the work that other users have done. This lack of access to observe others' work is a deliberate design by the Zooniverse developers to ensure independent responses, eliminating the possibility that one user's classification decision could affect the decisions of others. Indeed, this model of eliminating bias extends to the majority of the over 40 projects at Zooniverse.org. Furthermore, there are a limited number of journeymen in the project to guide the work of new participants. Given the inability to observe work and the scarcity of journeymen, we investigate how participants learn to contribute to the project where key features of situated learning are absent.



**Figure 2 Classification Interface**

Taking our point of departure in practice theory (Feldman & Orlikowski, 2011; Østerlund & Carlile, 2005), we combine insights from studies of learning in online communities with a sociomaterially informed theory of learning articulated by science and technology studies scholar, Sørensen (2009), as a way to consider how situated learning may develop beyond the formation of communities of practice. By drawing on sociomateriality to explore how learning can extend beyond communities of practice, we consider multiple forms of learning that include many types of relations, some relying on human interaction and some not. This also allows us to reach beyond studies of intersubjective meaning or meaning produced between humans towards studies of how humans are with materials in the context of open online collaborative communities.

## 2 Theory

Drawing on the work of Law and Mol (1994) Sørensen proposes a theory of presence, which examines the sociomaterial arrangements through which certain modes of participation are made available (Sørensen 2009:138). In her research on a blended learning classroom, where students participate between a traditional classroom setting and an online virtual world, Sørensen identifies three modes of participation or presence: Communal, authority–subject, and agent-centered presence.

Communal presence is most similar to the theory of situated learning, where knowledge and learning are validated through joint engagement in practice and where participants become increasingly engaged in a community as they become fluent in tasks, vocabulary, and organizational principles. Communal presence reflects prominent approaches taken in current research on newcomers to online

communities that focuses on participants' access so they may observe ongoing practice, feedback, and relationship building with experienced members. The second form of presence is authority–subject, where the learner occupies a subordinate and fixed position in relationship to experts. For example, Sørensen demonstrates how authority–subject presence is performed in a classroom, with the teacher occupying the front of the classroom, controlling the chalkboard and the textbooks, and the students facing the teacher, following instructions written on the chalkboard and reading the books they are told to read. Finally, in agent-centered presence learners are engaged in a form of playful exploration or bricolage, where students bring together various resources from different environments to impact their participation in the project. With agent-centered presence, each previous step influences the next and no single authority dictates the broader experience of the learner.

### 3 Data Collection

The empirical data is from a multi-year NSF-funded research collaboration with Zooniverse, a collection of online citizen science projects with over 40 projects and 1.4 million volunteers. Drawing on the practice perspective in social theory (Reckwitz, 2002; Schatzki, 2001), we conducted a qualitative analysis of the six months of participant observation data, trace data, and 21 semi-structured interviews with newcomers, experienced participants, and project scientists, focusing on the nexus of participant work practice in which social and material entities are entangled in the enactment of learning. In particular, we focused on data from interviews, traces, and observations that reflected the changing roles of artifacts and people as participant practice changed over time. Data from the ongoing study were independently analyzed by three doctoral students and then compared to identify themes about newcomer enactment of learning. These findings were discussed at weekly research meetings where results from the various data sources were triangulated.

### 4 Findings

**AUTHORITY–SUBJECT PRESENCE:** We observe the production of an authority–subject presence between the citizen scientists and the project scientists when newcomers express a need for expert guidance on how to contribute. For instance, we see newcomers moving back and forth between doing the work of analyzing light curves and, when they are uncertain about how to do work, revisiting the tutorial, reviewing the science page (see figure 2.), or looking for quick answers in the help feature. The tutorial, science page, and help feature are all resources managed exclusively by the science team, allowing the citizen

scientists to imitate and reference this tested knowledge in their work. The science team keeps tight control over this immutable region of knowledge, which then allows them to make scientific knowledge claims as they turn the citizens' work into scientific articles. Likewise, newcomers' engagement in the main classification interface often takes the form of authority–subject presence. The focus of the volunteers is drawn to a space controlled by the project experts, guiding and constraining the activities of newcomers by giving them instructions on what data to look at and options on how to classify the data. By contributing exclusively through the classification interface, newcomers are isolated in their work, oriented only towards the instructions of the scientists and not interacting with one another.

**COMMUNAL:** Whereas some participants appear to limit their work to answering a set of questions predetermined by the classification interface, some, prompted by their own curiosity, expand their range of activity by leaving comments and questions in the talk and discussion features. In our interviews, we found that for some participants, the talk feature played a role in what they describe as an indirect collaboration with the science team by building and organizing knowledge artifacts that are useful for the scientists. To these participants, Talk serves as a space where they present their evidence and reasoning to other participants about why particular data objects may be worthy of further investigation.

In the performance of communal presence, participants break from the isolated activity of authority–subject presence and reorient their attention towards a setting in which participants become mutually aware of each other's work and work towards building upon one another's efforts. However, in some talk situations, we found that the same participants may oscillate between authority–subject and communal presence. For example, while many experienced users see a significant decrease in their use of Help and the science page, Amy, a participant with over 10,000 classifications, occasionally refers to the science page as a reminder of project practice rather than as a learning resource. Other shifting relationships include how the classification interface remains the workplace monitored by the authority of the science team, but also becomes a source of images around which discussion and talk can resonate.

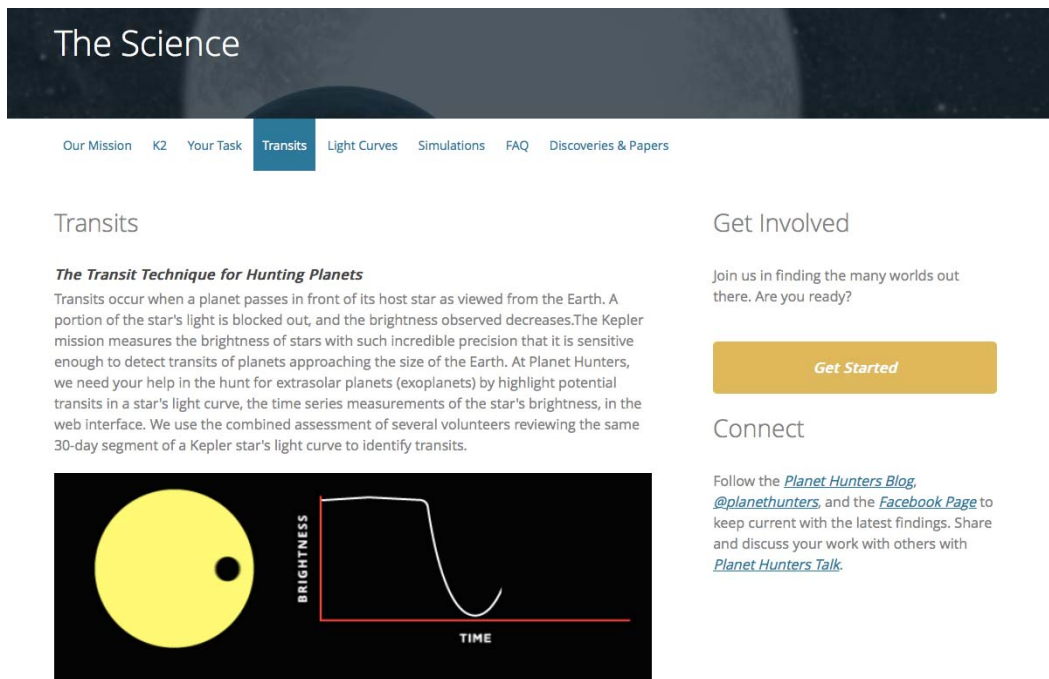


Figure 3 Science Page

**AGENT CENTERED:** By taking part in Planet Hunters, many of the longtime amateur astronomers that we interviewed encounter aspects of astronomy research that they are not familiar with. Referring to the tutorial on using the classification interface or reading the science page to learn more about the process of planet hunting is helpful, but many of the participants we spoke to use such moments of unfamiliarity as opportunities to expand their knowledge about astronomy. For example, some users will use Google, visit Wikipedia, or go to an astronomy education website hosted by a large state university to examine key terms. Some go so far as to take open online courses to address particular facets of the Planet Hunters project and then return to apply what they have learned. In all of these examples, we observe how Planet Hunters motivates participants to learn more about astronomy so that they can be more knowledgeable about the project they are participating in.

Learning to participate in Planet Hunters is therefore not uniquely bound to the authority of the Planet Hunter scientists that manage the project. Rather, in the broader practice of amateur astronomy and citizen engagement in scientific research, we observe the newcomer as bricoleur, building their learning experience across multiple sources in a variety of settings, such as in interpersonal interaction with other citizen scientists, searching the web for definitions of terminology, and taking open online courses. This activity of bricolage is what Kallinikos would describe as a “playful exploration” in which the bricoleur draws

on past solutions and a “miscellaneous toolbox” to address new problems and challenges (Kallinikos, 2012).

When we observe how Planet Hunters is situated within a broader practice of amateur astronomy, we decenter our focus on the project and find the agency of participants as it relates to their motivation to learn more about, and contribute to, astronomy research. In such a setting, we find that participants in Planet Hunters are not defined solely as citizen science volunteers functioning within the project platform; rather, they are amateur astronomers, moving back and forth within the project to learn more about their passion and apply what they know.

## 5 Discussion

The present study suggests that there exists not one but multiple and overlapping forms of presence in crowdsourcing environments. We believe that this calls for additional research into the particular ways participants tie together their presence in and across those settings.

For example, while our findings unpack a well-defined periphery of participation, where learning and involvement are tightly controlled by experts, we also find that newcomers exert agency and control over their participation when they described to us how they situated the project within their broader objectives for contributing to and learning more about astronomy research. The co-occurring power dynamics, where a user is at once a subject to the authority of experts but also an active learner who repurposes the scientists goals to fit their own needs, suggests a compelling tension in both the newcomer experience and management of the project that needs further exploration. Indeed, we believe it should encourage researchers to operate with more than one unit of analysis as they explore participants’ learning. In other words, we may analyze learning from the unit of the individual as well as the unit of the community. One does not exclude the other. For instance, future research in Planet Hunters could investigate how participants engage more broadly in science. What are the places they go to, and how do they bring those together with their communal and authority–subject forms of presence? For instance, several participants described how they stumbled upon Zooniverse and Planet Hunters as part of their interest in science, which involves a continuous exploration of various resources and settings, including magazines, news media, web resources, articles, and local astronomy clubs. An outside authority does not guide this playful exploration, but rather, it is their own process. In short, further research is required to fully understand how participants manage to integrate multiple forms of presence to stimulate their desires and goals.

Finally, it is worth noting that crowdsourcing projects like Planet Hunters are qualitatively different from peer production projects like Wikipedia, which have been covered extensively in newcomer research. As Brabham (2013) points out,

peer production projects like Wikipedia are managed by the volunteers who can determine the direction and purpose of the project while crowdsourced projects are driven by a small group of experts who determine the work that the crowd will engage in. While our analysis does not explicitly compare learning between crowdsourced projects and peer production projects, the key features of newcomer learning established in current research that we identify as missing from the newcomer experience in Planet Hunters does imply a key difference across project governance typologies.

## 6 Acknowledgments

Without the Zooniverse volunteers who worked on the projects and took the time to answer our questions there would be no paper. Many thanks to the Zooniverse team for access to PH data. Several colleagues offered invaluable feedback. This material is based on work supported by the National Science Foundation under Grant No. IIS 12-11071.

## 7 References

- [1] Brabham, D. (2013) *Crowdsourcing*. Cambridge: MIT Press
  
- [2] Bryant, S. L., Forte, A., & Bruckman, A. (2005). Becoming Wikipedian: transformation of participation in a collaborative online encyclopedia. Presented at the GROUP '05: Proceedings of the 2005 international ACM SIGGROUP conference on Supporting group work, ACM Request Permissions.
  
- [3] Ducheneaut, N. (2005). Socialization in an Open Source Software Community: A Socio-Technical Analysis. *Computer Supported Cooperative Work*, 14(4), 323–368.
  
- [4] Feldman, M. S., & Orlikowski, W. J. (2011). Theorizing Practice and Practicing Theory. *Organization Science*, 22(5), 1240–1253. <http://doi.org/10.1287/orsc.1100.0612>
  
- [5] Halfaker, A., Kittur, A., & Riedl, J. (2011). Don't Bite the Newbies: How Reverts Affect the Quantity and Quality of Wikipedia Work (pp. 163–172). Presented at the WikiSym '11, Mountain View, CA.
  
- [6] Kallinikos, J. (2012). Form, Function, and Matter: Crossing the Border of Materiality. In P. M. Leonardi, B. A. Nardi, & J. Kallinikos (Eds.), *Materiality*



*and Organizing: Social Interaction in a Technological World*. Oxford: Oxford University Press.

[7] Mol, A., & Law, J. (1994). Regions, Networks and Fluids: Anaemia and Social Topology. *Social Studies of Science*, 24(4), 641–671.

[8] Østerlund, C., & Carlile, P. (2005). Relations in Practice: Sorting Through Practice Theories on Knowledge Sharing in Complex Organizations. *The Information Society*, 21(2), 91–107.

[9] Reckwitz, A. (2002). Toward a Theory of Social Practices: A Development in Culturalist Theorizing. *European Journal of Social Theory*, 5(2), 243–263.

[10] Schatzki, T. R. (2001). Introduction: Practice Theory. In T. R. Schatzki, K. K. Cetina, & E. Von Savigny (Eds.), *The Practice Turn in Contemporary Theory* (pp. 1–14). New York: Routledge.

[11] Sørensen, E. (2009). *The Materiality of Learning: Technology and Knowledge in Educational Practice*. New York: Cambridge University Press.

