

# Modeling Participation within a Community

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## Abstract

What does it mean to be a central participant? An actor can participate in a single episode of an activity, and she can also participate within a community. The degree of participation can be greater or lesser depending on a number of factors. The primary participants are those that make direct contributions to an episode of activity. The secondary ones witness the action but do not make direct contributions. To be a central participant within a community depends on the number, kind, and ways in which the individual participates in the set of activities performed by the community. It also depends on the participant's knowledge of events and episodes that occur within the community, whether the actor directly participated or not. The study that is presented provides an analysis of the semester-long work of students in a co-blogging community.

**Keywords:** Modeling participation; Discourse Community; Co-blogging; Activity

## Introduction

Within a long standing community, there is a sense that some participants are more central than others. But what exactly does that mean? Central participants within an organization or community are likely to have more knowledge of the inner workings of that organization or community: they know more of the intersubjective space in which the community operates. This kind of knowledge has value, and is predictive of performance.

In many cases, learning depends on participation. Being able to model and measure participation has practical value for evaluating student work.

In apprenticeship systems, participation has been proposed as a model of how expertise develops. Learning can be viewed as a process of becoming a member of a sustained community of practice (Lave, 1991; Lave & Wenger, 1991; Hutchins, 1995). On each occasion of participation, there is a *horizon of observation*, where one participant can observe another, more seasoned and experienced, participant, and thereby, learning occurs (Hutchins, 1995). Overtime, by means of an accumulation of experience through participation, the actor gradually undertakes a more central role, gradually becoming more adept and knowledgeable at participating, partaking, and sharing with others in the action. As the actor's level and kind of participation changes she becomes more knowledgeable and skillful and her identity changes.

Within a classroom experience, participation also plays a significant role in learning. Those who participate more in the class learn more than they would otherwise. The various learning activities that the students perform during the

semester depend on participation. For example, reflection begins with experience (Dewey, 1916), which depends on participation. In professional schools, practicums and laboratories students are given the opportunity to participate in activities that are representative of the target community of practice (Schön, 1987).

What does it mean to be a central participant? An actor can participate in a single episode of an activity, and she can also participate within a community. The degree of participation can be greater or lesser depending on a number of factors. For a single episode of activity, central participation depends on whether the actions of the individual are critical. To be a central participant within a community depends on factors like status, role, and expertise, in addition to the number, kind, and ways in which the individual participates in the set of activities performed by the community. Being a regular participant makes one a more central participant, as does having knowledge of events that occurred in which one did not directly participate.

The study that is presented provides an analysis of the semester-long co-blogging work of students in an undergraduate class on Internet & Society. We present a model of their participation, develop some quantitative measures of evaluation, and use them to analyze the online activity of the students. The most active students were especially active, either as primary or secondary participants, in the critical events in the blog-o-sphere.

## Participation

Participation is fundamentally social: actors participate in social situations.

An actor participates "in", "with". An actor participates "in" an activity, a social situation, a practice, with another actor. The participants partake in the action. The participation is *embedded* in a social situation, in a context, in a physical (or virtual) locale, in a community of practice. The participation is "with" other actors, in a cultural history of that kind of action (Cole & Engeström, 1993; Vygotsky, 1980). There is a sharing. The "with" is mediated by representations (Hutchins, 1995). Within a ongoing community, a genre of speaking, a code, a shorthand for communicating, a syntax, and a semiotic, emerges (Blom & Gumperz, 1986; Halliday, 1978). The "thing" the participants share during the action is an experience, an event, an episode, and an intersubjective space. The participants have status, roles relative to one another, or relative to the situation (Ervin-Tripp, 1964). Within

a social situation the co-participants can be homogeneous or heterogeneous. The situation may have a “script” (Schank & Abelson, 1975); it may be convention-based (Lewis, 1969). Individual and common knowledge of the designs available for certain kinds of social situations predisposes the actors to partake in the activity in certain ways (Alterman & Garland, 2001). Acquiring knowledge of these designs depends on participation.

An actor can participate in a *single episode* of activity. Crossing the street at a busy intersection in Manhattan is a social situation and the pedestrians, cyclists, and drivers are participants. A public lecture is a social situation. Paying for groceries at the checkout stand is a social situation. A conversation at the dinner table is a social situation. There are actors who participate in each of these social situations, who cooperatively perform and achieve an interdependent set of tasks and goals.

Actors also participate in *ongoing communities*. The workplace, the students in a freshman dormitory, the family household, the crew aboard a ship, the regular patrons at the local bar or coffee shop, are all communities that have actors who regularly participate. Some of these are communities of practice but not all. To be a “regular” participant in a community means you are familiar with the genre of communication, you understand the ongoing narrative (Bruner, 2002), you are familiar with the recurrent activities and the common ways of “structuring” the interaction, you are a participant in the cultural history of the community of which you are a member (Wertsch, 1991).

### Modeling participation within a community

Suppose there is a set of events and episodes within a community: e1, e2, e3, ... These episodes can overlap one another in time. Episodes can be composed of other episodes. Any single episode can be part of the composition of more than one other episode. The episodes can be rated by their significance. A weekly lab meeting may be a significant episode because it coordinates the research activities of all the members of the lab, but a division manager fighting with his boss at the end of year holiday party is a remarkable episode for a different sort of reason.

There is a relation between being a central participant in a particular episode of activity, and being a central participant within a community. The central participant(s) in a single episode are the most active, their actions are the most critical. An actor’s participation will be central if she is doing something on the critical path, or if her activity is not easily replaceable. The central actors for a particular episode are also partially predetermined by factors like status, role, or domain expertise: at a professor’s lab meeting, the professor is a central participant for all three of these reasons.

During a single episode of activity, there are primary and secondary participants. The primary participants are those that make direct contributions to the episode. The secondary ones witness the action but do not make direct contributions. At the holiday season party the division head and his boss

are direct participants in the fight, and other party goers who witness the fight are secondary participants.

Those actors who regularly participate in the most critical activities are central participants within a community, regardless of their status or role or domain expertise. Central participation also depends on knowledge about those activities regardless of whether one participated or not. Those people “in the know” are more familiar with the events that occur within the community. Events can be “known” because one directly participated (primary), because one witnessed the event (secondary), or because one heard about it (hearsay). An employee, who was not at the end of year party, but heard about the fight is more of a participant in the community than one who misses the story entirely.

### Co-Blogging

There exists ample evidence that students talking and arguing about course content positively impacts their learning (Andriessen, 2006). Online co-blogging moves the discussion outside the confines of the classroom. Students can collaborate asynchronously. They do not have to be in the same place when they co-blog. In a co-blogging assignment, each student has her own *blog*. The blog is composed of multiple *posts* written by the blog owner. Blog posts can summarize the key content of a text that was read for class, or develop an argument on some issue that was discussed during lecture. Students can read each other’s blog posts and *comment* on them. A discussion emerges when a blog attracts a lot of commentary from other students. Blogging on course material is a learning activity that invites reflection and self-explanation and improves learning (Chi, De Leeuw, Chiu, & Lavancher, 1994; Chi & VanLehn, 1991). Reading and commenting on each other’s blog posts provides students with other interpretations of the course material and the opportunity to discuss and argue about the content of the readings, which also helps learning (Andriessen, 2006).

### Activity Analysis

For activity theory there are three levels to the analysis: the activity level (the motive), the action level (a set of goals to be achieved), and the operation level (how the actions are achieved) (Engestrom, 2000; Kuutti, 1995). Table 1 shows an activity analysis of the co-blogging work of the students.

Table 1: Activity analysis.

Level	
Activity level	Reflection and online discussion
Action level	Blogging, reading, and commenting
Operation level	Interface actions

At the *activity level* there are two educational motives. The blogging itself is a reflective activity. The students have the opportunity to review, rethink, articulate, and explain in their own words the course material. By making the reflections

of each student publicly available to the rest of the class, students have the opportunity to read each other's thoughts, interpretations, and explanations, which enables discussion. Although the instructors can provide commentary on the student blogs, this is by-and-large a venue for the students to develop their own narrative about the content of the course and what it means.

At the *action level*, there are three kinds of actions in which the students engage. Students can write a blog post, read another student's blog, or comment on a blog post. During some sessions of activity, the students are *blogging*, their explicit purpose is to write one or more blog posts. During other sessions, students *browse* the blog-o-sphere, they do not write a post, rather they read other students' posts and make comments.

At the *operation level*, each student physically interacts with the co-blogging environment. The operations they perform are composed of a set of interface actions.

### Participating in the blog-o-sphere community

The students are "with" one another, "in" the blog-o-sphere. The blog-o-sphere is an ongoing social situation. The students are participants in an online community. The style of communication is composed of blogs and comments on blog posts. The students share their reflections and their discussion of each other's posts. The students can assume different roles at different times: they can be a blogger, a discussant, or a reader. There is a design to the activity among the students. At the operational level their activity is structured by a set of predefined interface actions.

Suppose Hector writes and blog post, and Alice, Beatrice, and Carli all contribute comments on Hector's blog post. Hector's initial post in conjunction with the comments is an online "conversation": it is a single discussion. Hector is the only primary participant in the initial blog post event. There are four primary participants in the discussion: Alice, Beatrice, Cali, and Hector. Another student, Zack, reads Hector's blog post and the discussion of Hector's post, but does not make a contribution to the discussion. Zack is not a direct participant, he does not make a contribution to the conversation, but by reading the online discussion he is a "witness" to what was said: Zack is a secondary participant. Yet another student, Rebecca, reads about the conversation in an email newsletter that is sent out every 24 hours. Rebecca is a hearsay participant. She does not read the online discussion triggered by Hector's post, but she does read about one or another contribution to the conversation in the short summarizes provided by the daily newsletters. Rebecca is a tertiary participant in the online discussion.

To summarize:

1. Hector's blog post is a contribution to the blog-o-sphere. Hector is the *primary participant* in that event.
2. Alice, Beatrice, and Carli make comments on Hector's blog post. Alice, Beatrice, Carli, and Hector are all *primary participants* in the online discussion of Hector's post.

3. Zack reads the online discussion but does not make a contribution. Zack is a *secondary participant*.
4. Rebecca hears about the discussion from the newsletter. She is a *tertiary participant*.

Secondary and tertiary participation are more peripheral kinds of participation.

### Study

The students is an Internet & Society course taught in Fall 2008 collectively blogged during the entire semester. The course was an introductory course.

Each student had her own blog. Each post to a blog was tagged with a topic. As a student wrote her blog, she could read another student's post on the same topic with a click of the mouse. At the "front entrance" to the blog-o-sphere, there was a list of the ten most recent posts or comments on posts. Each item in the list displayed the name of the author of the post or comment and a short excerpt from the contribution. Students could also access the blogs via a word cloud.

Students received daily email newsletters that summarized the online co-blogging activity of the class in the previous 24 hours. The newsletter listed the title, author, and first line of all the newly created blog posts, and a list of similar information for any new comments that were added to blog posts. Students could use the links on the newsletter to directly navigate to any post or comment on the blog site that was of interest.

### Methods

All of the students' online work was automatically recorded in a transcript, which enabled both quantitative and qualitative analyses. It was also possible to track whether a student opened a newsletter (tertiary participation), but it was not possible to determine which parts of the newsletter were read. If a student used a newsletter to navigate to the blog-o-sphere, it was possible to determine which conversation or post was the destination.

At the end of the semester we distributed a survey, questions were on a 6-point Likert scale (from 1 not useful to 6 very useful).

### Participants

There were 25 students in the class. Students in the class were from a variety of disciplines. There were 8 females and 17 males. All of the students were undergraduates. There were 3 science majors and 1 science minor in the class. There were 12 students majoring in the social sciences and 8 minoring in the social sciences. The remainder of the class was either in the humanities or fine arts. The students roughly had the same amount of expertise. The blogging activity did not pre-assign roles or status.

### Procedure

At the beginning of the semester an in-class tour and exercise introduced the students to the important features of the blogging environment.

The students were required to blog at the pace of one post per lecture: there were two lectures per week. A typical post was 1 or 2 paragraphs in length. The students were also required to read and comment on other contributions to the blog-o-sphere. The student's co-blogging work counted for 35% of each student's grade.

The focus of the analysis presented in this paper is on the co-blogging work that the students did during the time the class read three books that were on the syllabus. The students wrote short papers on two of these books. There were nine lectures on these three books, so if every student completed his assigned work fully there would have been  $9 \times 25$  blog posts (totaling 225).

## Metrics

A post or a comment becomes a contribution to the blog-o-sphere only after it is read by at least one other student. The length of a conversation (discussion) depends on the number of contributions. A conversation with two contributions is of length 2, with three contributions is of length 3, et cetera.

The critical episodes are defined in terms of discussions. Longer conversations ( $\text{length} \geq 3$ ) are treated as more significant. In these conversations, the initial post was sufficient to generate some discussion and thus was likely to have produced more common ground (Clark, 1991).

## Overview of Student Participation in Online Discussion

There were a total of 246 online discussions of the three books. 37 of the discussions were of length  $\geq 3$ . There were 51 conversations of length 2, 16 of length 3, 12 of length 4, 8 of length 5, and 1 of length 6. The average conversation length was 2.7. On average there were 4.2 online conversations ( $\geq 3$ ) per lecture on the three books. On the whole there appeared to be a healthy amount of online discussion.

For conversations of length  $\geq 3$ , there was a significant range of direct participation among the students. The most active contributor contributed to 14 different discussions on the three books, making a total of 25 contributions during the online discussion. The least active contributor never directly participated in any longer online discussion. The average number of conversations in which each student contributed was 5.2, the median was 4. 75% of the contributions were produced while the students were blogging; 27% were produced while the students were browsing.

There was also a significant range of secondary participation among the students in the online discussion of the three books. Of the 777 reading events for the three books, roughly 46% of them occurred while the students were blogging. The most active reader read 29 different conversations of length  $\geq 3$ . The least active secondary participant missed all of the online discussion. On average, each student was a secondary participant in 10.8 longer conversations. The median number of longer conversations a student read without directly contributing was 9, and the standard deviation was 6.9.

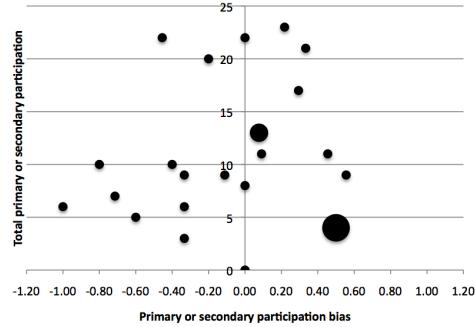


Figure 1: Primary and secondary participation.

There were six non-native speakers in the class. The data shows an interesting pattern of participation among these students. Early in the semester, their participation in the blog-o-sphere tended to be more secondary (they were reading a lot). As the semester progressed their participation became increasingly primary, and by the end of the semester they were amongst the most active participants.

When the students were asked in the survey to rate the value of their online co-blogging work as a means of giving them first-hand experience with online collaborative learning, the average response was 5.6. In response to the question of whether the students felt the knowledge community was useful, the average response was 5.3. When queried about the usefulness of the blog-o-sphere for writing papers, the average response was 4.5. When asked as a yes/no question, whether re-reading and reusing the blogging text helped the students write their papers: 67% answered in the affirmative.

## The most active participants

For each student in the class, we counted the number of conversations of length  $\geq 3$  in which they made a contribution (primary participation), and also counted the number of conversations of length  $\geq 3$  that they read but did not directly participate (secondary). For each student we then computed the following:

$$\frac{\text{contributions} - \text{reads}}{\text{contributions} + \text{reads}} \quad (1)$$

Figure 1 shows these results as a scatterplot. A negative number on the x-axis means a student was more of a secondary participant than a primary one; a positive number on the x-axis indicates a student was more of a primary participant. The y-axis is a count of total number of primary or secondary participations the student made; students with high values were the most active. A larger size bubble indicates more than one student at a data point. As can be seen in Figure 1, there were fewer primary participants than secondary ones.

In order to show trends we removed the four students who were within .5 of the average number of primary or secondary participations, which was  $M=10.68$  (see Figure 2). Throughout the rest of the paper, students above the mean are referred to as the *active* students and those below the mean as the *less*

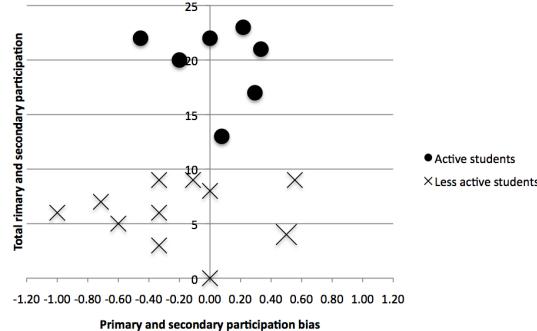


Figure 2: Trends of primary and secondary participation.

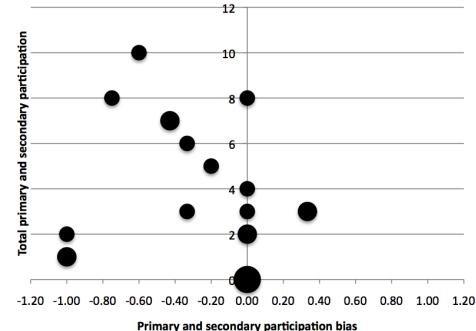


Figure 4: Participation during paper deadlines.

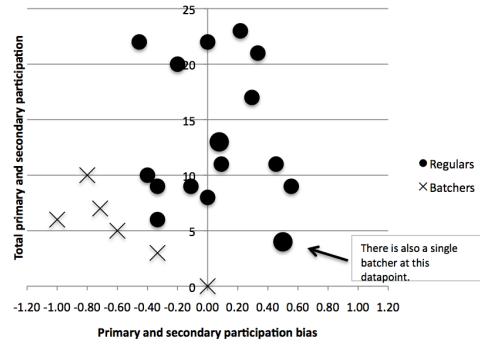


Figure 3: Contrasting batchers to regular contributors.

active students.

### Batchers

Some students did their online work in batches. We computed the ratio of blog posts to blog post sessions. The range was from 1 to 2, the average ratio was 1.3; there were 2 students at the average. Batchers were identified as those whose blog ratio was above the average. Eight out of the 26 students were batchers. As can be seen in Figure 3, batchers were less active: they wrote fewer blog posts (y-axis) and tended much more towards secondary participation (reading) than primary participation (contributing).

### Paper Deadlines

We analysed the reading and writing behavior of students on the blog-o-sphere during a three day period before the paper deadlines. Figure 4 shows the scatterplot of participation during this period. The data shows that the students spent the bulk of their time during this period reading posts and conversations related to the topic of the paper.

### Central Participation

Are the most active participants the central ones? That depends on whether they were significantly more likely to be primary or secondary participants in the important events in blog-o-sphere, i.e., the longer conversations. The longer conversations are where the students actually begin to engage in a more meaningful discussion of the course material.

The categories of active and less active students were based on overall participation in the conversations, regardless of whether the conversations were long or not. It is not necessarily the case that the active students' participation in the longer conversations was significantly greater than that of the less active students. It could be that the active students read and commented on everything, and the less active students only read and commented on the longer discussions.

On average, each active student contributed to 25.7% of the longer conversations and read 51.4% of them (see Table 2). On average, each of the less active students contributed to 7.3% of the longer conversations and read 16.2% of them. It was not possible to track what parts of the newsletter was read, so there is no data to compare the two groups of students tertiary participation in the longer conversations.

Participation	N	Primary	Secondary
Active	8	25.7%	51.4%
Less active	13	7.3%	16.2%

Table 2: Participation in longer conversations.

We used t-test for independent samples to compare the two groups to see if the means of the active group's primary and secondary participation in the important events was significantly greater than that of the less active students. The t-tests on the longer conversations showed that the active students were significantly more active than the less active students as both primary ( $t(21) = 5.9733, p < .0001$ ) and secondary participants ( $t(21) = 7.4151, p < .0001$ ).

What was the source of the difference in participation in the longer conversations by the two groups? It could be that the active students performed as expected and the less active ones performed worse than expected. Or that both outperformed expectations and the difference was still significant. Or both underperformed expectations and the difference was significant.

We performed a chi-square goodness of fit analysis to test whether the observed primary or secondary participation of the active students significantly exceeded expectations. For the null hypothesis we assumed the commenting and read-

ing activity of each student was evenly distributed among all the discussions, whether they were longer or not. The difference between the observed and expected values for the active students' primary participation was significant  $c^2(1, N = 21) = 25.419, p < .0001$ . The difference between their observed and expected secondary participation was also significant,  $c^2(1, N = 21) = 300.708, p < .0001$ .

A chi-square goodness of fit comparison of the online work of less active students shows that their primary participation in the longer conversations was significantly **less** than expected ( $c^2(1, N = 21) = 22.361, p < .0001$ ), but the difference between observed and expected reading behavior was insignificant. In other words, the less active students' participation in critical events was more peripheral than was expected.

## Concluding Remarks

There is a relation between being a central participant in a particular episode of activity, and being a central participant within a community. The central participant(s) in a single episode are the most active, their actions are the most critical. During a single episode of activity, there are primary and secondary participants. The primary participants are those that make direct contributions to an episode of activity. The secondary ones witness the action but do not make direct contributions.

Those actors who regularly participate in the most critical activities are the central participants within the community. Central participation within a community or organization or an ongoing social situation also depends on knowledge about the activities of the community. Events can be "known" because one directly participated (primary), because one witnessed the event (secondary), or because one heard about it (hearsay).

The study presented in this paper shows that in the class blog-o-sphere the active students were especially active in the critical discussions, either as primary or secondary participants. In contrast, the less active students had a more peripheral role in the longer conversations: they read as much as expected, but their direct primary participation was significantly less than expected.

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