

Cooperation and Groupness: Community Formation in Small Online Collaborative Groups

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ABSTRACT

We present a detailed descriptive analysis of the adoption and adaptation of common online tools by a newly forming small group with a cooperative work task. We compare their use of different tools over the course of successive specific cooperative activities, and describe how they use these tools as objects in the formation of a small online community. General patterns of participation that recognize the physical contexts of online group members, and specific patterns of interaction that influence the formation of an online community are explicated. The results of this study have implications for understanding how tools and tasks influence group formation and sense of community in online systems.

Categories and Subject Descriptors

H.5.3 [Group and Organization Interfaces] Computer supported cooperative work

General Terms: Design, Human Factors.

Keywords: Communities of practice, social capital, human capital, networks of practice, groups, teams, communities.

1. INTRODUCTION

Gabriel [13] explicated the themes of constructing knowledge, learning online together and viewing the online environment as a discrete place in a study of a partially online, partially face to face constructivist learning environment with 8 students. These themes were defined as central to the emergence of individual commitment to online groups and increased beliefs in individual self efficacy among group members in the online learning environment studied. Students grappled with two unfamiliar contexts – constructivist pedagogy and technology facilitated cooperation. The students faced difficulties understanding and applying the software tools. They also expressed difficulty, in many cases, adapting to the pedagogical expectations of student directed problem solving in an instructor facilitated (constructivist) course environment. Smith [31] described the cooperative learning experiences of a wholly online course of 25 students over a 16 week semester as a pattern of high early expectations, cyclical movement in and out of the group and collateral impacts of that cyclical movement on group and individual identity. Smith placed the emergence of these cycles in the context of group dynamics theory, which is grounded in the

behavior of physically co-located groups, noting that the patterns found in this online group were consistent with theories that emerged from study of the real (physical) world.

Constructivist pedagogy and online learning technologies are often paired together [1,2,7,15,27], but the explicit teasing out of the different impacts each has on the mediated evolution of small cooperative groups in online learning contexts has not been explored fully. More thorough exploration of this space promises to aid course designers and virtual world (tool) builders in the focused execution of their respective roles.

Johnson [18] explicated the development of teams in an online course setting using Knowles & Knowles [20] storming, forming, norming, performing model of small group evolution, observing that face to face groups, by comparison, tend to have more communication, more fruitful communication and more identifiable leadership. While they showed that virtual learning teams can collaborate from a distance, they also pointed out the relative weakness of these collaborative efforts when compared with physically co-located equivalent groups. Makinster, Barab, Harwood & Andersen [25] described how online social context – essentially the configuration of a tool – had a material impact on the quality of reflection and learning for a group of pre-service teachers. The environments they compared were private journals, online discussion boards with other students, and a separate web forum situated within a community of practicing teachers. In this study, there is a hint of the importance of who is in a group being critical, even online. There is also evidence of the general benefit of social interaction online when compared with working solo.

Nevgi, Virtanen & Niemi [26] explored the application of a specific tool intended to increase the capacity of a group to cooperate online, and demonstrated some degree of success. Like Makinster et al, a significant element in their tool design involved incorporating features to promote metacognitive awareness on the part of group members. In addition, their study promoted joint knowledge creation as important evidence of online cooperation within a small group, and associated increased learning with tools that facilitate joint knowledge creation by small groups. Jeong and Joung [17] demonstrated the effect of social expectations and argumentation scaffolds on the exchange of ideas in an online discussion board. Somewhat surprisingly, students whose posts were labeled to be of a certain argumentation type were less likely to help the collaborative group evolve the argument to the next logical level. In this case, tools that had shown efficacy in some contexts were less useful when deployed using a different pedagogical structure.

Brown & Duguid [4] distinguished groups as canonical, composed of *assigned* individuals engaged in practice and communities as non-canonical, with membership progressing from a legitimate periphery [22, 36] toward full membership, through practice. Rohde and Shaffer [30] defined a team as a

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group that is task driven and a community as a group consisting of a shared culture.

Previous research has explicated the evolution of learning groups and small teams in the real world, and the virtual world, often relying on blended co-existence of real (face to face) and virtual worlds to observe how the characteristics of the virtual worlds themselves (aka, “tools”) impact the development of groups and communities [7, 13, 28, 29, 30]. Many of these same studies viewed the introduction of virtual tools into groups and communities that had been previously unfamiliar with virtual modes of interaction in general and the specific tools used in that study, in particular. This study builds on that previous work by analyzing group formation, the use of electronic tools and the evolution of cooperation in a small, *wholly online* learning group with extensive experience in the use of the specific online tools (virtual world) used in the study. This distinction also creates new insight about the boundary between groups and communities in wholly online settings.

The rest of this paper is organized as follows: In section 2 we discuss theories of community and group formation, and social identity theory. In section three we describe the context of this study, the participants and the research methods. Results are presented in section 5. Section 6 includes discussion and directions for further research.

2. THEORETICAL FRAMEWORK

2.1 Social Theory of Learning

Recent theoretical analysis by Stahl [32] suggests that small groups of 3 to 5 are “where the action is” in online group cooperation. Stahl points out the need to develop a theory of mediated cooperation through a design based research agenda of analysis of small group cognition. Stahl’s focus on small group cognition in online cooperation is compelling, as it extends existing notions of organic systems of knowing, as suggested by Hutchins [16]. A socially grounded theory of group behavior in general is posited by Wenger [22, 35], who observed that practice is the construction of meaning in everyday life, and that our understanding of that meaning construction in any context – online or in person – must reconcile the duality of established protocols (what Wenger references as reification) with the participation of actors who apply and transform those protocols in the context of community. These systems are, in Wenger’s theory, dynamic and social.

What makes communities function well in the physical world is some combination of mutual engagement, joint enterprise and shared repertoire. The challenge of community formation in a virtual world includes these same dimensions, as well as new challenges. These challenges are the same as those faced by online cooperative work in general, most notably the context poor nature of the tools used. Social awareness in an online environment makes mutual engagement in general more likely, and the sort of rebelliousness that can demonstrate commitment to community possible. Similarly, Wenger’s notion of joint enterprise can be managed or assigned in most online cooperative environments with great efficiency, and is therefore more readily manufactured in the virtual world than it is in the physical world.

Shared repertoire is the socially negotiated component of a community of practice, and in a wholly online setting, is therefore highly dependent on the types of tools available for interaction.

In a shared physical setting, this includes the ability to work through many different problems at once, taking advantage of the richness of verbal and non-verbal communication people use when situated around the same table.

If a group is coming together for the first time, or is very early in its formative process at the time of a joint endeavor, such a group may be what Wenger references as a boundary between communities of practice or, more likely, a potential community of practice that has merely entered the first stage of reification. These types of nascent and boundary communities are common in wholly online collaboration, and the frequent source of real innovation in the physical world [6, 11]. Global organizations often need geographically disconnected groups to cooperate on a common problem, but the problem itself does not warrant the cost of bringing the group physically together. The outcome in these circumstances is influenced by the quality of interaction among the members – by whether they come together in common purpose, or merely go through the motions.

Wenger describes the effect of communities of practice on individual identity. There is a powerful set of dynamics at play between the individuals who belong to communities, how those individuals participate (or “non-participate”) in those communities, the negotiation of identity within the context of a particular community and the juxtaposition of membership in different communities within an individual’s identity. Participation in a community and contribution to the reification of different aspects of that community affect individual identity, and vice versa.

2.2 Social Identity Theory

Tajfel [34, 35] describes the process of social identity formation and how people self identify into groups that match their view of themselves (in-groups) and reinforce this identity and sense of belonging partly through the exclusion of themselves from groups they have no affinity for (out-groups). The cycle is, of course, self-perpetuating between individuals and these groups. The process of identifying with some groups, and not with others reinforces the roles of the groups, and the identity of the individuals within those groups. Brown & Duguid [4] emphasize that the constitution of the group is often overemphasized, to the detriment of understanding the importance of practices in the evolution of ideas, and the evolution of group and individual identity. What people do as members of a group is more important than the simple act of membership.

Brown and Duguid [6] describe the complexity of knowledge, practice and community orthogonally to Wenger’s [36] description of communities of practice (COP) by providing examples of how community boundary breaking leads to innovation vis a’ vi the leaking of knowledge between communities. Individually, each micro-community or organization views the leak as a negative event (a loss of intellectual ‘property’), but in the larger community {of communities} (region, university, and profession), such leaks result in networks of practice (NOP) [29], which strengthen the larger community and lead to concrete advantages for that particular larger community over others.

2.3 Groups and Communities of Practice

Blanchard and Markus [3] studied community formation and practice in a virtual community, finding that, as with physically

connected communities, virtual sense of community is enhanced by mutual recognition among members, informational and socio-emotional support and identification with the community. In virtual communities, however, their research suggests that identification and recognition of individual group members is actually more important to sustaining the community than the items related to the sense of community that members report.

Sense of community is an aspect of the social nature of online learning provided by Laffey, Lin & Lin [21], who described the concept of “social ability” in an online setting as “the person’s capacity to associate with fellows and use the members, resources and tools of the social context to achieve something of value”. They further identified social presence and social navigation as critical determinants of social ability. Social navigation means the awareness of what others are doing combined with the subsequent use of that awareness information to make choices about how and when to participate in an online community [21].

Laffey, Lin & Lin’s notion of social ability and its critical determinants of social presence and social navigation describe how relations are built in an online learning community. Blanchard and Markus’s examination of a less time fixed (less canonical) community also suggests that *the community* is found in the virtual world more through the explicit relations between individuals than in the more difficult to discern legitimate peripheral participation [22] of physically bound COP’s or NOP’s.

Rohde [29] contrasted COP’s with NOP’s by characterizing NOP’s as more amorphous, having lower barriers to membership and fewer coordinative rules. In that study, the online portion of the community they monitored did not allow access by members of other schools in the university or faculty. It seems from their results that this closed nature of the community increased the social capital among group members; consistent with Coleman’s [12] observation that social capital rises within a group when membership is restricted.

Social capital is a concept with numerous perspectives, but is germane to the formation and maintenance of community in any context. Coleman [12] identifies obligations and expectations, information channels and social norms as types of social capital, positing that social capital, unlike most forms of financial capital, is not fungible. Instead, social capital is defined by its function. Social capital derived from obligations and expectations are exemplified by completion of work as expected. Information channel based social capital might be earned by being around and sharing information with people (i.e., keeping your peers up to date) and social norms are a form of social capital by which closed groups like families or closely knit local cultures maintain members in good standing. Brown and DuGuid [5] and Cohen and Prusak [11] each reference the close-knit nature of New York’s diamond merchants as an example of social capital built through adherence to social norms. In that case, diamonds are exchanged and released for evaluation without any paperwork or assurances besides the loss of all social capital in that community, resulting in a highly efficient business model.

As the world becomes increasingly virtual, the likelihood of needing to develop and maintain virtual relationships with individuals whom one has never met and likely will never meet goes up. At the same time, human expectations about what is required to form satisfying community membership in an online

setting seems remarkably unvaried from expectations people have for a more physically bounded community. These expectations create an opportunity for disappointment in online cooperative work, and impedance to the development of tool-facilitated (virtual) communities.

2.4 Summary and Research Questions

Groups represent a more canonical, task oriented and identifiably bounded combination of people than communities, which are characterized by Wenger as having the distinguishing features mutual engagement, joint enterprise and shared repertoire among members. Communities are generally understood to represent a less explicitly defined “culture” or set of norms than groups. Online learning and work environments embody some aspects of groups, insofar as these groupings are typically made by management or instructor decree. Online learning and work environments also embody the characteristics of what the literature understands as community, insofar as a pattern of mutual engagement, joint enterprise and shared repertoire evolves among participants as they move from group to group within a common toolset or ‘virtual world’.

We chose to perform a study of participation, cooperation and group identity formation (group-ness) in a small online group during the course of a time-bounded set of cooperative activities. These activities were mediated by online tools that are quite common, including Skype, Skype Chat, Discussion boards and wikis. The group also posted intermediate work products to a shared file area and as attachments in a discussion board over the course of their interactions. We purposefully chose this initial, descriptive approach with a small group, planning to provide a referent case study on the formation of community in a wholly online setting. It is noteworthy that community formation in a setting that includes physical interaction among participants is well explicated by Wenger, and that the fully virtual nature of our community is the salient point of extension to the work of Wenger and others. Wenger focused on the formation and ongoing negotiation of community membership among longstanding, physically co-present communities of practice. We attend to the early stages of group and community formation in a tool facilitated, virtual context.

Communities form, change and disband at a much faster rate in the virtual world than in the physical world. In cases where the group was previously engaged in a common physical setting, there is evidence that the rate of change among virtual groups is lower [14]. Such groups are also more commonly sustained than when the interactions are “fully virtual”. Virtual communities where members never meet (and have mostly never met) in person are the focus of this study. We believe study of this type of group offers two advantages of insight for enriching communication in online environments: First, such a group has no established shared repertoire unique to itself. In contrast, studying a long running group may produce as much insight about that group and its member’s personalities as it does about the interplay of tools, cooperative work and the development of community. Second, newly formed online groups are generally established with a set of clearly defined goals, which allowed us to more fully examine the role of tools in online group and community formation, without needing to consider the usually highly variable nature of human motivation.

2.4.1 Purpose of study

The purpose of this paper is to provide a detailed explication of how groups cooperate and develop characteristics of community as explicated by Wenger in a tool facilitated, virtual environment. The focus of this case study is one small group that formed in the context of an online graduate school course. The course setting was chosen because the duration of engagement, tasks and expectations were stable. This allowed for a focused examination of the effect of tools on the undertaking and completion of tasks, and the corresponding formation of a group or community. It also enabled description of how the group's cooperation evolved into a shared repertoire which included tools as a salient dimension of the community itself.

2.4.2 Research Questions

The two research questions which have guided this work are:

1. How do members of a small group experience cooperation in a wholly online environment?
2. How do members of a small cooperative group participate in wholly online communities?

For the purposes of this study, *wholly online* is defined as a group or community interaction during which the participants never meet, and have never met previously face to face.

3. STUDY CONTEXT & METHODS

3.1 Setting

This study was conducted at a large, Midwestern US university, using an online learning environment composed of an open source course management tool called Sakai and another open source tool, the Context Aware Notification System (CANS), which provided awareness of the participants activities within the course management system to all other participants. Students used Sakai wikis, discussion boards, chat rooms and file storage areas during the course, and received daily email digests of fellow student activity from CANS.

3.2 Participants and Activities

Sixteen students participated in the single online course which was part of this study. The three participants in the core group were interviewed [8] before joining the same ad-hoc community, which was observed online for a period of 16 weeks. Each of the three group members was interviewed three times during the course of their interactions and pursuit of common goals in an online community. The first interview occurred prior to their becoming a group. Over the course of one semester, one author interviewed the 3 participants before they became a group, and then once again after each of two, 3 week cooperative tasks. The two cooperative tasks were a software design evaluation task for activity one and an actual software design task for activity two.

In addition, discussion board activity and assignments completed by each group during cooperative activity were observed on a daily basis, with field notes generated during that process. Assignments and work products produced by the small group were also reviewed and coded.

3.3 METHOD

The methodology of this study was guided by Wenger's social theory of learning. Wenger's social theory of learning and explication of communities of practice form a foundation for

investigation of how communities of practice may be enabled in a context poor, online environment. This study examined the role tools play in the negotiating and shaping of a small online group. A case study method [33] was employed to explicate how participants experienced the online community under investigation. Interviews, observations, course deliverables and activity logs were collected and analyzed.

3.4 Data Analysis

Two types of data were collected to address the research questions of this study. The first type of data was full, verbatim interview transcripts derived from audio recordings with our informants. These transcripts were imported into NVivo 7.0 and coded. We also imported our field notes taken in the observations into NVivo for analysis. The second type of data collected included written deliverables, discussion board posts and field notes related to discussion board posts from the small group. These were reviewed for quality and alignment with the stated objectives of the work.

From this data analysis, transcript analysis and coding techniques adapted from grounded theory [9, 10] were employed to expose what, if any, important themes related to small group online cooperation could be discovered. By coding and review of participation data, we developed a description of this group's cooperative experience, and chronicled it's "becoming" a community in case study format.

4. RESULTS

An array of potential themes and patterns emerged from our analysis of the data. First, we identified general themes of tool use and cooperation. Next, we described the behavior and context of the community as it is forged in the crucible of online cooperative work. Finally, we identified salient patterns of engagement that distinguish community formation in a fully online environment from similar events chronicled by Wenger and others in non-virtual and semi-virtual worlds.

4.1 Themes of Tool Use & Cooperation

Two core themes related to the general online experience emerged from discussion with all of our informants. Those themes are:

1. Politeness and Risking social capital
2. Multi-tasking

4.1.1 Politeness & Risk Taking

Participants in wholly online cooperative groups consistently describe a strong drive to ensure that their peers perceive them as polite. As a result, the emergence of low risk, cordial communication, even in the face of general disagreement is quite common. Comments like "I don't disagree with people online.. I just think in a face to face setting that you have a lot more opportunity to interact back and forth and ultimately get to the point" are common in our discussion with informants.

The absence of disagreement in an online community, particularly in a learning community, has been associated with low levels of engagement and learning. This is a consequence of attempts to transfer metaphors of the physical world, such as a classroom, directly to designs for the virtual world, as in the application of physical classroom constructs into a virtual classroom [15, 37]. The absence of earnest disagreement from the virtual environment reflects a failure of tool designers to distinguish the behaviors in

the physical world, which enable learning, and subsequently build tools that support those behaviors in the virtual world. In this case, the tools are simply not attending to the specific needs of participants, who seem to miss some of the physical props of coordination and group formation they rely on for context in the physical world. The implication is that the available tools limit the type of interchange, specifically argumentation, which results in constraints on the negotiation process and diminished capacity for cooperation in the virtual environment.

4.1.2 Multi-Tasking

Multi-tasking is another theme that emerged. Unlike in regular classrooms where, for the most part, students are physically and mentally engaged in the process of learning during the course, our informants were frequently engaged in other tasks at the same time as they were participating in synchronous or asynchronous aspects of the community. “I’ve actually been driving down (the highway), talking to my husband and posting to my team” and “sometimes I get distracted when my boyfriend saws something up in Gears of War while I’m chatting with my team online” are representative of reports received from our informants regarding their participation in online groups.

Participants in online communities are often simultaneously engaged with people who are not part of their online world, but who are physically present with the online learner. We speculate that there is an emotional component of belongingness that people require when they are participating in an online community, but which may not be met well in the medium they are using for the course – There is no way to actually interact with other real people who are in the course, but participants do choose to interact with people who are in their physical environment, with whom they have an emotional bond. It seems to be enough to merely have another person present, even if that person is focused on a separate task themselves.

4.2 COOPERATION AND GROUP FORMATION IN THE SMALL

Here are the members of the team studied. There are three individuals. All three are currently living in North America, and participating in an online graduate program in educational technology at a large public research university in the Midwestern part of the United States of America. They’ve never met, and report that they have not worked together in a group prior to this experience.

4.2.1 Kelly

Kelly is from Nova Scotia in Canada. She currently spends a lot of her time consulting with organizations around North America, and will frequently find herself on an airplane several days during the week.

Kelly is an experienced online collaborator. She has participated in a number of online work groups before, and had some positive and not so positive experiences in those settings. In a previous online learning workgroup, Kelly was one of three members, one of whom (not Kelly) was not pulling their weight. This kind of social loafing can occur in online communities, and for Kelly, like for many people, dealing with this issue is a particularly awkward burden in the online environment. When she is unable to provide her collaborators with relevant non-verbal social cues about their

poor participation patterns, Kelly becomes frustrated: “well, we’re more mature than this and we can work together and so forth”.

Kelly is sensitive to her obligation to contribute, and sensitive to other group member’s perceptions of her.

4.2.2 Xena

Xena is from Portugal and relatively new to the United States. She is a doctoral candidate at the university.

Though she lives and works on campus, and knows many of the professors who teach online courses, she is herself participating in some courses online because that is the only mode of delivery they are offered in. Xena doesn’t particularly enjoy online learning. Xena is relatively new to online group work, and has a strong preference for interactive, social experiences. During a discussion on ways to improve online tools, she volunteered several observations about online work, which reflect her strong preference for face to face experiences. Despite the implicit challenges of online work, Xena does not distinguish between these two cooperation modes in terms of the difficulty she experiences providing constructive feedback, which several informants have described as particularly difficult in an online setting.

4.2.3 Marge

Marge lives in Pittsburg, PA (USA) and has been enrolled in an online masters program for several years.

Marge is an experienced online learner who had previously been part of a group of individuals who moved from class to class, mostly together. This past experience of a consistent cohort is something that Marge valued a great deal, but lost when she took some time off from school: *I think I had a richer learning experience in the beginning of my program when I knew a lot of people and I had the same people in my courses. Then I had a baby and took two semesters off. Since coming back to school I haven’t really known anybody in class.* Marge clearly identified with this past cohort, and misses the consistency of their collaborations.

Marge has also had some challenging experiences in online cooperation before. In one of those experiences, a group of three Marge was in had clearly developed what Wenger would refer to as a shared repertoire. The social cues and modes of interaction for the group were established. At a later point in the cooperation, the composition of the group was altered by the addition of a fourth member, resulting in a “good group” going bad.

4.2.4 Pre-Cooperative Discussion

Prior to their cooperative activity and the initiation of community formation, each of the three group members had experience with online work in groups that had never met physically. Kelly and Marge had each experienced very positive online cooperation and very frustrating online cooperation. Xena was not ‘against’ online work, but clearly expressed a preference for face to face interaction, if only as a supplement to the online modality.

Each informant expressed a consistent desire to impress their collaborators with dedication to the group, and willingness to contribute. They also identified communication within the group as an important element to the overall success of the group effort during past online community based cooperative group work. Kelly and Marge shared “online cooperation horror stories”

during our discussions. These past, bad experiences motivated them to not have that kind of group.

When comparing good and bad past online experiences, each informant recognized the importance of communication, with one going so far as to indicate a strong preference for the richer communication available in a face to face setting. It's also noteworthy that when Kelly and Marge described their bad online experiences, the manner in which they did so was passionate. In other words, there were strong cues to the investigation team that these bad online cooperation experiences were emotional.

4.3 Group Formation, Cooperation and Community

This first cooperative activity served as both an introduction to the work, as well as the establishment of the cooperative group. Joint enterprise was easily identified for this team in their early interactions – It was the unit of work they were responsible for producing together. The 'alpha group' produced four different work products of different types, and two reviews of other teams work over the course of this three week "module", which was one module in a series that constituted the online course. Several themes related to small online community formation emerged during this module.

The specific activities around which group cooperation and tool interaction happened were activity 1.3 & activity 2.2. In activity 1.3, the group needed to put together a conceptual model of a performance support system. In the case of this group, the performance support system TurboTax, a popular US tax processing software package, was selected for them. The main communication channel among the group during activity 1.3 was an asynchronous discussion board. The members used this as a central command. Other groups in the same course appear to have used the discussion board as a secondary control channel. This was revealed by following communication on the other technology channels that support group cooperation, including chat, email, a wiki and a file sharing area. Some groups in the course produced the required conceptual model for activity 1.3 without using the discussion board as frequently as alpha group did. This is important because it demonstrates the exercise of choice by different groups in this structured virtual environment.

The use of the discussion board as a primary tool for coordination was not a conscious choice. Instead, it was a negotiated practice. Alpha group used the tools available to choose how to coordinate activity. This particular choice had the effect of the group defining other practices beyond mere coordination in the context of the constraints of asynchronous communication. This was not required. It was chosen. In some respects, this tool represented the path of least resistance, but it is important to keep in mind that other groups chose other tools as the primary means of coordinating activity. Other groups in the wider course community chose to use email and chat as primary communication channels.

The other technology channels selected by the group had a greater impact on their negotiation of community practices than the primary discussion channel. For example, during activity 1.3, instant messaging was used to discuss the specific content that was put into the groups work product. The work product itself is in an object based format – PowerPoint – , which Marge initiates. This is distinct from alternative choices, which include the use of

collaborative editing tools (wikis). There are two significant elements of community and individual identity that are represented by these choices. First, chat is a social, interactive communication channel, over which the members reported being able to get to know each other and understand details of their personal lives. Xena's remote family issues, Marge's baby and Kelly's frequent flier nightmare stories added levity and a social bond to the alpha groups cooperative work oriented discussions. These personal stories, shared in the context of a required cooperative task, built a social bond in the group. Second, the use of a document based tool for constructing the final deliverable mutes the opportunity for the work itself to be actively negotiated by the group. In activity 1.3, the PowerPoint only goes through three changes from the time it is drafted to the time it is finished. The only point of change, which Xena describes in detail as the determination that users may easily move back and forth between 'state taxes' [which, in the US means the local or provincial tax] and 'federal taxes' [central government taxation], is played out primarily during a second chat discussion using skype chat.

Marge and Xena describe chat and the use of PowerPoint for the production of the deliverable for activity 1.3 with positive terms. These two group members are the more socially motivated of the three. In contrast, Kelly's choices are more pragmatic. Her view of the activity is that it took a great deal of coordination to arrange the chat session, and while she expressed satisfaction with the results, she expressed less sense of ownership than the other two members, who played a more active role. Marge and Xena feel their ideas were adopted in the results of activity 1.3. Kelly was satisfied with the result, and also felt that her ideas were adopted. Kelly was a contributor, but not a driver in this activity, which was a different role than she usually plays. Activity 1.3 was an important marker in the development of the alpha group community. It represented their first successful completion of a task, the application of specific tools to the completion of that task, and evidence of compromise of individual points of view and style in the interest of maintaining a harmonious group.

With rapport established, the movement of the group into module 2.2 was a turning point in the evolution of their cooperation, and the development of their sense of community. The selection of a synchronous tool (chat) for creative cooperation helped to strengthen the bonds within this community, and allowed module 2.2 to be executed with some efficiency.

The trust established and success perceived in activity 1.3 gave the alpha group confidence to be adventurous and choose a wiki for creative cooperation in activity 2.2, which was the development of a detailed report about a performance support system. This choice was consistently described by group members as a disruptive choice. None of the members of this group had previously used a wiki. Most other groups in this same class did not use the wiki at all on this module or did not use it to the extent that alpha group did. This is probably because the tool was not promoted within the class. In fact, it's obvious from alpha groups discussion board that Kelly, in effect, 'discovered' the wiki and inspired her team, in fits and starts leading up to activity 2.2, to experiment with and ultimately use it for creative cooperation. Kelly's reasons for identifying and pushing the use of the Wiki within the alpha group were pragmatic – it allowed for the completion of work in an asynchronous manner which did not require the group to coordinate a time to chat about it. For a heavy traveler like Kelly, this was a major convenience. Alpha

group members described themselves as flexible and comfortable with risk. They did not perceive themselves as having anything to lose by trying the wiki. This made it easier for the group to choose a completely new tool after previous success using other tools. Alpha group was imaginative and flexible enough to try new things.

In Wenger's terms, what the group did by making these choices is called negotiating a shared repertoire, which is then reified through practice. In other models, this reification is considered a starting point from which the group either strengthens their alignment around a joint enterprise (purpose) or deviates from it. In an online environment, this negotiation is more fluid. If the group is physically co-present, physical infrastructure will grow up around the shared repertoire. Physical infrastructure is hard to move once it's in place. In this online community, the prior choice to use chat for cooperative activity is unceremoniously done away with in favor of a tool set that requires less coordination effort.

In contrast with the limited editing and evolution of the work product for activity 1.3, the work product for activity 2.2 changed 11 times. There were four major changes, and 7 minor iterations. This reflects the difference in the nature of tools selected by the group. When the changes were negotiated in chat during activity 1.3, time was spent on a single item, and the resulting change to the final version was small. The blocking behavior that is well documented in synchronous collaboration limited the exchange of ideas. The evolution of the final deliverable was observable with the asynchronous tools, and the resulting dimensions of change were more profound. New sections were added, sections were completely modified or altered and each member visibly contributed. Though there was early confusion about how to use the wiki, the group did figure it out, and the result for that activity was a more well thought out and complex deliverable, compared with those produced by other groups in the same class. The effect of the change in tools for this group was a lower level of social engagement, but a higher degree of quality in the final product of their cooperative effort.

Tool choices represent tradeoffs. People whose lives are centered in technology and the use of technology for coordination and maintenance of community may be surprised to learn that these tools are not yet widespread among large portions of the population. While each group member has chat clients from Skype, they do not use the clients to communicate with each other outside of scheduled time. These clients are perceived as intrusive by the members, and not necessary for the day to day execution of their lives. Also, the members of alpha group are not tethered to computing equipment like people in technology centered industries are. Their limited application of synchronous coordination technology warrants a challenge to the occasional assumption about the liberating effects of these types of tools for distributed group coordination.

Alpha group made pragmatic choices for coordinating their activity, and the results of their work evolved from beginning to end. They expressed a developing identity as a group through the contents of their discussion board posts (*aren't we a great group*) and through subsequent discussion with us, where they commented on the strength of their group from several points of view. Alpha group also demonstrated more coordination of group activity as their work together moved through time. From the

point of view of group members, their choice of tools influenced the development of this interaction, and tools themselves largely served as the objects of the group's actions.

From the cooperation of alpha group, and through their development as a small online tool-mediated community, several patterns emerged.

4.4 Pattern One: Instant Shared Repertoire

Based on our analysis of discussion board activity and work products, a shared repertoire developed surprisingly quickly among the members of alpha group. Communication to coordinate work followed a pattern for the six activities in this module –

- o Organizing Pleasantries
- o Suggested course of action
- o Tacit acceptance of the course of action
- o Deliverable drafting
- o Nominal discussion of drafts
- o Posting of final version, occasionally following a “last call” message for input from other team members

In addition to this regular flow, exchanges regarding logistics and reassurance were laced throughout many of the messages exchanged by this group.

An example of this shared repertoire, which Wenger says includes routines, words, ways of doing things, stories, gestures, symbols, genres, actions or concepts that the community has produced or adopted in the course of its existence, and which have become part of its practice (Wenger, 1998, p. 83) is presented below. It is the opening discussion for module three, and includes the organizing pleasantries as well as a suggested course of action:

Hi guys. I read through the module 3 work and saw that we would need to post a flow chart by Thursday the 15th. I will be traveling with my job and so won't have access to the internet Monday (12th) or Tuesday (13th). (I will look around to see if there's any connections where I'm going, but I can't guarantee it.) I will have access later that day on the 13th and then won't be traveling after that for a little while.

...I can help with creating/drawing the flowchart if you'd like, too.

For the next activity, the same user – Kelly – initiates a more concise introduction, which nonetheless, repeats the described repertoire:

Hey guys,

I'm working on getting us started on the next step (our report). Once I get that done, I'll post it and you guys can take a look, edit/add, etc.

K? I'm hoping of getting the start of it up by tonight or tomorrow morning so we can all take a look and have time to add things. :)

Critical consideration of such a rapid formation of shared repertoire by a small group of people previously unknown to each other begs the question of whether or not the members brought this repertoire with them to the group. Perhaps their participation in this community extends or leverages a repertoire that has

developed among participants in these types of virtual communities. If so, the same organizing sequence could be easily spotted in other groups. While it can in some, at least one group that was casually observed within the same course had an observably different repertoire that included occasional social faux pas and long stretches of non-communication within the thread. While we have not studied a broad sample of technology mediated groups in great depth, the repertoires we have observed are different among the groups in this course. Another critical consideration is whether or not this simple pattern constitutes what Wenger would classify as a “shared repertoire”. Does compliance with this simple “way of doing things” constitute shared repertoire, or is it, rather, a simple and prudent adaptation the group makes in the pragmatic interest of meeting the objectives of their “joint enterprise”?

There is evidence in our subsequent discussion with group members that the application of this repertoire was negotiated based on three main considerations: First, past good & bad group experiences from which they learned “how to be a good member” and “what a bad member looks like” in a technology mediated community. Second, there are patterns that group members follow in their engagement with the group, which are carried over, from past experiences. Third, the group clearly negotiated a protocol for communicating with each other, which reinforced not just their joint enterprise (in this case, it really requires little affirmation; There is a job to do) but also their “groupness”. Our members intuit or have learned from past experiences that it’s simply more enjoyable to work in a group that has developed a respect laden, conscientious repertoire. For this group, the development of this repertoire is a high “out of the gate priority” once they are “thrown into the fire” together.

4.5 Pattern 2 – Flavors of Online Negotiation – Tool Negotiation

The adoption (selection) and adaptation (how they use and make their own) of tools in this online cooperation environment is a fundamental component of how meaning is negotiated by the ‘alpha group’. The ‘alpha group’ constructs meaning through experimentation with online tools, participation in the structured activities (joint enterprise) they are responsible for completing together and reification of how the tools in the online environment are used to support the evolution of their shared repertoire. Both meaning and this repertoire are negotiated within the context of a tool set.

Wenger asserts that meaning arises out of a process of negotiation that requires participation in a community, as well as the reification of the constructs of that community. In turn, the reification of practices, words, etc is a fairly organic outcome of ongoing community participation. In an online environment, participation is as much an engagement of tools, as it is of a common purpose or meaning. The shared repertoire, which develops among the group, includes the language and signaling (semiotic) system that is part and parcel of the tools the group is using. Whereas, in the communities Wenger has studied, these shared repertoire’s evolve using well understood modes of interpersonal communication, in the case of this small online community, the course tool, skype and email are all important tools to consider, because they in fact are what is used to negotiate meaning.

For example, there are occasions early in the cooperation where tools are being used incorrectly, and the misapplication of them caused problems for alpha-group, as in Kelly’s accidental “ruining” of the discussion thread:

Okay, shoot. I didn't think it would show the whole thing and ruin the thread!

Another example is Xena’s confusion about where to look for another team’s assignment during a feedback component of the course:

I only see Team one's Activity 1.3 – Team 1 will examine the Performance Support System (PSS) of Turbo Tax. I'm confused.

Alpha-Group’s negotiation of how to use the Wiki to complete their task is another example of how tool use is negotiated at the same time as content and task oriented meaning. The negotiation process Alpha-Group went through included not only cooperation around the work, but active experimentation with the boundaries of the tools in order to allow cooperation. In the case of creating an activity summary (a group deliverable), Kelly identified the Wiki as a tool resource, and subsequently pursued its use for the team to work together on one “collective” piece of feedback:

Hey guys, I'm so excited!!! I don't know why, but I've been ignoring that whole wiki thing we have here.

Anyhoo, I transferred our paper into the wiki. I put a Home Page wiki for Team 3, with a link to our Mod 3 summary for Turbotax. Just click "edit" and you can edit whatever you would like! Maybe we can do that and then when we get together tonight we can just discuss what each of us have added and tweaked?

--Kelly;0)

The other team members joined in, but had difficulty. On the same day, Marge initiates this post:

I;m not able to reply to the wiki.

Kelly’s response is pretty straightforward:

Do you see a list of links at the top, one of which is "edit"? If you don't, perhaps there is a permissions issue that Dr. Kennedy can fix...

Oh, if you do see "edit", then just click on the link that goes to the Turbotax page, and then click "edit".

If you want to make a reply or comment, then you can click on "comment" down below where the comments are.

If you don't see anything of what I'm talking about, then there must be a permissions issue if some sort.

Marge responds that she’s effectively worked around the tool issue, as Kelly suggested:

I couldn't ever get the turbo tax sheet to edit...so I just added comments. I think kelly has done a really solid job.

From this point forward in the module (about another 2 weeks), the team uses the wiki for cooperation with great effectiveness. It alters the way that they post items to the discussion board, and also reduces the number of “rapid exchange” types of posts which occurred early in the cooperation when the Alpha-Group was

negotiating what the results of an assignment should be. In addition, this new tool – new to alpha-group – had an effect on the quality of work product evolution and negotiation. As previously described, the quality of output in the PowerPoint was not as high as the quality of output in the Wiki.

4.6 Pattern Three – Post Type Taxonomy

Alpha team's discussion board posts can be classified into one or more of four categories:

- o Pleasantries – statements like, “Really having fun”, “this group is great”
- o Logistics – statements like, “I’ll be available at 7 & 9pm Wednesday” or “I’ll be traveling to Vancouver”
- o Pseudo-Synchronous communication – These types of posts are usually related to cooperative work production & “finishing” something. What differentiates these types of posts from others is the rather rapid exchange of communication, with times between post being less than 15 minutes for two or more team members over at least one full exchange (a minimum of three total posts). These types of posts actively evolve the shared repertoire of alpha group.
- o Idea Generation – Sometimes these are also pseudo-synchronous communication, but they are differentiated from other post types by the creation of new ideas which address either meaning negotiation, task completion or other group dilemma. They are focused on the joint enterprise of the alpha-group.

These categories reveal that the discussion board is used primarily as a coordinating tool. Nonetheless, there are aspects of the discussion board, particularly when posts occur pseudo-synchronously, where the group gropes through the tools at their disposal and builds a shared repertoire in the context of their limited toolset.

5. DISCUSSION

5.1 Summary

The three patterns which emerged in this group's practice provide insight into the influence that familiarity with a virtual environment or toolset has on group formation and community development in an online environment. The limited bandwidth and context poor nature of online communication is a salient concern, but one that the alpha-group was able to overcome. The group demonstrated a willingness to experiment with the tools, and a sustained adaptation of those tools for the successful completion of their joint enterprise.

Each member of alpha group behaved with an observable awareness of the repertoire to be used in the course tools selected, and discussed the critical importance of abiding by established protocols (such as *doing your share*) in an online collaboration. In this way, the alpha group demonstrated some manner of membership in a broader community of online learners at this Midwestern university, while, at the same time, forming membership in a specific, new collaborative group.

Wenger's model of communities of practice includes consideration of joint enterprise, shared repertoire and mutual engagement. Distributed, technology mediated groups like this emerge into communities differently than physically co-present groups. The boundaries of community and task group are, in this case, possibly bounded by the use of tools. The alpha group

successfully completed their joint enterprise by somewhat organically developing the necessary and efficient communication protocols required for task-focused work. That the quality of those work products improved when they used the wiki instead of the exchange of a file has implications for how cooperative tools play a role in the construction of all dimensions of Wenger's notion of a community of practice in the context of a small, online cooperative group.

In online communities, tools themselves act as the objects around which cooperation occurs and community forms. This study explicated the tool-centered aspects of group cooperation and community formation by seeking and analyzing experiences of members of a newly formed small, online workgroup.

Tools that enable cooperation among small groups and support the formation of community in an online setting are illuminated from a different angle when observed in detail, from the perspective of participants. Marge's use of the wiki and preference for social interaction inspires the notion of wiki-chat. Asynchronism serves the disconnected, but not the highly social community member. Integration of these features would serve both. Our community does not use chat in the sense that is common in some circles, but did enjoy and grow from its use in the context of their community. Contextualizing chat functions through online community tools – but segregating them from ubiquitous desktop deployment – would encourage the convenience of asynchronous work and the community building strength of more social chat.

5.2 Limitations

This in depth case study identified a number of interesting elements in the formation of an online group that is situated in a larger, tool bounded, virtual learning community. The primary limitation of this research is sample size. The detailed analysis consisted of three members of a 16 student online course, and should be continued with larger numbers of students in more diverse online collaborations in the future.

5.3 Future Development

This online group's ability to build a useful repertoire in the space of a week, and then apply that repertoire to rapid application of different tools in an online environment suggests that community formation, which is described by Wenger as a longitudinal process that evolves over long periods of time, may be enormously compressible in the virtual world. The more familiar the metaphors and tools are to participants, and the more intuitively adaptable the tools are, the more quickly community is able to form. The implications for 3D virtual environments and other emerging collaborative technologies is that creative small groups will adapt those tools to their purposes. Construction of tools that consider the critical aspects of community formation should drive the development of small communities in online contexts.

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