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Assessing online collaboration among language teachers: A cross-institutional case study

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Abstract

This paper focuses on computer-supported collaborative learning (CSCL) among foreign language (FL) graduate students from three universities, who worked together to create a wiki. In order to investigate the nature of CSCL among participants, this qualitative case study used the Curtis and Lawson framework (2001) to conduct a content analysis of learners' collaborative behaviors. Transcript and survey analyses indicate that the success of collaborative interaction depends largely on the group members themselves. Differing levels of participation indicate that not everyone was equally involved with the wiki project, which ultimately affected the level of collaboration, the group dynamics, and the final product. In addition, the leader in each group influenced the degree of collaboration taking place in her group.

Introduction

This paper focuses on computer-supported collaborative learning (CSCL) and investigates the nature of online group interaction and cooperation in the process of developing a collaborative product. Specifically, foreign language (FL) graduate students at three universities worked together to develop a wiki, a multi-authored webpage that served as a knowledge resource to supplement their course material. This study was designed to examine the nature of

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online cross-institutional interaction in such "intensely collaborative" (Godwin-Jones, 2003, p. 15) endeavors.

Literature Review

Many current pedagogical approaches are heavily rooted in constructivist thought. Drawing from Piagetian and Vygotskian theories, these approaches view learning as a dialogic and inherently social process of knowledge building (as opposed to knowledge transmission), in which the teacher cedes control to allow learners to pool their knowledge and experiences to create common meanings. Communication and interaction play a central role as the primary mediation tools for these socio-cognitive processes (for a review see Palincsar, 1998).

Collaboration and Cooperation

As Haythornthwaite (2006) advocates: "Collaborative learning holds the promise of active construction of knowledge, enhanced problem articulation, and benefits exploring and sharing information and knowledge gained from peer-to-peer communication" (p. 10). The term "collaboration", however, defies clear definition (Dillenbourg, 1999). For the purpose of this article, we follow the restricted conceptualization of cooperation vs. collaboration (e.g., Dillenbourg, Baker, Blaye & O'Malley, 1996; Haythornthwaite, 2006). Under this distinction, cooperation entails division of labor where tasks are split into sub-tasks in advance to be assembled into a larger whole later on. This setup allows group members to work relatively independently during certain work phases (task specialization), but does not foster true collaboration. Collaboration, in contrast, is a model where "no single hand is visible in the final product" (Haythornthwaite, 2006, p. 12), thereby relying on a sustained synchronous and coordinated effort of all group members to regulate their activity and learning. With little or no externally imposed structure, collaboration involves complex social and cognitive processes, whose success depends on a variety of factors, such as: (1) face-to-face interaction, (2) positive interdependence, (3) individual accountability, (4) social skills, and (5) group processing (Johnson, Johnson & Smith, 1991; cited in Dixson, Kuhlhorst & Reiff, 2006).

Computer-Supported Collaborative Learning (CSCL)

Asynchronous technologies such as e-mail and discussion boards provide opportunities for distance as well as blended learning environments to overcome the limitations of the physical classroom. Past research on CSCL has explored a variety of issues to determine the nature of online interaction and its benefits. One area of interest has been the cognitive dimension. Arnold and Ducate (2006), for example, found that students interacting on an electronic discussion board frequently worked together to explore issues and search for solutions. Fahy, Crawford and Ally (2001) also reported that the discussion board transcripts they analyzed were dominated by expository statements aiming at the transfer of information, mirroring findings by Gunawardena, Lowe and Anderson (1997), Rafeali and Sudweeks (1997) and Liu and Tsai (2008). However, cognitive activity does not always remain at this basic level as reflections, evaluations and other higher-order thinking occurs as well (Arnold & Ducate, 2006; Fahy et al., 2001; Schrire 2006).

Research has also explored the social nature of asynchronous exchanges. Comparing two groups of learners working on case studies, Paulus and Roberts (2006) observed that the more

successful group engaged in more socializing and supportive discourse. Similarly, Arnold, Ducate, Lomicka and Lord (2005) found evidence of multiple aspects of social presence (e.g., affective and cohesive interactions) but emphasized the effect of task type: reflective tasks triggered more affective interaction than abstract and more structured tasks. Howell-Richardson and Mellar (1996) and Yang, Newby and Bill (2008) also noted the effect of task type on such variables as group vs. task-orientation, participation levels and quality of cognitive activity.

These findings indicate that asynchronous exchanges have great potential for encouraging cognitive as well as social interaction between learners. The case study presented here investigates the immediate processes that arise during task engagement in a cross-institutional online collaborative task. Our goal is to provide a process-oriented account of learner interaction in order to investigate if and how learners collaborate on a project-based task.

Methodology

Context and Tasks

Carried out by four classes of graduate FL teaching assistants at three large southeastern public universities, this collaborative cross-institutional project involved the creation of a wiki. Using a simple markup language, wikis are collaborative websites that are easily edited and modified by any user (e.g., Wikipedia, the largest and best known wiki). The wiki described here was not only intended as a class resource but also as a possible reference for other language teachers. The production of the wiki was designed to allow students to build on each others' teaching experiences in order to establish a forum where they could discuss and internalize information about their teaching.

A total of 31 graduate students divided into five groups participated in the creation of this wiki. Each group was comprised of 6-7 students representing all three universities and a variety of languages. Groups were responsible for creating one page of the wiki each, focusing on an assigned pedagogical topic: feedback, language choice, technology, culture or grammar. These topics were determined *a priori* by the course instructors because they are generally not dealt with sufficiently in course textbooks, deserve greater attention, and/or are considered relevant current topics in foreign language education. The task assigned to each group was not to discuss the topic, but rather to create a resource page for that topic. Therefore, the analysis of their interaction and discussions is not an analysis of what students said about their topics, but rather how they interacted to collaboratively create their wiki page.

The groups were entirely responsible for the content, layout and design of their wiki page. Each page had its own discussion board, which the students were encouraged to use for their communication. The project was carried out in predetermined phases, with dates and deadlines set in the course syllabi in order to structure the task and to ensure timely completion of the project within the semester. During Phase 1, each student read a different professional article on their topic and posted a summary of that article on their group's discussion board. In Phase 2, the students created the outline for the content of their wiki page, with the final phase consisting of completing and finalizing the webpage. During the last two phases, group members also had to visit the wiki page of two other groups and leave comments or suggestions for those members on their discussion board (peer review).

Keeping in mind the description of collaboration provided above, this particular wiki-

based task was designed to create conditions under which collaboration could occur. The "jigsaw" format of the article information exchange, for example, created a certain degree of knowledge asymmetry and resource interdependence, which would hopefully lead to divergent viewpoints and thus promote communication as a precursor to collaboration. The course instructors purposely did not participate in any phase of content creation or feedback on the wiki pages to allow freedom of expression to develop independently in each group.

Research Questions

The overarching goal of this study was to describe how learners engage with each other to complete an online collaborative assignment. Due to the exploratory nature of this project (i.e., *how* do groups work together?) and our primary interest "in process rather than outcomes, in context rather than a specific variable, in discovery rather than confirmation" (Merriam, 1998, p. 19), a case study approach was chosen for the investigation. We were interested in comparing the two groups that received the highest and lowest member ratings in terms of successful collaboration (HiPCol and LoPCol) and formulated the following research questions:

1) How do group members participate in organizing the project and contributing to the wiki itself? What differences emerge within groups? What differences emerge between a group that perceives itself as highly collaborative (HiPCol) and one that does not (LoPCol)?
2) How do groups time their work on the wiki page with regard to the deadlines for the assignment? Are there any differences between the HiPCol and LoPCol Groups?
3) What collaborative behaviors do learners engage in? How do these behaviors differ between the HiPCol and LoPCol groups?

Given the case study approach chosen for this investigation, along with our belief that multiple dimensions of a group's interaction must be analyzed, various forms of data were collected and analyzed to answer these research questions.

Data

The primary data for this project were the history of the wiki page edits as well as the corresponding inter- and intra-group communication that occurred on the discussion boards during the course of the semester. The students also completed an end-of-semester survey composed of 17 Likert-type items (with the option of elaborating on their answers) and six open-ended questions pertaining to group interaction and dynamics, as well as their own reactions to collaborative work.

Selection of Cases for Analysis

In order to gain deeper insights into the phenomenon of online wiki collaboration, purposive sampling was used to identify cases for analysis – a common method in case study research (Merriam, 1998; Schrire, 2006). The selection criterion for this non-probabilistic method was the degree of successful collaboration as reported by the group members on the end-of-semester questionnaire. Specifically, we chose the two groups whose members reported the most and least successful collaboration on the project for comparison of how they worked together. It is important to recognize that small sample sizes are common and acceptable for case

studies since the generalizability of findings is not a goal of this type of research.

Four questions on the survey measured the degree of successful collaboration as perceived by the group members. These questions (numbers 6, 7, 9 and 12) are listed below in Table 1, along with the average response values from all groups. Overall, the answers provided by the Grammar Group indicated the least effective collaboration: its members were most critical of the cross-institutional aspect of the project and had the lowest values for the items addressing successful collaboration, equal involvement, and respected contributions.

Table 1
Survey Items Relating to Collaboration with Group Average Responses

	Culture	Feedback	Grammar	Language Choice	Technology
#6. My teammates and I collaborated well together.	3.714	3.200	2.200	3.429	3.286
#7. I would have preferred to work only with students in my class.	3.000	2.750	4.200	3.714	3.714
#9. I do not think my teammates valued my contributions.	2.000	2.200	2.000	2.857	2.000
#12. Everybody in my group was equally involved in the process.	3.143	2.200	2.000	2.571	2.714

Choosing the most collaborative group, however, was more difficult, as three groups' survey results indicated effective collaboration: Culture, Technology, and Language Choice. Therefore, we turned to the comments on the surveys to determine which of the higher groups reported an effective collaborative working relationship, and found that the Culture Group showed more positive, and very few negative, comments regarding the nature of their team collaboration, such as: "Everyone was open to changes," or "Most of us contributed equally."

To corroborate the selection of the Grammar and Culture Groups for further analysis, we performed a non-parametric statistical analysis of the survey responses in order to determine if there were statistical group differences that our evaluation of the comments and averages did not reveal. A non-parametric Analysis of Variance (Kruskal-Wallis) revealed significant Group x Question variation on survey item: #6 ("My teammates and I collaborated well together;" $p < 0.05$). Post-hoc testing (Mann Whitney 2-sample Independent Comparison of Means) revealed that the Grammar Group's mean rating (2.200) was significantly lower than the Culture Group's mean rating (3.714) ($p<0.05$). In other words, the Grammar Group reported significantly less collaboration than the Culture Group did. These results confirm the selection of these two groups – the Grammar Group as the group with the lowest perceived collaboration (LoPCol) and the Culture Group as the one with the highest perceived collaboration (HiPCol) – as the two groups to be subjected to further and more detailed analysis.

Participants in the HiPCol and LoPCol Groups

As described above, the discussion board analysis was limited to the two groups that represented the most and least successful collaborative efforts. Seven participants (five females, two males) contributed to the group with high perceived levels of collaboration (HiPCol, Culture), and six participants (five females, one male) were members of the group that reported the lowest degree of collaboration (LoPCol, Grammar). All three universities involved in the project were represented in each group, and students in each group taught a variety of languages (French, German, Spanish). All participants were proficient in English, which was used for all group communication and all wiki pages were composed in English. Most participants were in their 20s, but otherwise their backgrounds were varied in terms of culture, native country, specialization in graduate school, and prior teaching experience. The participants from two of the methods courses were placed in groups by the professor and therefore did not self-select the topic they worked on throughout the semester; in the other classes the participants were allowed to choose their groups.

Analysis

Participation and Interaction

Discussion board data were used to analyze two separate dimensions: participation and interaction (Schrire, 2006). As a manifest variable, participation is readily observable and quantifiable (for a review of participation indicators, see Dringus & Ellis, 2005). For the purpose of this study, we used the following measures: 1) number of messages posted by each student, 2) individual student activity relative to the activity of the group as a whole, 3) and timing of discussion board and wiki activity. While these are only quantitative surface indicators, they provide a first glimpse into the inner workings of a group and can reflect heterogeneity of participation, roles, social loafing and free riding (Johnson & Johnson, 1996).

As a latent variable, interaction needs to be inferred through content analysis (Schrire, 2006). The deductive content analysis for this project was performed using the Curtis and Lawson framework (2001) designed specifically for online collaboration. As illustrated in Table 2, it is based on five behavior categories described by Johnson and Johnson (1996) as central to collaborative learning situations: planning, contributing, seeking input, reflection/monitoring and social interaction. Since it allows for the coding of social, cognitive and coordinating behaviors, it was deemed broad enough for our exploratory research question. The examples in Table 2 are from the wiki discussion board used in the current study.

Table 2

Curtis & Lawson's Framework for Analyzing Online Collaboration (2001)

Behavior categories	Description	Examples from FL wiki discussion board
Planning	Group Skills: a generic code applied to expressions that encourage group activity and cohesiveness.	I look forward to working with my colleagues at U of X and from any other university.
	Organizing Work: Planning group work; setting shared tasks and deadlines.	I'll get back in a few hours (hopefully) with some ideas to add. I went ahead and deleted the article post.
	Initiating Activities: Setting up activities such as chat sessions to discuss the progress and organization of group work.	Also, I was thinking that since we all likely use our e-mail accounts obsessively, maybe we should create a listserv and drop each other a line any time some great amazing idea comes up, or even just to say "hey, I did something on the wiki you might want to look at... Check it out."
Contributing	Help Giving: Responding to questions and requests from others.	If you can't find anything substantial, I would suggest just writing that in the section. It doesn't hurt to let people know that the particular viewpoint isn't very popular.
	Feedback Giving: Providing feedback on proposals from others.	I was wondering if the historical background part isn't a bit too detailed, since our main research interest is how to integrate culture in our teaching.
	Exchanging Resources/Information to assist other group members.	Also, if you are set on finding other articles, I would suggest searching stuff on Bill Van Patten...he is really big in this field and has a lot of research.
	Sharing Knowledge: Sharing existing knowledge and information with others.	We already know that students learning styles are different; therefore we also have to remember that their cultural background could influence their academics and classroom response.
	Challenging Others: Challenging the contributions of other members and seeking to engage in debate.	And how effective in acquisition of the L2 is learning and practicing grammar, even in a context, for a student of the L2? It bears asking if students (perhaps only the more perfectionistic ones) can look past the mechanics and see the sociocultural aspect of the L2 if all we "teach" is grammar.
	Explaining/Elaborating: Supporting one's own position (possibly following a challenge).	For example, A German would expect a German professor to lecture about German because, culturally and academically, this is normal in Germany. An American would expect an American professor to involve the students more in a class-wide discussion
Seeking Input	Help Seeking: Seeking assistance from others.	The first part is in bold, we tried to fix it, can someone please help?
	Feedback Seeking: Seeking feedback to a position advanced.	I would love to hear any ideas or comments you all have. Thanks!
	Advocating Effort: Urging others to contribute to the group effort.	Brainstorm back and we'll get it worked out (eventually)
Reflection / Monitoring	Monitoring Group Effort: Comments about the group's processes and achievements.	You did a great job, have a nice weekend!

	Reflecting on Medium: Comments about the effectiveness of the medium in supporting group activities.	I would first like to say that I find the format of this wikispace extremely difficult to deal with...all the clicking back and forth is bothersome.
Social Interaction	Social Interaction: Conversation about social matters that are unrelated to the group task. This activity helps to 'break the ice'.	My name is WH. I have a BA in German from U of X. I am now in my first year in the MA in German at U of X.

The researchers worked together to discuss coding procedures and to code the transcripts of discussion board postings for both the HiPCol and LoPCol Groups. To capture complex behaviors that often extend beyond a single sentence, the unit of analysis was the thematic unit, "a single thought unit or idea unit that conveys a single item of information extracted from a segment of content" (Budd, Thorp, & Donohue, 1967, p. 34).

Results and Discussion

Participation: Between Group and Within Group Comparisons

To gain a better overall picture of general group participation, we first discuss the number of revisions and posts generated for each group (see Table 3). Interestingly, the two groups chosen for this analysis proved to be the ones with the most activity in page revisions. These two groups also had high quantities of posts within their groups, although they did not rank highest in total posts.

Table 3
Group Activity on Discussion Board (DB) and Wiki Page

	Page Revisions on Wiki Page	Posts within Group on DB	Replies within Group in DB	Comments outside Group in DB	Total Posts
LoPCol (Grammar)	111	41	23	31	95
HiPCol (Culture)	150	44	14	58	106
Feedback	100	35	24	38	97
Technology	93	41	11	66	118
Language Choice	85	39	37	46	123

As can be seen in Table 4, the HiPCol Group posted a total of 106 messages. Within their group, there were 44 posts on the discussion board and 14 replies. They made 58 comments to wiki members outside of their group. Out of the seven members of the group, Maria (all names have been changed) posted the most often (32) whereas Wayne posted the least (9). Sandy, with 20 comments, made the most revisions to the page and Ramona only made one revision.

Table 4
HiPCol Group Posts

Member	Number of Revisions	Number of DB Posts			
		Posts within Group	Replies within Group	Comments from outside Group	Total Posts per Person (Percent of Total Activity)
Ella	1	4	1	5	10 (9.2%)
Maria	18	18	4	10	32 (30.2%)
Ramona	1	5	1	8	14 (13.2%)
Wayne	9	2	0	4	6 (5.7%)
Sandy	63	5	5	10	20 (18.9%)
Carla	18	3	0	6	9 (8.5%)
Henry	40	7	3	15	25 (23.6%)
Totals for Group	150	44	14	58	106

Within the LoPCol Group there were similar ranges from very active throughout the semester to less active, as shown in Table 5. This group posted a total of 95 messages: 41 posts and 23 replies within the group and 31 comments to members outside of their group. Group members made 111 page revisions to their wiki. Table 4 displays the summary of posts from this group. Within the group, Micaela made the most postings (39) and her posts were consistent throughout the semester. Alfredo (8) was the least involved: his posts were made primarily at the beginning of the semester. Micaela also ranked highest in revisions to the wiki (50), while Alfredo only made one revision throughout the semester.

Although these summaries are not necessarily indicative of a group's success, nor do they indicate the quality of the content of the postings, they do provide us with a general idea of the level of participation, pointing towards ineffective group behaviors like the free-rider effect (Johnson & Johnson, 1994). In this study, Alfredo and Ramona contributed only one time each to their pages, diffusing responsibility for the work to their group mates. This inequality of participation can significantly hinder a group’s effectiveness.

Table 5
LoPCol Group Posts

Member	Number of Revisions	Number of DB Posts			
		Posts within Group	Replies within Group	Comments from outside Group	Total Posts per Person with Percent of Total Activity
Willa	27	5	4	4	13 (13.7%)
Jennifer	18	10	3	6	19 (20%)
Nicole	15	7	2	7	16 (16.8%)
Micaela	50	17	14	8	39 (41%)
Alfredo	1	2	0	6	8 (8.4%)
Totals for Group	111	41	23	31	95

In addition to information on each groups' participation, we also examined the timing of both the revisions to the wiki page as well as the sequencing of the activity on the discussion board for the HiPCol and LoPCol Groups for particular patterns of (in)activity. For both groups, discussion board activity was rather consistent throughout the semester, although some individuals were strikingly more active than others, as was just discussed. Regarding the timing of the wiki page revisions, there are several noticeable differences between the groups. First, the LoPCol Group was more consistent overall with their revisions and made more revisions earlier in the semester. The HiPCol Group tended to cluster revisions around deadlines. For example, they made 18 revisions the day before or after the due date for their outline of the page while the LoPCol Group made only three. Whereas the HiPCol Group made 18 revisions the day before their draft was due, the LoPCol Group made 12; HiPCol Group members made 28 revisions the day before their completed project was due and eight the day after the due date, whereas the LoPCol Group made only one during this period. These trends are reflective of certain collaborative behaviors that will be further discussed in the next section.

Interaction: Between Group Comparison

Using the Curtis and Lawson framework (2001) we coded for several different collaborative behavior categories. As illustrated in Figure 1, the HiPCol Group engaged in high amounts of planning and contributing while focusing less on seeking input, reflection and monitoring, and social interaction. Within the category of planning, this group discussed organizing the most, and within the contributing category, sharing knowledge was the most common orientation of their activity (refer to Figure 2). Within the category of reflection/monitoring, most of the input was from guests outside of the group (118 posts, 90%). Perhaps the members of the HiPCol Group did not feel it necessary to comment as often within

the group since they were receiving so much encouraging feedback from outside of the group.

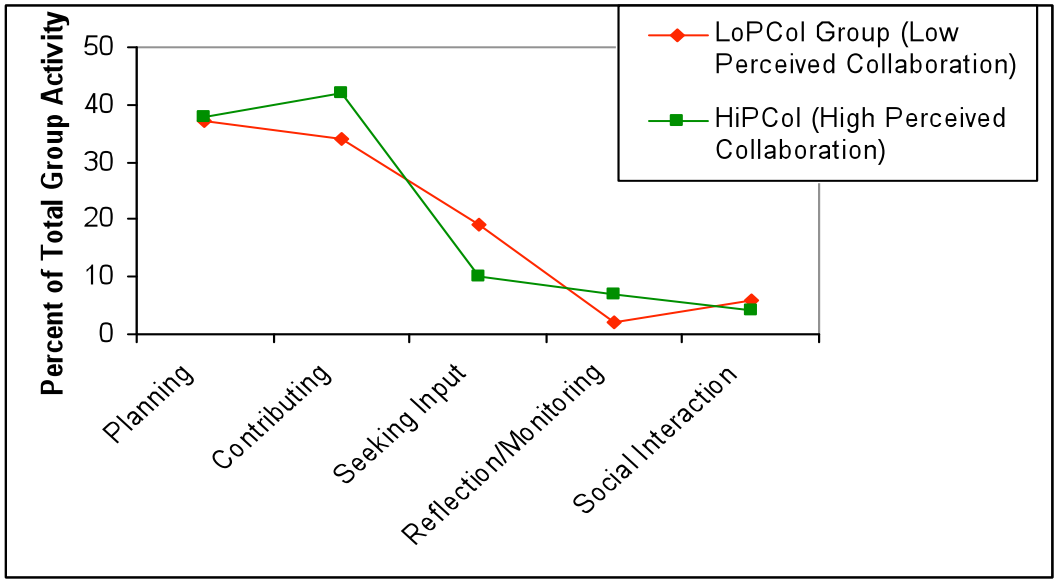

Figure 1. General results from discussion board analysis

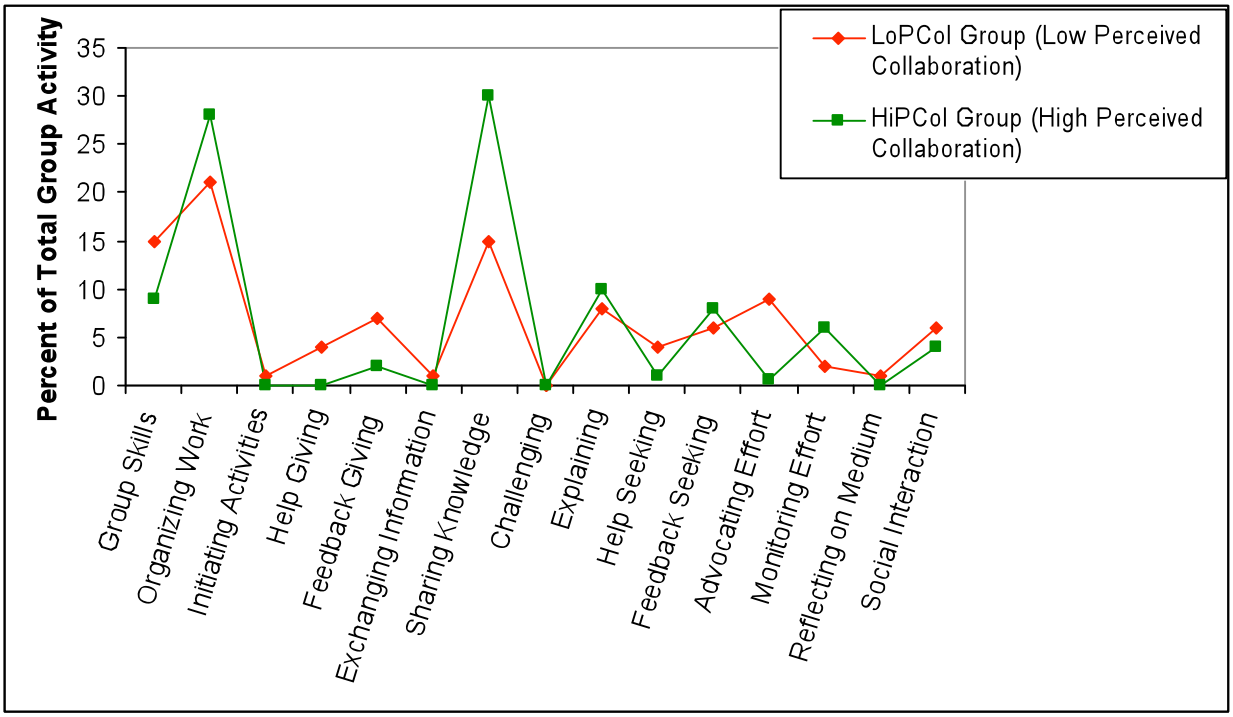

Figure 2. Specific category results from discussion board analysis

In the LoPCol Group's discussions, planning and contributing ranked as the most frequent behaviors. Interestingly, students in this group spent almost as much time planning as they did

contributing content and new information to the discussion. Ultimately, this group's extensive planning behavior limited its work on the project itself, probably contributing to the perception that this group did not work well together. Socially, the group did not rank highly, which may help explain why the members of the group stated on the end of semester evaluation that group dynamics were poor. Specifically, the LoPCol Group had high levels of group skills, organizing work, feedback giving, sharing knowledge, explaining or elaborating and monitoring group effort.

The discussion board analysis showed that both groups had similar amounts of planning, reflection/monitoring and social interaction. The HiPCol Group engaged in more sharing of knowledge and organizing work and little help or feedback giving. The LoPCol Group was the opposite and displayed more evidence of feedback giving and advocating effort. However, these differences must be interpreted in light of the data regarding group dynamics, as the roles adopted in each group seem to have impacted the interaction within the groups.

Interaction and Group Dynamics: Within Group Comparison

Although there were no formal roles assigned in order to allow students the flexibility to change and/or adapt their roles as needed (Strijbos, Martens, Jochems & Broers, 2004), a leader emerged in both groups. These two leaders, however, exhibited very different behaviors. In the HiPCol Group, the leader, Maria, shared many examples and knowledge, exemplified by the following quote: "According to the national guidelines of the American Council on the Teaching of Foreign Languages (ACTFL), teaching culture is one of the 5 C's (Communication, Cultures, Connections, Comparisons, and Communities) that we need to impress upon our students . . ." (November 20). She also tried to facilitate planning within her group by making suggestions about what to include in the page and how to organize it: "This outline looks great! Of course we all need to decide where it needs clarification and to make it visually organized. Thank you all for your time" (October 1). At the end of the semester, she tried to keep everyone organized to make sure the page was ready by the due date: "We need to check the organization and clarity of our ideas. I think I will do this on Thursday, and if I change anything, I will post what I changed. Also, we need to fix the filler text. Anything else before Friday?" (November 29). Maria contributed the most postings in organizing work, sharing knowledge, explaining, and feedback seeking (69 total postings in these areas, which totaled 36% of all postings made by all seven Culture Group members), whereas the next highest number of postings from her group's members were 32, 28, and 21. From her postings, it seems that Maria was trying to facilitate collaboration among her group members and provide a positive, motivating influence within the group with comments such as "As always, questions and comments welcomed" (September 7).

Based on the feedback from the other members of the HiPCol Group, they did not see Maria's leadership as obtrusive. They felt that the group members collaborated well and that everyone contributed equally to the task. Their comments regarding teamwork were mostly positive and reflected a high level of satisfaction regarding how open everyone was towards new suggestions about the wiki page format or content.

Analysis of the LoPCol Group's discussion board shows that one member (Micaela) also emerged as the most active, both in terms of her participation and her interaction. Shortly after the project was introduced in class, Micaela, a motivated first-year MA student, was the first to post to her group, emerging as the group's leader from the very beginning of the semester. She

was also the first to begin organizing the wiki: "I went ahead and organized the main page in a way that seemed interesting to me. If anyone has any complaints or ideas, let me know so we can all be happy with the outcome" (September 23). The end-of-the-semester questionnaire results confirm her leadership. One student mentioned that "one person took the lead" and another added "It was helpful to have a leader to push the group. When one person takes on enormous responsibility, others tend to at least do their part." A clear leader, however, does not necessarily contribute to a group's success.

Micaela generated high numbers of collaborative behaviors in group skills: organizing work, giving help and feedback, sharing knowledge, seeking feedback and advocating effort (133 total posts, comprising 57% of all posts made by the five LoPCol Group members). Thus, Micaela both encouraged cohesiveness within her own group and was consistent about planning work, setting tasks, and meeting deadlines. Advocating effort, or urging other members to participate, was also a frequent behavior of Micaela's. As the semester progressed, group members seemed to be less proactive about interacting with their peers and instead allowed the leader to do their share of the work. Micaela took on the responsibility of picking up the slack of some of the group members. She imposed organization, content and structure to their group page but did welcome other members to make modifications as well: "Please feel free to modify the introduction and other posts that I make to the main page as needed. It's a collaborative effort, so I don't want to take over everything, I just want to stay on top of it for my own sake" (September 27). Although she acknowledged the collaboration aspect of the project, it is apparent that she also desired to maintain control and close management of their wiki. In addition, it is evident that she managed her group carefully, keeping members on top of their tasks: "I want to get started creating pages and linking to them. I have not yet received grammar activity ideas from any of you. I have some ideas of my own and will start posting those to the main page tonight" (October 11). She mentioned collecting the grammar activity ideas from group members in at least five different posts throughout the remainder of the semester, asking that students email these activities to her directly.

Students noted on the opened-ended questionnaire that once the LoPCol Group's leader emerged and "took charge," their contributions were streamlined, members became less active, and participation was strained after the leader made decisions. Micaela also generated high numbers in terms of feedback giving, illustrating that she made efforts to provide input on responses to the board. Unfortunately, however, Micaela's leadership was not seen in a very positive light. Students reported on their end of semester evaluation that dynamics in the LoPCol Group were poor, communication was lacking, and that there was unequal contribution among group members. As a leader, Micaela emerged quickly and naturally, but her style of leadership focused more on planning and was perceived as autocratic, mandating that certain work be completed quickly and by certain dates. Rather than embrace collaboration, Micaela took it upon herself to finish tasks independently because they were not completed, or not completed to her satisfaction.

To summarize, both groups saw the emergence of a self-appointed leader who tried to facilitate the planning within their groups. While the HiPCol leader fostered an environment of encouragement and gave less feedback, the LoPCol leader appeared to be more "bossy" and gave higher amounts of feedback. These trends suggest that Micaela may have assumed a leadership role in the LoPCol Group, focused primarily on the task, while in the HiPCol Group, Maria functioned as the social-emotional leader (Johnson & Johnson, 1994). Open-ended comments also pointed out that the LoPCol Group's leader took on a highly active and directive role in her

group and "pushed" or "directed" group members more than the HiPCol leader, thus creating more of a hierarchy. Micaela was involved in almost every aspect of the LoPCol Group. Members indicated that discussions were initially more creative until their leader came in and streamlined in order to maintain her control. Maria, on the other hand, maintained a more behind-the-scenes role and served to motivate her group members and encouraged them to share ideas for the wiki.

These findings are in line with those of previous research on group leaders. According to Curtis and Lawson (2001), there are two types of leadership: organizing/initiating on the one hand and giving help/feedback on the other. Hale (2003) distinguishes between authoritarian and democratic leaders. In our study, the more authoritarian leader, Micaela, helped to maintain high productivity within her group, even though she was sometimes doing most of the work. However, group morale was low. Maria, on the other hand, encouraged higher morale, but in some cases the group members were less organized or punctual with their assignments. Hale (2003) also found that groups with authoritarian leaders tend to be very productive but suffer from low morale while democratic leaders seem to foster high morale, but perhaps less productivity.

Discussion

The questions that framed this investigation led us to examine how participation is characterized in an online distance group, how cross-institutional groups approach the project, and how students collaborate in an online distance group. We summarize our findings to each below.

Our first research question asked how group members worked together to organize the project, how they contributed to the wiki, and what differences there were between the two groups and the group members. We have seen that each of the two groups approached the task in different ways. In the LoPCol Group, the leader was very focused on the task at hand. However, the behaviors that she initiated in the group (high levels of activity, highly structured, feedback) were not reciprocated by her group members. Perhaps this group depended too much on their leader to accomplish the wiki tasks, and she felt a need to fill in the gaps of members who were not regularly contributing. They began by approaching the tasks in a semi-creative format (sharing ideas, and brainstorming), but once leadership was established, some group members reported that creativity was stifled. The LoPCol Group's leader also provided over half of the comments for their group, taking on a dominant role within her group. The HiPCol Group, on the other hand, maintained collaboration throughout the semester and seemed to enjoy working together. Members did more sharing, complimenting and organizing, whereas the LoPCol Group, mainly the group leader, gave more feedback. Additionally, the HiPCol Group did not offer as many comments within their group, perhaps because they were getting so much encouraging feedback from outside the group.

Regarding contributions, the totals of posts for each group were relatively close in number, ranging from 95 to 123 total posts. Apparently, the level of intra-group communication did not affect how members perceived their group's degree of successful collaboration. What is striking in both groups, however, is the way in which these postings were distributed among group members. That is, some group members were very involved while others were extremely inactive. Both groups included free riders who seemed to participate in the project merely because it was assigned to them, while others were genuinely interested in collaborating with

their group members to create a well-organized and interesting wiki page. Interestingly, this did not affect the HiPCol group, while it might have been an obstacle for the LoPCol group. These results correspond to Curtis and Lawson's (2001) study, whose participants also engaged in a wide range of contributions with some members participating much more than others.

The second research question sought to establish how cross-institutional online groups timed their work on the wiki page with regard to project deadlines and what differences there were between groups. As discussed above, the LoPCol Group revised their wiki consistently throughout the semester, while the HiPCol Group became more active as deadlines neared. This finding is somewhat counter-intuitive as one would assume that time pressure stifles collaboration among members. It could be that the leader dynamic helped to shape how group members approached the task, or simply that diverse groups of people collaborate differently. Since Maria in the HIPCol group was more of a social leader and morale builder, her group members were more relaxed and did not feel the need to work steadily throughout the semester. Micaela was viewed as more authoritarian and managed to either keep her group members on-task or take care of the revisions herself.

Finally, the third research question was designed to investigate which collaborative behaviors learners engaged in and how these behaviors differed between the HiPCol and LoPCol groups. Survey results and the discussion board analysis indicate that the members in the HiPCol Group collaborated better together than the members of LoPCol Group. Although members waited until the last minute to accomplish their tasks, they were more collaborative in terms of sharing, complimenting and organizing, and they received more praise from within their group. Additionally, outside their group there was a high amount of sharing of information from guests. Within the HiPCol Group, participation was balanced among most group members and they were perhaps motivated by the positive comments they received from visiting guests. Further, the role of the leader allowed for more collaboration among group members.

Conclusion

The discussion board and survey analyses indicate that the success of collaborative interaction depends largely on the group members themselves. The differing levels of participation suggest that not everyone was equally involved in the wiki project, which ultimately affected the level of collaboration and the group dynamics in one of the two groups. In addition, the leader in each group significantly influenced the degree of collaboration taking place in her group. Once group members felt that their self-appointed leader had taken over the planning and design of the wiki, they apparently felt less compelled to contribute to the project.

When considering these findings, it is important to remember the limitations of this study. While the data collection was in progress, it was discovered that some group members spontaneously used other forms of group communication (e.g., e-mail, face-to-face meetings) to supplement their discussion board interactions. Unfortunately, it was not possible to record these interactions for analysis, leaving an incomplete picture of how learners engaged with each other on this collaborative project. Apparently, some participants perceived online communication modes as inconvenient, inappropriate or ineffective to address certain issues. It would be interesting to investigate why and how group members choose alternate ways to interact with each other. Further, we should also point out that the different language background of the participants might have inhibited communication. While all discussion took place in English,

some of the non native speakers may not have participated fully due to language barriers, despite their advanced proficiency in English.

The present study analyzed only two groups of learners to gain a deeper understanding of their participation and interaction. As a qualitative case study, the findings reported here are necessarily context specific and do not allow for generalization beyond these two cases. Future research should investigate online collaboration from a quantitative perspective to allow for more general insights into the process of online collaboration in learning environments.

Based on our findings, we offer a number of suggestions for increasing opportunities for effective collaborative learning online. Since communication among all group members is a vital component of collaboration, and since communicating with strangers can sometimes be difficult (Curtis & Lawson, 2001), teachers should train students in good communication strategies, such as giving and seeking feedback, and encouraging or sharing knowledge before beginning a collaborative task. Students can also be made aware of the possible challenges associated with collaborative learning, such as having to rely on others (Curtis & Lawson, 2001) or organizing projects asynchronously with group members so that they are prepared if such issues arise.

Training can also be beneficial in raising students' awareness of the unique aspects of communicating through computer-mediated communication tools. While it has been found that CMC can equalize participation (Wainfan & Davis, 2004), it can also lead to less participation among some students because it is easier not to be noticed in CMC than in face-to-face communication (Hale, 2003). HiPCol members reported that they felt they contributed equally; in the LoPCol Group, it was easier for the less motivated students to fade into the background and let the more vocal students take over. Before beginning a collaborative task, teachers can include training on specific CMC approaches, such as how to encourage participation from less interactive group members. As effective collaborative learning becomes more essential in many types of educational and business situations, it is imperative for educators to train their students to successfully complete a task while working together. As Cecez-Kecmanovic and Webb (2000) point out:

> Learning through a collaborative process cannot be forced upon or induced through outside forces: it has to be internally created, mutually accepted as valid and valuable, and enacted by students ... we cannot directly affect learning but rather learning conditions, seeking to get closer to an ideal learning situation (section 2, para. 4).

Teachers must continue to investigate ways in which they can bring students closer to this ideal learning situation so that they embrace the advantages and ideals of online collaborative learning themselves.

In order to account for varying degrees of motivation and interaction among group members, teachers might consider assigning roles and responsibilities to the different group members. Benne and Sheats (1948), for example, list a number of functional task and maintenance roles, such as coordinator and recorder. Research examining assigned roles such as these has not been shown to necessarily have a positive effect on performance, and could potentially reduce a group's flexibility to deal with conflict and organizational changes (e.g., Strijbos et al., 2004). As in our study, role differentiation can also occur informally (even if formal roles have been assigned). Formal distribution of roles would allow the group to maximize its productive capabilities (Hare, Blumberg, Davies & Kent, 1994; Mudrack & Farrell, 1995), but could possibly lead to unequal collaboration. With assigned roles, students would still be required to collaborate to complete the task, but might have a clearer idea of their responsibilities. This kind of structure can significantly reduce the need for self-coordination so

that a group can focus more on the task at hand. In addition, roles could be helpful for students who have never met, as in this project. By changing roles periodically throughout the project, each student can engage in different ways throughout the semester.

The limitations of this study and questions raised by the results point to several avenues for future research. Since the topics of the wiki pages were mainly chosen by the professors in each course, future studies could allow students to self-select the topics in order to facilitate more motivation and possibly more collaboration. Since it was not within the scope of this analysis, it remains to be investigated in what ways students incorporated each other's suggestions, both from within and outside of the group, into their wiki pages as another measure of collaboration. Members' work on the actual wiki page should also be investigated to gain further insights into the development of a collaborative project, in other words the product itself, not just communication about the product.

These findings provide useful information for educators seeking to embark on collaborative online projects. The interaction among participants, and the roles the participants took on, seemed to have a direct impact on the collaboration the groups were able to achieve. By investigating these online relationships, we can continue to explore the nature of such collaboration and gain a greater understanding of how relationships develop in these media. As wikis and other online resources continue to gain popularity in classroom settings, studies such as this one provide valuable insight for teachers.

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