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Spontaneous Group Decision Making in Distributed Collaborative Learning: Toward a New Research Direction.

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Abstract

This paper attempts to identify and establish spontaneous group decision making in collaborative learning as a new research direction, with particular attention to collaborative learning in distributed online environments. After a brief introduction, related concepts and theories are examined for differentiation of interpretation. The concept of "spontaneous group decision making" is established in the context of collaborative learning. Literature review is conducted to glean anecdotal observations from past research to identify potentially influential factors, and a diagram framework is proposed to charter the territory. The paper also reports findings from a preliminary survey of 159 graduate students on their group decision making activities in online collaboration. The findings indicate that spontaneous group decision making is prevalent in distributed collaborative learning activities and suggest that this area be investigated from a perspective different from the mainstream research on group decision making in other settings.

Keywords: Collaborative learning, Spontaneous group decision making, Online teaching, Distributed learning environment.

Introduction

The Internet, as a communication medium and an interaction platform, is rapidly changing the face of higher education. As Internet-based online teaching gains popularity, it has led to the emergence of new educational approaches such as problem-based learning (Zafeiriou, Nunes, & Ford, 2001) as well as transference and transformation of established teaching practices from traditional classrooms to online environments (Han & Hill, 2007).

One instructional approach that has been heavily promoted and widely practiced in online teaching is collaborative learning. While the effectiveness of collaborative learning in face-to-face settings is well established and its benefits well documented (Johnson, Suriya, Yoon, Berrett, & La Fleur, 2002, p. 380), collaborative learning in online environments is different.

Instead of working face-to-face in groups, online collaboration takes a distributed form. Students from diverse geographical locations form virtual groups and rely on Internet communication technologies to coordinate group processes and carry out group activities. Group interactions are mediated by computer networks. While students are afforded flexibility and new ways of interacting, their group processes and interactive behaviors are also constrained by technical features and functions of the supporting system available in the Internet-based learning environment at the same time.

This mediated and distributed nature of online collaborative learning spurs abundant interests of inquiry and has become a major focus of recent research. Numerous research findings have been reported in support of its usefulness. A comprehensive review of related studies can be found in Resta & Laferrière (2007).

Early studies mostly focused on identifying and validating the relative advantages and disadvantages of technology-mediated collaborative learning over face-to-face groups and students' technological

proficiency for online collaborative learning. Researchers' attention later shifted to system design, distributed group process, learning tasks, group facilitation, and interacting behaviors. While these studies covered many aspects of collaborative learning in the Internet-based learning environment, spontaneous group decision making in distributed collaborative learning – an essential component of collaborative group processes – has been largely overlooked. Although some researchers alluded to decision making in their discussion of group processes and offered some anecdotal observations (e.g., Clark, Nguyen, Bray, & Levine, 2008; Duemer, Christopher, Hardin, Olibas, Rodgers, & Spiller, 2004; Göl & Nafalski, 2007; Joiner, 2004; Moore & Marra, 2005), an exhaustive literature search failed to locate any study that purposefully investigated spontaneous group decision making in the context of distributed collaborative learning. As an important dimension of collaborative process, spontaneous group decision making impacts not only the quality of final group products, but also the effectiveness of collaborating and learning, therefore deserving equal attention from the research community of online teaching and learning.

This paper attempts to identify and establish the area of spontaneous group decision making in collaborative learning as a new research direction, with particular attention to collaborative activities in distributed online environments. Its content is organized as follows. First, related concepts and theoretical frameworks are examined to provide a background and to differentiate interpretations. Then, the concept of "spontaneous group decision making" is established in the context of collaborative learning. Literature review is conducted to glean scattered pieces of empirical (often anecdotal) evidence from published research on collaborative learning and group interaction in general. A diagram framework is proposed to charter the territory by highlighting potentially influential factors for future investigation. Finally, the paper reports the findings from a preliminary survey of graduate students and concludes with a summary of key points.

Distributed Collaborative Learning

Collaborative Learning is a complex and not clearly defined concept (Resta & Laferrière, 2007). In their effort to identify an underlying theoretical framework for describing how collaborative learning occurs in the Web environment, Han and Hill (2007) trace collaborative learning (as an educational theory) to its roots in social theories of learning and theories related to situated and shared cognition. By citing their 2006 work, they describe collaborative learning as "a social process of learning that takes place in the context of communities of inquiry", and explain that "collaborative learning in this context is therefore not just an individual effort, but also a collective effort based on distributed intelligence" (p. 91).

Some writers have attempted to differentiate "collaborative" and "cooperative" learning, but there is neither a universally adopted meaning of these terms nor agreement on precisely what their differences are. In spite of different wordings, the general sense seems to be that cooperative learning emphasizes division of labor among group members, while collaborative learning involves mutual engagement of participants in a coordinated effort to solve the problem together (Dillenbourg, 1999; Panitz, 1996; Roschelle & Teasley, 1995;). Further, cooperative learning tends to be associated with well-structured knowledge domains, but collaborative learning with ill-structured knowledge domains (Slavin, 1997). Collaborative learning requires small groups to confront complex, ill-defined problems in real-life situations (Smith & Dirkx, 2007, p.26). Ultimately, collaborative learning and cooperative learning both involve instructional use of small groups in which students work together to maximize their own and each other's learning (Johnson & Johnson, 1996).

Collaborative learning also differs by group tasks, which may be as simple as learning about a topical subject through collaborative literature research and shared discussion, or as sophisticated as developing solutions to an ill-defined problem. A good example of *content-centered* collaborative learning is Jeong & Chi's (2007) study of knowledge convergence in collaborative text comprehension, with college students collaborating in pairs to learn about the human circulatory system from assigned textbook chapters. In such cases, students are divided into groups to learn the content on a specific subject by participating in online communication -- either asynchronous forum discussion or synchronous text/voice chat. As noted in Han & Hill (2007), asynchronous discussion may be more effective for content-centered collaborative learning, and indeed it has been more preferable to both instructors and students alike.

In contrast, *problem-centered* collaborative learning necessitates frequent and much more intensive group interactions in real time, especially if the problem is ill defined. McConnell (2005) observes that student groups engage in a considerable amount of synchronous communication in order to understand

the problem, negotiate changes in their perception of the "problem", and revise solutions as their work progressed. Kapur & Kinzer (2007) note that problem-centered interactional activities typically involve defining the problem, identifying relevant parameters, brainstorming solutions, evaluating and elaborating suggested alternatives, selecting solutions, and negotiating a final decision (p. 441).

Online Collaborative Learning simply means that collaborative activities for learning take place in a computer-mediated environment. The term "computer-supported collaborative learning" was used as early as in 1989, and soon the area was recognized as an important focus of research (Lipponen, Hakkarainen, & Paavola, 2004). In the following years, various terminologies have been used in reference to collaboration in educational context that involves information technologies to different extents. For instance, "computer/technology mediated/supported group/collaborative learning", "online/virtual group work", and "distributed collaborative learning", to list a few. In part, the rather chaotic use of terminologies is a result of changing information technologies employed to support collaboration.

Computer mediation of group process was pioneered as an innovative idea to improve the effectiveness of onsite group decision making for business management, in the general area of management information systems (MIS). It soon expanded to include task-oriented group collaboration. Software designed to facilitate group decision making was dabbed as "group decision support systems" (GDSS), and systems designed to support team work and group collaboration in general were called "groupware". Experimentation of using standalone GDSS and groupware for collaborative learning started in early 1990s, and continued till Internet-based groupware and online teaching systems took over the enthusiasm (Alavi, 1994; Chang & Simpson, 1997; Jiramahapoka, 2005; Khalifa, Kwok, & Davison, 2001; Lawrence, 2002; Manning & Riordan, 2000; Pappas & Krothe, 1998; Schrum & Lamb, 1996).

In the last one and half decades, computer-mediated group collaboration has moved from onsite, standalone, LAN-based systems to Internet-based, Web-interfaced, and distributed communication platforms. What started as application software highly specialized for centralized management of onsite group processes evolved into a distributed virtual environment, where people in different places can interact and collaborate on projects from distance. As groupware functions get integrated into online teaching systems to support collaborative learning, the line between systems for teaching and learning and for facilitating group processes of distributed collaboration becomes increasingly blurred.

Resta and Laferrière (2007) categorize technological settings of collaborative learning as follows: technology-rich learning environments, network-enhanced learning environments, blended/hybrid learning environments (combining face-to-face and online interaction), and virtual learning environments. When one says "online collaborative learning" today, it is very unlikely to mean anything else but group learning activities in distributed environments – either within a Web-based online teaching system (e.g., Blackboard and Angel), or using some Internet-based P2P text/audio/video communication software such as MSN/Yahoo! Messenger and Skype, or both. To emphasize the *distributed* nature of technological environments and the fact that students participate in group activities from different geographical locations in distance, the terms of "distributed collaboration", "distributed collaborative learning", and "distributed environments" will be used consistently in our discussion from now on.

Students working in collaborative groups often need to make decisions both individually and as a group. Just like in onsite face-to-face settings, equally if not more, distributed collaborative learning requires students to make group decisions in order to achieve the common goal of completing the learning tasks.

Group Decision Making in Collaborative Learning

Group Decision Making (GDM) is described as a decision situation in which (a) there are two or more individuals who differ in their preferences (value systems), but have the same access to information, and each of them characterized by his or her own perceptions, attitudes, motivations, and personalities, (b) who recognize the existence of a common problem, and (c) who attempt to reach a collective decision (Bui, 1987, as cited in Herrera, Herrera-Viedma, & Verdegay, 1995). Although the terms of "group decision making" and "collaborative decision making" have been used interchangeably by Luppicini (2007) and discriminated by others, we will forgo the hair-splitting differentiation and use the term "group decision making" consistently throughout our discussion.

GDM as a research domain has produced a huge body of literature in the MIS field since Roberts (1975) published the first article on this topic. While early studies focused on decision making in small face-to-face groups, the focus shifted in early 1980s to computer-mediated settings, development of GDSS

(Gallupe, Desanctis, & Dickson, 1988), and ultimately to web-based, distributed environments. Besides comparative studies of decision making between face-to-face and computer-mediated groups, researchers have investigated all kinds of factors potentially impacting the decision making performance and decision quality of a group, such as group size/composition/dynamics, task/problem type, facilitation, cognitive style, cultural difference, gender difference, time constraint, and so on.

A similar shift of research focus has happened in the field of collaborative learning, from face-to-face to computer-mediated groups and further to distributed environments (Resta & Laferrière, 2007). However, there has been little overlap between the two fields, except a few attempts of using standalone GDSS to support collaborative learning (Alavi, 1994; Chang & Simpson, 1997; Lawrence, 2002; Pappas & Krothe, 1998) and occasional cross references in discussion of group dynamics (Johnson et al., 2002).

GDM has been researched mostly as a formal independent process focused on one single decision making task in scenarios of business and organizational management. However, this does not mean that only groups in those settings make decisions. Evidently, students working on collaborative learning tasks need to make all sorts of decisions as a group throughout the course of collaboration for learning.

GDM activities may not be present to the same extent in all collaborative learning scenarios. In content-centered collaborative learning, there may be little need for decision making at the group level, except for negotiating meeting schedules and group logistics. However, in problem-centered collaborative learning, especially when the problem is ill defined, GDM becomes a prominent part of interactive activities. Besides setting up meetings and working out group logistics, students as a group need to make decisions on how to solve the task problem, all the way along and throughout the project lifespan (Kapur & Kinzer, 2007).

The collaborative learning task itself can be such that it requires students to make one final group decision. For instance, law students may work in groups to learn about aspects of legal practice or judging that involve GDM, to gain sophisticated understanding of judicial decision making, and to improve GDM in a variety of legal practice areas (Cobb & Kaltsounis, 2008). Medical students may be asked to make a group decision of diagnosis on a sample patient case. MBA students may work in groups to make a business decision of resource allocation (Blaskovich, 2008) or financial investment (Cheng & Chiou, 2008).

Apparently, the nature and extent of GDM in collaborative learning, regardless of being distributed or not, depend not only on whether it is content-centered or problem-centered, but also on what kind of problem is used as the learning task. An ill-defined problem may be expected to spur more problem-related GDM activities. The analysis above suggests three kinds of GDM activities in collaborative learning: (1) negotiation of meeting schedules and group logistics, (2) identifying/deliberating/selecting options during the process of problem solving or project development, and (3) reaching one final group decision as required by the task problem or scenario. While the final one is task-imposed, the first two are spontaneous.

Task-imposed GDM occurs when the task problem explicitly dictates that a formal group decision has to be reached upon the conclusion of a group meeting or collaborative session. It is in reference to the one final decision that a group of decision makers have to reach as required by the task problem, which is the ultimate objective and final product of group efforts. The bulk of existing research on GDM, mostly published in the MIS field, focused exclusively on this kind of group decision making process.

In contrast, *spontaneous GDM* refers to any decision making activities undertaken by a group of collaborative learners, during the process of completing a project or developing solutions to a task problem as a group, regardless of whether the task problem is ill defined or not. It is in reference to any decisions made during the collaborative process, not necessarily limited to one final and formal decision as dictated by a decision making task. Spontaneous GDM may occur anywhere and anytime as necessitated by the group process itself. The concept of "spontaneous GDM" is proposed to emphasize the spontaneous nature of group decision making in collaborative learning, to differentiate it from traditional GDM research.

Spontaneous GDM in collaborative learning has not been a focus of any published research either in the field of GDM or of collaborative learning. Although oftentimes students were used in GDM research as surrogate "decision makers" working on a decision making task disguised as a class project, the researcher's attention was exclusively fixed on GDM-centered factors, processes, and parameters, with little consideration of the context and purpose of collaborative learning (e.g., Bandy & Young, 2002;

Blaskovich, 2008; Cheng & Chiou, 2008; Li, 2007; Postmes & Lea, 2000; Yi & Park, 2003; Zhou & Zhang, 2006).

Spontaneous GDM in Past Research

The absence of publication directly focused on spontaneous GDM in collaborative learning does not mean that this issue has eluded researchers' attention completely. About a dozen articles did mention students' decision making in connection to collaborative learning, with some in onsite face-to-face settings and others in online environments, albeit quite briefly (Chang & Simpson, 1997; Clark et al., 2008; Gokhale, 1995; Göl & Nafalski, 2007; Haller, Gallagher, Weldon, & Felder, 2000; Hron, Hesse, Cress, & Giovis, 2000; Hunt & Burford, 1994; Joiner, 2004; Moore & Marra, 2005; Pearce, Clarke & Gannaway, 2007; Wang, Sierra, & Folger, 2003; Zafeiriou, Nunes, & Ford, 2001). Some anecdotal findings on students' spontaneous GDM were reported in a small number of articles, and the following paragraphs summarize bits and pieces gleaned from these works.

Technological Platform

As far as one can tell, the earliest attempt of providing support for spontaneous GDM in collaborative learning was reported in Alavi (1994). In this experimental study of collaborative learning in classroom setting, a GDSS (VisionQuest) was employed to support collaborative activities, with nine tools (brainstorming, comment cards, compactor, point allocation, ranking, rating, scoring, subgroups selection, and voting) available for facilitating GDM processes. Students were free to use these tools in any way, sequence, and combination they wished, and not restricted from face-to-face communication. They were given GDM instructions along with a tutorial on GDSS system features. Although significantly positive impacts were found on students' experience of collaborative learning and performance on final exam, nothing was reported about their behaviors or processes of spontaneous GDM.

Use of groupware and GDSS has been found to help improve decision quality in collaborative learning (Benbunan-Fich, Hiltz, & Turoff, 2003). Fjermestad (2004) suggested that the use of GSS improved decision quality, depth of analysis, equality of participation, and satisfaction. However, the limited nonverbal communication cues and communication spontaneity served to increase the time needed to make decisions and reach consensus (Smith, 2005; Valaitis, Sword, Jones, & Hodges, 2005).

Synchronous vs. Asynchronous

Several researchers noted student preference of synchronous communication (text chats) over asynchronous communication (discussion forum/board) for brainstorming and making group decisions (Han & Hill, 2007; Johnson et al., 2002; Kapur & Kinzer, 2007). Valaitis et al. (2005) reported that most students felt synchronous chat was invaluable for problem-based learning, particularly for GDM and objective setting, but at the same time "overwhelming and frustrating" due to issues such as everyone "talking" at once, slow typing, lack of peer response, multiple conversations, fast paces, and feeling unheard. Mercer (2002, as cited in Valaitis et al., 2005) reported that chats provided immediacy of responses and enabled collaboration and negotiation for decision-making within a short time frame. McConnell (2002) found that chats led to agreements in decision-making and supported convening of groups, which ultimately led to more asynchronous discussion. Mattheos, Nattestad, Schittek and Attstrom (2001) found that students felt synchronous communication was far superior to asynchronous communication for problem discussion and hypothesis generation.

In-Group Conflicts & Difficulty

Nevertheless, when synchronous online meetings with full participation of all group members are not feasible, students may have extreme difficulties in reaching consensus and validating group decisions. McConnell (2005) reported that in his study, subgroups of students went ahead to meet online as previously scheduled, and later posted summaries of decisions made by subgroups in discussion forums, inviting those absent to comment, as a remedy to seek for group validation and consensus. This approach proved unworkable, as those not present would question the meeting outcomes and demand that decisions made by subgroups be renegotiated. Further, in one case, ground rules and project focus were changed afterwards in the discussion forums, and the interpretation of decisions made in chat sessions was questioned even by some of those who had taken part in them. These difficulties led to frustration for all, and even collapse of one group. In addition, the distributed nature of online environments and lack of nonverbal cues created more difficulty for student GDM in collaboration, as noted in Johnson et al. (2002).

Lack of GDM Skills & Guidance

A common problem in collaborative learning is the lack of GDM skills among students (Duemer et al., 2004). Ochoa and Robinson (2005) argue that "group members are less than able to distinguish between the quality and quantity of contributions or between the idea and its advocate", and that "the instructor should provide students with training in group process and advocacy" (p.18). Providing students with basic GDM guidelines may have a positive impact on both learning outcomes (Alavi, 1994) and group process (Katz & Rezaei, 1999). In Prichard, Bizo & Stratford's (2006) study, a one-day workshop was conducted as experimental treatment, to train students on GDM among other teamwork skills. It was found that prior training on teamwork skills produced superior group work. Where training and basic guidelines were not given, students had tremendous difficulty in making group decisions.

Process & Decision Quality

Johnson et al. (2002) observed that when making group decisions, students often did not really go through a forming/brainstorming phase, or if they did, it was very rapid. Kapur & Kinzer (2007) reported that in groups working on an ill-defined problem of collaborative learning, "the first idea put forth tended to be taken up with little debate on its merits" (p. 451). Ochoa & Robinson (2005) observed that one group with individual opinions split along 3-2 divide and there was little discussion before the group decided in favor of the minority opinion. As a result, the decision quality ended up being compromised, and the group went with less than optimal solutions, which ultimately led to inadequate final products for the collaborative projects and a lowered grade for the group's performance in class.

Personality Dominance

Kapur & Kinzer (2007) reported that in the brainstorming and deliberation stages of GDM, "the group member who proposed the idea ended up dominating the discussion" (p. 451). Even when the most able (of prior knowledge) member was the proposer and ended up dominating the subsequent discussion, it was not a guarantee of productive group outcome.

Other researchers (McConnell, 2005; Wang, Sierra, & Folger, 2003) also noted that students suffered from anxiety about inclusion in the GDM process when it was dominated by strong personalities who took strong views on issues and were unwilling to negotiate around them. The lack of effective group functioning prompted students to seek for "outside" intervention and to ask an authoritative figure to make some important decisions on behalf of the group.

Facilitator & Facilitation

Several researchers mentioned two alternative tactics students had employed for facilitating group functioning in general and for managing GDM processes in particular. One tactic was to rotate the facilitator role among group members on a weekly basis, and the other was to have a "self-appointed" leader emerged in the group (Johnson et al., 2002, p. 388).

Smith (2005) reported that student groups implicitly created "surrogate or substitute teachers", typically played by older members, assuming roles traditionally associated with the instructor such as leadership and instruction, and that having a "surrogate teacher" allowed the members to avoid the need to make decisions in the midst of competing voices and confusion about group direction. Ochoa & Robinson (2005) also observed that in one group, an individual who felt strongly about the topic/project emerged as a self-appointed gatekeeper, directing the discussion and deciding when consensus was reached.

Having a self-appointed leader can be good news for the group, especially if the leader has strong interpersonal skills, leadership quality, and capability of group and time management. Duemer et al. (2004) reported that self-appointed leaders used empowerment, organization, and decision-making skills to guide the group process. Students praised the good decision making skills of their leaders, stating that "without the ability to make decisions, they thought the project had the possibility of stagnating and becoming unproductive" (p.723).

However, the "self-appointed leader" tactic may backfire and be counterproductive. Johnson et al. (2002) observe that when one person emerges as the leader, he/she may be viewed as "having strong opinions and personality" (p. 388). The self-appointed leader may not necessarily have the skills to elicit productive participation from other group members, effectively short-circuiting the problem-solving process (Ochoa & Robinson, 2005), dominating the group's decision making, and even making decisions *for* others (Kapur & Kinzer, 2007). In view of this possibility of a self-appointed leader overrunning the

group, Duemer et al. (2004) advise that "accountability (via peer evaluation) … forces the leaders to work with the group and share in the decision-making process" (p. 725).

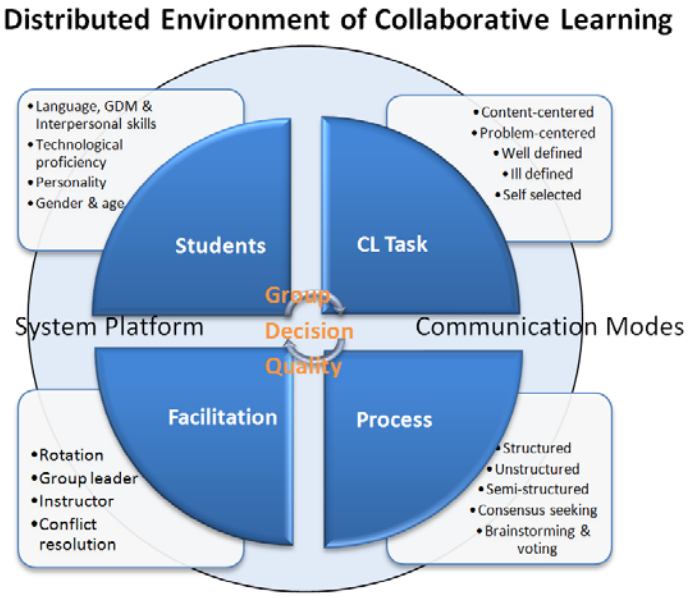
Consensus Seeking vs. Voting

Katz and Rezaei (1999) reported that students used both consensus seeking and voting in GDM, even though they were encouraged to use the former whenever possible. They hypothesized that consensus encouraged more involvement by group members and increased the number of ideas generated.

However, Lauzon (2000) warned that "consensus types of online collaborative learning could reinforce the dominant ideology when minority group members are not allowed full participation within the discussion and decision-making processes" (p. 184). Knotek (2003) found that "social power and influence" were reflected in the opinions adopted as group consensus. The input of high-status team members strongly influenced the perspectives and decisions of the whole team, while alternative and minority opinions put forth by low-status members received little hearing and had small likelihood of influencing the group's decision.

Research Framework

The above analysis and review of past research identifies some potential factors and key issues relevant to spontaneous GDM in distributed collaborative learning. To summarize and put these factors and issues in perspective, a diagram of research framework is proposed to guide future investigation, as shown here.



Obviously, potentially influential factors need to be investigated in relation to decision quality which in turn should be connected to final products and effectiveness of collaborative learning. Impacts of individual factors and their interactions should be studied with equal attention.

Preliminary Survey

To gain initial knowledge about spontaneous GDM in distributed collaboration learning, a Web-based questionnaire survey was conducted of graduate students in a library and information science program, where 86.9% of classes were taught completely online and a high percentage (in range of 80-90%) of classes of required courses had students to complete a substantial group project. The survey (URL) was distributed by emailing via the school's administrative listserv, and the survey scope was limited to the whole student population (2119 in total) as of the summer of 2008. A total of 159 valid responses were collected, and the response rate was 7.5%, admittedly a rather low figure.

The survey showed that spontaneous GDM was prevalent in distributed collaborative learning. In terms of mean percentages of collaborative activities involving GDM, 68.41% involved some and 54.54% involved extensive GDM (N=157, STD= 29.808 and 29.071 respectively).

More than 72% of subjects reported that their online meetings were facilitated by themselves, 12.3% by the instructor, and 14.8% not facilitated at all (N=155). Specifically, 41.9% reported that their online meetings were facilitated by any student willing and available, 16.8% by each member in rotation, and 14.2% by an elected group leader (X^2 =47.419, p<0.001).

Specific to GDM process, 7.5% of subjects chose "well structured with facilitation", 22.0% "semi-structured with facilitation", 37.1% "unstructured with facilitation", and 33.3% "casual without facilitation" (N=157, X^2=34.873, p<0.001). In other words, although over 66% of subjects indicated that their GDM processes were facilitated, only 29.5% took a well-structured or semi-structured approach to making decisions as a group.

Of those indicating that their GDM process was facilitated, 18.9% stated that facilitation was by an elected group leader, 28.3% by members in rotation, and 50.0% by anyone willing and available (N=106, X^2=88.057, p<0.001). In essence, the data revealed a pattern of facilitation similar to that of online group meetings, as noted earlier.

When asked to indicate when GDM was most likely to occur within the life span of a group project, 70.4% of subjects chose "all the way through", 15.7% "mostly in the initial stage", 9.4% "till half way through", 2.5% "mostly in latter half", and 1.9% "at middle point" (N=157, X^2=262.981, p<0.001). The finding suggests that GDM tends to be heavier in the initial phase and tail off throughout a project.

The survey found that about 1/3 of group efforts were spent on developing a project plan and identifying/assigning mini-tasks, and approximately 1/5 on each of the following GDM tasks: determining project scope, brainstorming, deciding which idea to adopt, scheduling group activities, and deciding on technical issues related to project implementation. Less than 10% of group activities were for electing a group leader.

In spite of the argument in favor of synchronous communication for GDM (Han & Hill, 2007; Johnson et al., 2002; Kapur & Kinzer, 2007; Valaitis et al., 2005), the survey revealed a noticeable preference for asynchronous over synchronous and online over in-person/telephone communication avenues. In descending order, the estimated percentages of use of different communication avenues are: email 42.6%, discussion forum 23.7%, Internet-based audio/video teleconferencing 17.6%, text chatting/messaging 12.6%, in-person 11.7%, and telephone 6.5%. This finding, which seems consistent with McConnell's (2002) observation that real-time conversation ultimately leads to more asynchronous online discussion, may also be explained by geographical dispersion of student location and instructors' grading practice. Collaborating from different time zones (even continents), students would have real difficulty with real-time meetings, and possibly be left no choice but to make group decisions by emailing and/or posting in discussion forums. On the other hand, many instructors based their grading partially on tallies of postings in discussion forums (taken as evidence of class participation), which created a grading pressure on students. Consequently, students might have deliberately moved their GDM activities from real-time meetings to discussion forums, at the expense of group decision quality and efficiency.

The survey also revealed that students mostly took semi-structured and unstructured approaches to GDM, without much use of formal ranking and voting functions. Only 13% claimed to have used the system's voting function in their GDM process, and no more than 30% indicated that contributed ideas or identified options were formally ranked based on merits, which implies that decisions were mostly made by consensus. Nevertheless, 54% claimed to have used virtual whiteboards for listing contributed items when brainstorming.

Students may have deliberately chosen a laissez-faire approach. However, their preference of an unstructured or semi-structured approach is more likely a result of their unawareness of more effective GDM tactics and lack of GDM skills, as noted by Duemer et al. (2004) and Ochoa & Robinson (2005). In fact, 49% argued that their collaborative efforts would be more productive if they were taught how to make group decisions more effectively. Their expressed wishes for more instructional help with GDM makes the latter a more plausible explanation.

Contrary to the common belief of anonymity being a positive factor, 53.6% of respondents found it undesirable in brainstorming and more than 25% undecided. With formal ranking and voting not being practiced by the overwhelming majority of students, the anonymity factor was taken out of the deciding phase as well. Apparently, the commonly assumed positive effects of anonymity in GDM need to be reassessed in the context of distributed collaborative learning. Instructors' grading practice may also in part explain students' disliking of anonymity in brainstorming and GDM. Instructors commonly require active (and equal) contribution and penalize "social loafing" (Blaskovich, 2008) in group projects. Furthermore, students may be under the pressure of having their contributions noticed by peers, for fear of being perceived as not contributing to the group effort at an equal level.

The survey also revealed some gender and age differences. Female students reported significantly greater percentages of GDM activities by circulating emails (44.10% vs. 27.67%, F=4.443, p=0.037) and were less in favor of ranking ideas in group discussion, as reflected in ratings on 5-point Likert-scale (3.37 vs. 2.69, F= 4.6, p=0.034). Students of age 50 and older reported more use of telephone conferencing for GDM (13.0% vs. 3.68-4.0%, F=3.078, p=0.018) and greater percentage of meeting time

used for resolving conflicts (37.0% vs. 7.13-20.67%, *F*=2.603, *p*=0.038). Finally, subjects in their 20s were more likely to use the system's voting function (3.0 vs. 3.73-4.53, *F*=3.595, *p*=0.008), but less in favor of anonymity in brainstorming (3.71 vs. 2.89-3.65, *F*=3.649, *p*=0.007).

Finally, more than 37% thought more system support for GDM was needed, and 33.1% believed that better system support for GDM would have led to better group work.

Conclusion

Distributed collaborative learning has become an increasingly popular instructional approach in online teaching. In spite of the large body of existing literature on collaborative learning and online teaching, spontaneous GDM has caught little attention in the research community.

A preliminary survey of graduate students establishes that spontaneous GDM is prevalent in distributed collaborating learning in online teaching and presents different behavioral and theoretical issues. As an important dimension of collaborative process that impacts not only the quality of final group products but also the effectiveness of collaborative learning, spontaneous GDM in distributed collaborative learning needs to be investigated from a perspective different from the mainstream research on GDM in other settings.

Based on anecdotal observations and findings from existing literature, a diagram framework of spontaneous GDM in distributed collaborative learning is proposed, as an initial step, to charter the territory of this newly identified research area, and to guide future investigation.

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Appendix A. Web Survey Questionnaire

Welcome to this web survey site!

This online survey is part of an on-going research about students' collaborative learning in online education. Specifically, it focuses on students' group decision making in a distributed virtual environment.

Group decision making is about how groups consisting of multiple members make decisions. In the specific context of this research, group decision making means that a group of students make a decision jointly on issues related to the group's completion of a task (given assignment or self-selected project) to fulfill class requirements as specified by the instructor. The decisions may pertain to planning/coordination of group activities, development of ideas, choice of a feasible project, identification and assignment of responsibilities/mini-tasks, etc.

This online survey is absolutely anonymous, and all data collected will be held strictly confidential. Participation in this survey is voluntary and will not be compensated with credits or in any other forms. Similarly, choosing not to participate will not affect your academic standing either in the MLIS program or in any classes. You may choose to cancel at any point by simply closing the browser window without hitting the SUBMIT button.

However, please be advised that we will not be able to delete your response from the dataset retrospectively after you have completed the survey and hit the SUBMIT button, since the system is not tracking individual responses in its storage.

Thank you for support by participating. Your contribution to this research effort is highly appreciated. Please contact Dr. Geoffrey Z. Liu (gliu@slis.sjsu.edu), the primary investigator, if you have any questions about this research.

Please click on the NEXT button when you are ready to proceed.

Part A. General & Demographic

* **1.** Age

☐ 20-29 ☐ 30-39 ☐ 40-49 ☐ 50-59

☐ 60-69 ☐ 70-79 ☐ >=80

* **2.** Gender

☐ Male ☐ Female

* **3.** Native English speaker

☐ Yes ☐ No

* **4.** Internet/computer proficiency

☐ Poor ☐ Low ☐ Average ☐ High ☐ Expert

* **5.** Please specify the number of classes you have taken at SJSU in each of the delivery modes specified below.

(Make sure to check off the little square preceding each answer entry and enter a number in the trailing textbox.)

- ☐ **On-site** meetings + **on-site** activities
- ☐ **On-site** meetings + **online** activities
- ☐ **Online** meetings + **on-site** activities
- ☐ **Online** meetings + **online** activities

* **6.** How many student project groups have you participated as part of your learning experience in the MLIS program? Please categorize below as best as you can.

(Make sure to check off the little square preceding each answer entry and enter a number in the trailing textbox.)

- ☐ With **on-site** group activities only
- ☐ With **online** group activities only
- ☐ With group activities **both** on-site and online

* **7.** Your **on-site** group meetings were facilitated mostly by

- ☐ The class instructor
- ☐ The elected group leader/coordinator
- ☐ Each group member in rotation
- ☐ Anyone available and willing at the time of meeting
- ☐ Not facilitated
- ☐ (Not Applicable)

* **8.** Your **online** group meetings were facilitated mostly by

- ☐ The class instructor
- ☐ The elected group leader/coordinator
- ☐ Each group member in rotation
- ☐ Anyone available and willing at the time of meeting
- ☐ Not facilitated
- ☐ (Not Applicable)

* **9.** Your **on-site** group activities usually took place

- ☐ During a normal class meeting
- ☐ Immediately after a class meeting
- ☐ At scheduling unrelated to class meeting
- ☐ None of above
- ☐ (Not Applicable)

* **10.** Your **online** group activities usually took place

- ☐ During a normal class meeting
- ☐ Immediately after a class meeting
- ☐ At scheduling unrelated to class meeting
- ☐ None of above
- ☐ (Not Applicable)

* **11.** To what extent virtual breakout rooms were used for your online group activities, especially when it was during or immediately after a normal class meeting?

☐ Always ☐ Usually ☐ Sometimes

☐ Occasionally ☐ Once or twice ☐ Never

Part B. Group Decision Making

* **12.** What is the percentage of your group activities that involved **some degree** of group decision making?

* **13.** What is the percentage of your group activities that involved **extensive** group decision making?

* **14.** Which one of the following best describes the occurrences of your group decision making activities?

- ☐ Mostly at the initial stage when setting things up
- ☐ Mostly in the middle of a group project

- ☐ Right from start till half-way through the project
- ☐ Mostly in the latter half of the project
- ☐ All the way through the whole project life span

* **15.** Below is a list of typical decision making tasks for student project groups. For each type applicable, enter a percentage score to indicate its proportion relative to all your group activities.

(Make sure to check off the little square preceding the answer entry and enter a number in the trailing textbox.)

- ☐ Electing a group leader/coordinator
- ☐ Developing a general plan
- ☐ Establishing a schedule of future group activities
- ☐ Developing possible project ideas
- ☐ Deciding on one project idea (among others identified) for the assignment
- ☐ Determining the project/assignment scope
- ☐ Identifying mini-tasks and assigning to group members
- ☐ Reaching a decision on technical issues of project implementation
- ☐ Resolving internal politics and conflicts
- ☐ Other

* **16.** Which one of the following best describes the style of your group decision making?

- ☐ With a facilitator -- well structured (i.e., following timed steps of brainstorming, deliberating, evaluating, ranking, voting etc.)
- ☐ With a facilitator – semi structured (e.g., following major steps without timing)
- ☐ With a facilitator – unstructured (e.g., everyone talks, agree? Done!)
- ☐ Without a facilitator – casual (i.e., no structure nor noticeable steps of movement)

* **17.** Your group's decision making was facilitated mostly by

- ☐ The class instructor
- ☐ The elected group leader/coordinator
- ☐ Each group member in rotation
- ☐ Anyone available and willing at the time of meeting

☐ Not facilitated

* **18.** What is the percentage of your **group decision making activities** that were carried out in each of the following ways?

(Make sure to check off the little square preceding the answer entry and enter a percentage number (without "%") in the trailing textbox.)

☐ By meeting onsite and in person

☐ By telephone conferencing

☐ By circulating emails among group members

☐ By participating in online discussion forums

☐ Through real-time text chatting or instant messaging

☐ By Internet-based audio/video teleconferencing

☐ Other (please specify)

Part C. Technological Support

* **19.** Which of the following systems have been used for your online group activities?

(Select all that apply.)

☐ Elluminate ☐ Blackboard

☐ Angel ☐ Skype

☐ Yahoo! Messenger ☐ MSN Messenger

☐ Windows IM ☐ None

☐ Other (please specify) ☐ Not applicable

* **20.** The school's online teaching system provided sufficient support of our project group's decision making.

☐ Strongly agree ☐ Agree ☐ Not sure ☐ Disagree ☐ Strongly Disagree

☐ Not applicable

* **21.** Our group used the virtual whiteboard (or something equivalent) for listing identified items/options.

☐ Strongly agree ☐ Agree ☐ Not sure ☐ Disagree ☐ Strongly Disagree

☐ Not applicable

* **22.** Options under consideration were formally ranked and sorted by our group.

☐ Strongly agree ☐ Agree ☐ Not sure ☐ Disagree ☐ Strongly Disagree

☐ Not applicable

* **23.** Whenever available, we used the system's voting function to make a group decision.

☐ Strongly agree ☐ Agree ☐ Not sure ☐ Disagree ☐ Strongly Disagree

☐ Not applicable

* **24.** The support system should automatically compile and list items contributed by participants

☐ Strongly agree ☐ Agree ☐ Not sure ☐ Disagree ☐ Strongly Disagree

☐ Not applicable

* **25.** When brainstorming, the system shouldn't allow us to see who said what.

☐ Strongly agree ☐ Agree ☐ Not sure ☐ Disagree ☐ Strongly Disagree

☐ Not applicable

* **26.** More system support is needed for making group decisions in a well structured manner.

☐ Strongly agree ☐ Agree ☐ Not sure ☐ Disagree ☐ Strongly Disagree

☐ Not applicable

* **27.** Our meetings would be more productive if students were taught how to make group decisions more effectively.

☐ Strongly agree ☐ Agree ☐ Not sure ☐ Disagree ☐ Strongly Disagree

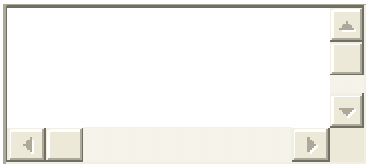
☐ Not applicable

* **28.** Our group would have produced better work had the online teaching/collaborating system provided better support of group decision making.

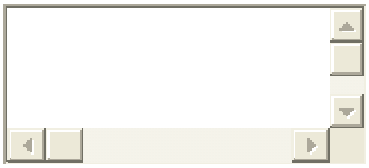
☐ Strongly agree ☐ Agree ☐ Not sure ☐ Disagree ☐ Strongly Disagree

☐ Not applicable

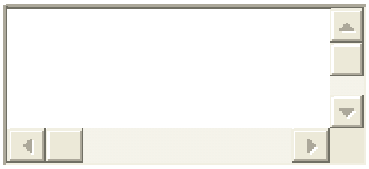
29. Any additional features/functions you wish the online teaching/collaborating system provide? Please specify.



30. Any observation about online group activities you wish to share? Please briefly explain.



31. Any comments about this research? Please enter below and keep it brief.



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