Understanding Leadership Roles in Online Collaborative Learning Teams

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Abstract: This paper proposes an approach for understanding how leadership roles emerge in a collaborative learning team. In such teams, the leadership is usually distributed and shifts among team members over time. The assumption of this paper is that leadership is exercised and perceived through interpersonal interactions, which can be studied at the level of the local dynamic behaviors of the team. Following Gibson (2003), team interactions from online discussion boards are coded as sequences of participation shifts (P-shifts) to represent the participation status of team members as contributor, target and unaddressed recipient. In other words, sequences of P-shifts represent the local dynamic behaviors of the team and the leadership role can be analysed in terms of distinctive patterns of participation in relation to other team members. Empirical studies with 7 teams of students show that interactions in collaborative learning teams share the basic propensity rule with traditional team but not status differentiation. Moreover, leaders usually exercise their leadership and are perceived as leaders through their patterns of participation in online discussion boards. Additionally, the leaders are more likely to receive a response either from other members or other leaders in the team, when they request it.

Keywords: Emergent Leadership, Collaborative Learning Team, Participation Shift

1. Introduction

1.1 Collaborative Learning Team

This paper is interested in collaborative learning teams, which are virtual learning teams comprising distributed online students collaborating and achieving an academic goal together through a computer mediated communication system. Like a traditional face-to-face team, a virtual learning team employs team-based learning as a primary strategy to foster consensus among team members and to enhance individual cognitive ability at the same time [1]. However, because of space and time constraints and missing social cues as well as the limitation of technology-based communication tools, a virtual learning team generally differs from a traditional team in a variety of aspects. For example, these include the nature of the group forming [2,3], the processes used to achieve consensus [4], the satisfaction of team members with process and outcome [5], social presence [6], and the emergence of leadership [7,8] among others.

Once students are assigned to work in a team, the issue of their role inevitably arises. During the period of collaboration, there are normally different roles performed by team members. Additionally, those roles can be interchangeable over the collaboration time. The ability to better understand the roles students take during the learning process is very crucial because it benefits the facilitator in many aspects. For example, it may allow a facilitator to provide an appropriate support for online students to enhance group performance [9,10,11]

and to provide a better design of the appropriate activities for role allocation in a virtual environment [12,13]. Although every role should be recognized precisely, identifying every role usually requires much effort from the facilitator. Therefore, to suit constraints on time, the focus falls naturally on the key role of leadership since the leaders are normally the firstly to be recognized [14]. Even then, it has been stated that leadership has the effect of building trust among team members [15,16] and it is the major indicator of the team success [15]. Nonetheless, there has been relatively little research work on leadership in virtual teams [16,17].

1.2 A Definition of the Leadership Role

The leadership role studied in this paper is the person of influence in the team. The leaders exercise their influence by performing both task leadership behavior and team maintenance behavior [7] through interpersonal interaction on the online discussion board. Task leadership behaviour includes coordination of team actions; team maintenance behaviour includes actions that support motivation and communication among team members. More specifically, the leadership role involves influencing the team with task-oriented action as well as coordinating and directing the team. However, in a distributed virtual team where team members usually make diverse knowledge contributions and there is normally no appointed leadership role, the emergence of the leader is difficult to explain using conventional leadership theories particularly from traditional face to face teams.

1.2.1 Emergent Leadership Role of A Collaborative Learning Team

As already noted, leadership roles in a collaborative learning team are neither assigned nor selected, but emergent. Moreover, the assigned collaborative task is usually designed to require shared leadership. The leadership of collaborative learning teams can thus be considered as associated with either leaderless teams or multi-leader teams as in Jarvenpaa and Leidner's work [18]. This means that the problem of identifying leadership roles in this kind of team is very challenging.

This paper aims to understand the emergence of the leadership role by making the assumption that leadership roles are expressed through interpersonal interactions over the collaboration time and that leadership is also perceived through those interactions. If this assumption is correct, then the local dynamics of interaction behavior provide signals for inferring and perceiving leadership roles and a key challenge is to understand those signals.

2. Literature Review

Generally, there have been different leadership theories for differentiating the leadership role from that of other team members. These include trait and style theories [19,20] that attempt to define the traits or behaviors that differentiate leaders from others, situational and contingency theories [21,22] that attempt to identify the leader's behavior and the environmental circumstances and functional theories [7] that attempt to define the leadership functions helping the team to achieve the goal.

Some theories have been applied to the problem of identifying the leadership role in a distributed virtual team. For example, based on trait and style theories, many of the current research works have mainly focused on the frequency of participations and the volume of such participations which are classified as the leader's special behavior. The use of developed tools such as icons [9], conversational skill sentences [23], and the number of posted messages and their contents [7,8] are thus, widely examined. These approaches

describe behavior that is expected to be performed by the leader without taking the local dynamic behavior of the team into account.

On the other hand, the functional theory has been widely accepted as potentially suitable for a distributed virtual team because it focuses on the team behavior not only on a single individual. Many research studies have attempted to identify different kinds of leadership behaviors required for team success. Consequently, leadership functions have been considered either explicitly [24] or implicitly [25]. The former aims to clarify the leadership function valued and required by team members, while the latter estimates the leadership perception from network position of the leader, which reflects the historic action of the leader. However, these studies have also not focused on the local dynamics of interaction which may be important to understanding the emergence of the leadership role through the course of collaboration.

2.1 Motivation and The Proposed Model

As mentioned before, this paper focuses on the local dynamic behavior of the team in an attempt to understand the emergence of the leadership role more precisely. By local dynamic behavior we mean the pattern of interpersonal interactions of the team. Those interactions are coded as sequences of participation shifts (P-shifts) [26] to represent the sequential patterns of (online) turn-taking among team members. At the same time, sequences of P-shifts represent the local dynamic behaviors of the team which is subject to the influence of the leader in relation to other team members through interpersonal interaction. Although P-shifts were conceptualized in the context of conversation in traditional face to face teams and used in analyzing conversation in these kinds of team [26,27], this paper proposes application to the online environment, arguing that online interaction will exhibit some of the features of face-to-face interaction, and will also be potentially distinctive in others. An analysis of P-shifts in this online setting will reveal the local interaction dynamic of the team.

2.2 P-shifts

Basically, a P-shift has been conceived to analyse the sequential nature of conversational interaction and to explore the social rules that govern interaction in group settings. In face-to-face conversation, the conversation is governed by rules such as there is only one speaker at any time, and not everybody has the same opportunity to speak. Therefore, the P-shift characterizes the participation status of each team member at any interaction point as speaker, target or unaddressed recipient. Every speaking turn is seen as a point of interaction and Gibson [26] described 13 possible P-shifts from 4 types of turns as shown with the explanation in Table 1. As shown in table 1, at any moment in time, the speaker (designated as A) can speak to the team (designated as O) or the addressed target (designated B). At the next speaking turn, the speaker can be the same speaker (A), the addressed target from the prior turn (B), or someone else in the team other than A or B (X). Additionally, the target in the next turn can be the same as the prior speaker (A), the prior addressed target (B), or someone else in the team other than A, B or X (Y). Each speaking turn and the turn that follows it can be classified as one of the 13 P-shifts in Table 1, leading to a characterization of local interaction patterns in terms of the frequency of occurrence of each P-shift.

P-shifts used in this paper are quite different from the conversational prototype because of the online environment; hence we refer to contributor rather than speaker, to the target or addressee, and to the entire group. We also single out a potential leader in the role of contributor or target (denoted by a following "(L)"). For example, we are interested in the P-shifts including AO (a team member makes a contribution to the entire group) and

A(L)O (a team member who is identified as a potential leader makes a contribution to the entire group). We are also interested in sequences of interactions such as AO-AO, A(L)O-A(L)O. These refer respectively to cases in which a team member and a team member who is a potential leader make successive postings of messages to the discussion board.

Table 1 Inventory of P-shifts with explanation

P-shift	Explanation
Turn receiving	
AB-BA	A addresses B, then B replies.
AB-BO	A addresses B, then B addresses the team
AB-BY	A addresses B, then B addresses someone else
Turn claiming	
AO-XO	A addresses the team, then someone else addresses the team
AO-XA	A addresses the team, then someone else addresses A
AO-XY	A addresses the team, then someone else addresses another one
Turn usurping	
AB-XO	A addresses B, then someone else addresses the team
AB-XA	A addresses B, then someone else addresses A
AB-XB	A addresses B, then someone else addresses B
AB-XY	A addresses B, then someone else addresses another one
Turn continuing	
AO-AY	A addresses the team, then A addresses someone else
AB-AO	A addresses B, then makes the remark to the team
AB-AY	A addresses B, then to someone else

3. Research Methodology

The research methodology of this paper is explained in more detail in this section as following.

3.1 Empirical Study

The empirical study was conducted with 7 teams of students, 5 members per each. The team members were selected randomly. Previously unfamiliar students were assigned to work on an unfamiliar topic. Each collaboration session took 14 days on the online discussion board of Future Learning Environment (FLE). There are 3 kinds of conversation sentences can be used including definite answer (da) for providing information to the team, question (q) for setting the question and response (r) for answering the question. At the end of collaboration time, team members were asked to nominate one or more leaders of the team, including themselves.

3.2 P-shift coding

Content analysis was performed manually on the conversation from the discussion board. Then, the interactions were coded in the form of sequences of P-Shifts. Figure 1 shows how P-shifts are coded from the excerpt of online discussion board.

Figure 1 shows how a P-shift is coded from the interaction in the discussion board. Suchira announces to the team that she has uploaded the answer and she asks for comment from the team so P-shift is coded as AO. Then, Au comes next day to ask the team about the uploaded answer, the P-shift is thus coded as XO. Therefore, the sequence AO-XO is created from these pair of sentences. Next, after Au asks the team, Ochin answer the question on the next day. Therefore, the sequence AO-XA is created from this pair of sentences. Finally, for the last pair of sentences, Au addresses Ochin and asks her to

complete the report. After some days Ochin comes to answer Au, then the sequence AB-BA is created.

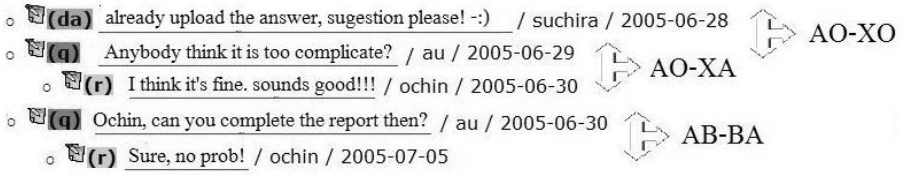

Figure 1. The P-shift coding

4. Results and Discussion

By using the survey at the end of collaboration, members were asked to nominate the team leaders. Five teams had a single identified leader and 2 teams had 2 identified leaders. The data analysis starts with the analysis of cumulative behavior of the team. Figure 2 shows the examples of the cumulative interaction networks at different points of collaboration time for both kinds of teams. The nodes represent team members, while ties from one actor to another represent the numbers of times a second actor made a contribution following a contribution by the first actor.

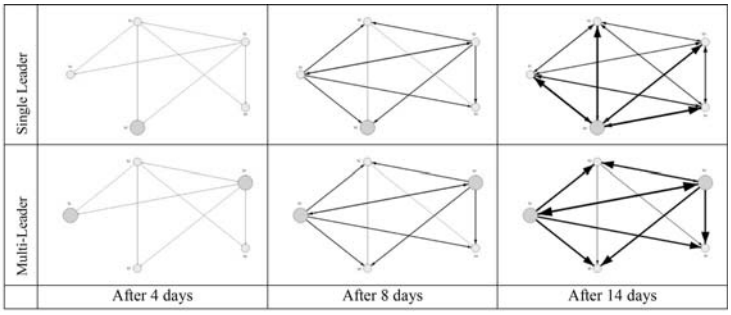

Figure 2. Examples of Cumulative Interaction Network

As shown in Figure 2, a node's size represents the different status of members, the larger one being the nominated leader(s), a tie's thickness represents the volume of interaction among members, and the arrow represents the direction of the interactions. It is suggested from the analysis of cumulative interaction networks that the leaders can be roughly identified as the one who normally has the most intense participation in the team. Moreover, there is also the intense interaction between the leaders in Multi-leader team. However, the distinctive interaction patterns of being the leader cannot yet be revealed.

Next, the analysis of local dynamic behavior is performed. Table 2 shows all P-shifts used in both types of teams. The notation (L) indicates the participation status of the leader in P-shift. For example, A(L)O-XA(L) represents the turn when the leader addresses the team, then another team member comes to answer the leader. In evaluating these results, the basic propensity rule, that the target of a contribution has a higher propensity for being the next contributor is firstly considered. For the case of a non-leader in a single leader team there is a conditional probability of 0.33 for AB-BA and 0.44 (0.11+0.33) for either AB-XA or AB-X(L)A. (in other words, given that one team member has addressed another, the probability that the addressee responds to the initial contribution is 0.33 and the probability that a different team member addresses the initial contributor is 0.44). Since the teams are of size 5, this means that there is higher propensity for the addressee to respond to the contribution than any other team member. In the case when the leader is the target, the leader will speak for the next turn with the conditional probability of 0.29 (corresponding to

AB(L)-B(L)A). For the non-leader case of multi-leader team, similar results are obtained. There are equal conditional probabilities of 0.33 for AB-BA and AB-XA. For the case that the leader is the target, there is also an equal conditional probability of 0.2 (corresponding to AB(L)-XA and AB(L)-X(L)A). These findings suggest that online discussions share the basic propensity rule with face-to-face conversation. It is noteworthy, though, that the propensity for the addressee to make the next contribution is not overwhelmingly high; rather, there is a reasonable chance that a new contributor will appear, reflecting the fact that the discussion involves the entire team. Everybody has an opportunity to contribute.

Table 2 Conditional Probabilities of P-shifts

Single Leader Team			Multi-Leaders Team		
P-shift	Frequency	Cond. Prob.	P-shift	Frequency	Cond. Prob.
AO-XA	25	0.19	AO-XA	3	0.13
AO-XO	3	0.02	AO-XO	1	0.04
AO-AO	56	0.42	AO-AO	8	0.35
AO-X(L)A	35	0.26	AO-X(L)A	3	0.13
AO-X(L)O	2	0.01	AO-X(L)O	5	0.22
AO	13	0.10	AO	3	0.13
AB-BA	3	0.33	AB-BA	1	0.33
AB-XA	1	0.11	AB-XA	1	0.33
AB-AO	2	0.22	AB-AB	1	0.33
AB-X(L)A	3	0.33	A(L)O-XA(L)	20	0.19
A(L)O-XA(L)	27	0.31	A(L)O-XO	5	0.05
A(L)O-XO	4	0.05	A(L)O-A(L)O	54	0.51
A(L)O-A(L)O	48	0.55	A(L)O-X(L)A(L)	15	0.14
A(L)O	8	0.09	A(L)O-X(L)O	6	0.06
A(L)B-A(L)B	2	0.17	A(L)O	6	0.06
A(L)B-XA(L)	5	0.42	AB(L)-B(L)A	1	0.2
A(L)B-A(L)O	5	0.42	AB(L)-XA	1	0.2
AB(L)-B(L)A	2	0.29	AB(L)-AO	1	0.2
AB(L)-AB(L)	1	0.14	AB(L)-AB(L)	1	0.2
AB(L)-XA	3	0.43	AB(L)-X(L)A	1	0.2
AB(L)-AO	1	0.14	A(L)B(L)-B(L)O	1	0.2
			A(L)B(L)-XA(L)	2	0.4
			A(L)B(L)-A(L)O	2	0.4
Total	249			142	

Next, the analysis for both single leader and multi-leader teams where an unaddressed recipient is the next contributor is performed. For the case in which a non-leader addresses a single leader team, there is a conditional probability of 0.27 (0.26+0.01, corresponding to AO-X(L)A and AO-X(L)O) that the leader will come to answer either directly or to the team. Additionally, when a non-leader addresses multi-leaders team, this conditional probability is 0.35 (0.13+0.22, corresponding to AO-X(L)A and AO-X(L)O) that the leader will be likely to answer the contributor either directly or to the team. This suggests that the leader tends to respond more actively to another team member's request. This is one way in which the leader can exercise his/her leadership. In the case in which the leader addresses a single leader team, there is a conditional probability of 0.36 (0.31+0.05, corresponding to A(L)O-XA(L) and A(L)O-XO) that someone will answer the leader either directly or the team. At the same time when the leader addresses multi-leaders team, there is a conditional probability of 0.24 (0.19+0.05, corresponding to A(L)O-XA(L) and A(L)O-XO) that someone will be likely to answer either directly or to the team. Additionally, there is also a conditional probability of 0.20 (0.19+0.1, corresponding to A(L)O-X(L)A and A(L)O-X(L)O) that another leader will come to answer either directly or to the team. Therefore, once the leader addresses the team, there is a high possibility that someone will answer either other members or other leaders. The reason is possibly because the leader has influence in the team, so it is be likely that the request from the leader will attract a response. Additionally, there are quite high conditional probabilities for both types of team that the leader keeps posting the message to the team, as the conditional probability of 0.64 (0.55+0.09, corresponding to A(L)O-A(L)O and A(L)O)

for the single leader team and 0.57 (0.51+0.06, corresponding to A(L)O-A(L)O and A(L)O) for the multi-leaders team. This means the leaders express their expert powers to the team by repeatedly posting topic-relevant messages to the team. Although, there is no response, the team members can see those posting messages and perceive the exercised leadership.

The above results show that the interaction of collaborative learning team in online environment follows the propensity rule that the target is more likely to become the next contributor in turn, and in this way, current interactions exert their influence on future ones. The interactions belong to the team by which every team members has an equal chance to speak. Finally, the leaders usually express their expert powers through repeated posting of messages and the leader appears more likely to prompt a response either from other members or other leaders.

Although the study in this paper has shown that interpersonal interaction can reveal the emergence of the leadership role, which the leader will be more likely to have many topic-related messages and respond actively to the team, when exactly this role emerges during the period of collaboration is not revealed. It is also not clear what influence less recent prior interactions play in leadership perceptions. Consequently, future work will be focused on the possibility that both more distant and immediate past interactions between leader and the team members affect the present and the future of interactions within the team. In this way, a more precise understanding of the emergence of the leadership role should be revealed.

5. Conclusion

This paper presents an approach to analyzing the local dynamic behavior of collaborative learning teams so that the emergence of the leadership role can be more precisely understood. The dynamic behaviors studied in this paper are patterns of interpersonal interaction in an online discussion board. The data are analyzed using Gibson's (2003) conceptualization of P-shifts revealing the moment by moment participation status in terms of speaker, target and unaddressed recipient. Empirical studies with 7 teams of students show that leaders usually exercise their leadership and are perceived as the leader through differential patterns of behaviour expressed in terms of patterns of posting of messages to the online discussion board. Finally, because of their influences on the team, the leaders usually receive response either from other members or other leaders in the team, when it is requested. Future work will be focused on revealing when exactly the leadership roles emerge during the period of collaboration. Although the proposed method is suitable for online learning environments where students in small teams can freely express their leadership through online discussion board without any social constraint as in face to face environment, it can also be used for larger online communities where some other factors should be taken into account. Moreover, in order to validate the proposed method, a larger numbers of studied teams and statistical assessment of differences between probabilities are required.

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