Dynamic Features of Students' Scaffolding Interaction in English Writing Class

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Abstract—**Peer scaffolding as an important index of active student-student interaction has already aroused researchers' interests. In addition, the application of Dynamic System Theory in language study provided researchers with a new perspective. The author conducted an eight-week research in a foreign language university in China. 56 non-English major sophomores from two classes participated in this study. The results indicated that students' interaction in small group discussion was a dynamic system and it had all the dynamic system features such as unpredictable, sensitive to initial conditions, open, complexity, etc. With the results of this investigation, the current study concludes with some suggestions for future group discussion design.**

Index Terms—**small group discussion, peer scaffolding, Dynamic System Theory**

I. INTRODUCTION

With the deepening of the second language study, classroom interaction gradually becomes a hot topic. Current second language classroom communication focuses gradually change from "teacher scaffolding" to "peer scaffolding". With further development of "scaffolding" research, more and more empirical studies suggest that "scaffolding" among students also has positive effect on students' second language development, which is called "collective scaffolding" or "peer scaffolding" by Donato (1994). In recent decades, researchers have found that teachers' role has transferred from the sender of English knowledge to the organizer of classroom activities. Teachers notice the benefits of student-student interaction in second language learning class. Many teachers assign students to work on a task in pairs or small groups. Group discussion is a common classroom activity, where most of teachers usually divide students into several groups randomly. However, a number of researchers such as Storch (2002), noticed that just to divided students into several groups or pairs will not necessarily create conditions conductive to learning. Therefore, the way to assign students into different discussion groups in second language classroom could be an interesting topic.

In terms of the application of peer scaffolding in second language class, most of the researches are concerned about the influence of peer scaffolding on students' oral English development. As for the studies of peer scaffolding concerning English writing classroom activities, current researches usually focus on students' peer feedback on each other's writing. The benefits of peer scaffolding in group discussion or pair works are usually neglected in English writing classroom communication studies. However, peer scaffolding, an important dimension of classroom interaction, always be mentioned in researches such as peer feedback in second language writing class (Ge & Zhou, 2013). Then, what are the dynamic features of students' scaffolding interaction in small group discussion in English writing class? To answer this question, the author adopted Dynamic System Theory research methods to help investigate the dynamic features of students' interaction system. Different from traditional studies concerning peer scaffolding in writing class which mainly focused on peer feedback and students' writing output, this study tries to discover the dynamic changing process of peer scaffolding by analyzing the recording of group discussion and students' feedback.

II. LITERATURE REVIEW

A. Dynamic System Theory

Starting in 1960s, Dynamic System Theory (DST) is a theory of change (Lowie, 2012). Larsen-Freeman (1997) is the first one who introduced DST into applied linguists, which laid a theoretical framework of DST. According to Larsen-Freeman (1997), dynamic system has these features: dynamic, complex, nonlinear, chaotic, unpredictable, sensitive to initial conditions, open, self-organizing, feedback sensitive and adaptive.

(1) Dynamic, Complex, Nonlinear

The behavior of complex systems emerges from the interactions of its components, rather than built in to any one component. De Bot, Wander, and Marjolijn (2007) argued that language development is not a linear process, but a

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somewhat intricate, complex and unpredictable process. Complex factors that influence language development interact to make language development unpredictable and nonlinear.

(2) Chaotic, Unpredictable, Sensitive to Initial Conditions

Larsen-Freeman used Chaos to describe the period of complete randomness that complex nonlinear systems enter into irregularly and unpredictably. A major reason for the unpredictable development of complex system is their sensitive dependence on initial conditions (Larsen-Freeman, 1997), which could be called the butterfly effect. In addition, the system might present significant differences even if the initial conditions were similar (Larsen-Freeman & Cameron, 2008).

(3) Open, Self-organizing, Feedback Sensitive, Adaptive

Dynamic systems are open to new matter, they increase in order and complexity by absorbing energy from the environment (Larsen-Freeman, 1997). At the same time, dynamic system is self-organizing and feedback sensitive, or we can say complex system are adaptive. Dynamic systems do not simply respond passively to events. They are capable of learning and actively try to turn whatever happens to their advantage (Larsen-Freeman, 1997).

In general, Dynamic System Theory emphasized the interconnected factors in the system have mutual relations with each other. Besides, they are influenced by internal and external environment. These factors interact in a multiple environment leads to the feature of complete interconnectedness in a system (De Bot et al., 2007).

B. Scaffolding and Peer Scaffolding

Scaffolding Theory was initially used by Jerome Bruner, who used this term to describe the children-tutor interaction. With the development of Scaffolding Theory, scaffolding was gradually associated with Vygosky's notion of zone of proximal development (ZPD). ZDP is the area between the novice's current development level determined by independent problem solving and level of development that novice could achieve through expert' guidance (Vygotsky, 1978). The guidance in ZDP is called scaffolding. With the help of scaffolding, novice will be able to finish the task that he or she may not be able to do without assistance (Sabet, Tahriri, & Pasand, 2013). Actually, the term scaffolding has been interpreted and operationalized in various ways since its emergence (Nguyen, 2013). Researchers found that scaffolding is not just a unidirectional support between expert and novice, but can occur between novices. During this process, both learners act as expert and support each other mutually and concurrently through dialogic interaction (Hanjani, 2019).

Peer scaffolding, also called "reciprocal scaffolding" by Holton and Clark (2006), was first used by Donato (1994) in his research on peer interaction. This term refers to that students working in pair or group help each other to get one common task or problem solved. Sociocultural Theory serves as the foundation for peer scaffolding and collaboration including collaborative writing, collaborative revision and peer review (Hanjani & Li, 2014), which encourage researchers to do more empirical research to explore the way to improve the effectiveness of classroom interactions. In addition, researchers also found that scaffolding between peers are mutual, which means that lower level learners also provide a scaffolded assistance for higher level learners (Kowal & Swain, 1997).

C. Functions of Peer Scaffolding in Small Group Interaction

Scaffolding occurs during classroom interaction. Small group interaction is a common pattern of real classroom interaction, and it is a complex dynamic process (Xu & Kou, 2017). Gradually, researchers found that scaffolding occurring in students' interaction has positive effect on students' second language development. Currently, the functions of peer scaffolding have been specified. Xu (2016) put forward seven functions of peer scaffolding by analyzing Chinese students' interaction dialogue in small groups discussion in English class. She found that there are seven functions: increasing participation, providing words and expressions, providing opinions, correcting wrong usages, explaining to simplify tasks, task maintenance, and frustration control. Besides, students sometimes provide wrong scaffolding to each other due to their limited language proficiency, which may have a negative impact on the other group members.

In general, current studies neglect the dynamic features of student interaction in small groups. Inadequate researches in this field have resulted in difficulties for teachers to guide effective small group interaction in English class. This thesis tried to investigate the features of scaffolding interaction in small group discussion from the perspective of Dynamic System Theory. This thesis adopted interview and questionnaire to find out the dynamic features of peer scaffolding. By doing this, this thesis tried to give suggestions about organizing effective small group discussion in English writing class.

III. RESEARCH DESIGN

A. Research Questions

1. What are the dynamic features of students' interaction in small group discussion?
2. What are the implications for future small group discussion design?

B. Participants

The participants were fifty-six sophomores from different classes of Beijing International Studies University.

Twenty-eight students were from Class A majoring in Finance, and twenty-eight students were from Class B majoring in International Trade. The Advanced English Writing Course of the two classes was taught by the same teacher. In terms of the average writing proficiency and willingness to communicate in English of the two classes, there was no significant difference between the two. The two classes were used to do controlled experiment. To investigate the dynamic changing process of students' interaction and their English writing proficiency, the author chose 8 focal students from the two classes. Detailed data are presented in the research procedure part.

C. Research Methods

1. Questionnaires

Two questionnaires were used in this research, one is the Willingness to Communicate in English Questionnaire, which was used before this experiment to learn about students' willingness to communicate. The other is the Satisfaction Towards Peer Scaffolding, which was used after this experiment.

Questionnaire on Willingness to Communicate in English used in this experiment was based on the Willingness to Communicate Scale designed by MacIntyre et al. (2001) and was made some minor revisions by the author according to the realities of second language class in China. To be user-friendly, this questionnaire was written in Chinese. This questionnaire consists of four dimensions, which are speaking English, reading English, writing English and comprehension in English class. There are 24 items in this questionnaire. The questionnaire asked these participants to rate on a 5-point scale.

TABLE 1
RELIABILITY STATISTICS ON WILLINGNESS TO COMMUNICATE IN ENGLISH QUESTIONNAIRE

Cronbach's Alpha	N of Items
.941	24

To make sure this questionnaire is reliable enough, the author firstly pre-tested this questionnaire. The reliability of this revised questionnaire was examined by using Cronbach's coefficient alpha. Table 1 shows that the questionnaire is reliable enough ($\alpha=0.941$). Validity analysis of this questionnaire was conducted via factor analysis on SPSS 22.0 which is particularly useful in identifying how many dimensions underline a set of items. The results of rotated component matrix on the Willingness to Communicate in English Questionnaire indicated that this questionnaire could measure students' willingness to communicate by four dimensions: writing, speaking, comprehension and reading. Therefore, this willingness to communicate questionnaire can be used to measure students' willingness to communicate.

The Satisfaction Towards Peer Scaffolding Questionnaire was designed by the author. To be user-friendly, this questionnaire was also written in Chinese. This satisfaction questionnaire consists of four dimensions, which are attitudes towards the benefits of group discussion, attitudes towards group discussion activities during experiment, attitudes towards group members and experience of peer scaffolding during group discussion. Each dimension has 5 items. There are 20 items in total. The questionnaire asked the participants to rate on a 5-point scale. This questionnaire was completed by students in Class A and Class B. 56 valid questionnaires were collected. The results of these two questionnaires were analyzed by SPSS 22.0.

2. Recordings of Small Group Discussion

The discussion topics were related to the specific writing skills. In every discussion, students were asked to discuss for at least three minutes. One of the four students in each group was in charge of recording group discussion with his cell phone. After each class, the author collected recordings of each group and transcribed them. This experiment lasted for 8 weeks and 112 discussion recordings were collected. To describe the dynamic changing process of group interaction, 16 group discussion recording fragments of group A and group B were the main focuses of this research.

3. Interview

Qualitative data were collected from the complementary interview with open-ended questions. These questions can be divided into four categories: comment on small group discussion during experiment, comment on peer's contribution, self-evaluation and measures adopted when facing troubles during discussion. The collected answers were analyzed to find out the reasons and participants' thoughts towards small group discussion.

D. Research Procedures

Before this experiment, a writing test was assigned to these participants. Students were asked to write a at least 100 words writing to describe a person. As Table 2 shows, the results of Independent-samples T test showed that there was no significant difference in the students' English writing score of the two classes (t=0.265 df=54, p> 0.05). Then, these two classes were used to do control experiment.

TABLE 2
WRITING SCORE OF CLASS A AND CLASS B

	Class A (n=28)		Class B (n=28)	
	M	SD	M	SD
Writing Score	92.607	2.0063	92.464	2.0273

According to the results of these students' answer to Willingness to Communicate in English Questionnaire, each student's willingness to communicate was quantified into a specific score. Their score was analyzed by SPSS 22.0. The results of Independent-samples T test showed that there was no significant difference between the two classes (t=0.098 df=54, p> 0.05).

TABLE 3
WILLINGNESS TO COMMUNICATE (WTC) SCORE OF CLASS A AND CLASS B

	Class A (n=28)		Class B (n=28)	
	M	SD	M	SD
WTC Score	90.107	14.5178	89.714	15.5346

The best group size is 3 or 4 students, for large group size makes group members just to make up the number (Hai, 2014). To make each group has the same number of students, the author did this experiment with the group size of 4. Class A was grouped by teacher according to students' answer to the Questionnaire on Willingness to Communicate in English. For each item in this questionnaire, the rate that students chose stands for the score. The total score is the sum of each item point. By analyzing the results, the author grouped those students' score into three levels: High (between 120 and 98), Medium (between 97 and 83), Low (lower than 83). According to Storch (2002), expert/novice and collaborative patterns could promote more meaningful interactions in classroom interactions. Therefore, the author adopted high-low, medium-medium group patterns according to students' score of willingness to communicate. Students in Class B were asked to join up on their own willingness. To focus on the dynamic changing process of group interaction, the author chose one group from Class A and named it Group A. Correspondingly, chose Group B from Class B.

The experimental time was eight weeks. The two classes had the same teaching procedures and content. Participants in this experiment were taught by the same experienced English teacher. To make small group discussion in the two writing classes more effective, the teacher did small group interaction strategy training before this experiment. The strategy training contents were based on the research results of Xu (2016), in which she put forward seven functions of peer scaffolding in English learning class. Every week, the teacher organized small group discussion in English writing class according to her teaching plan. The leader in each group recorded the discussion with their cell phone and sent the recording to the author after class. After the experiment, the author sent Satisfaction Towards Peer Scaffolding Questionnaire to these participants. To learn more about students' feedback, the author interviewed eight students from the two focal groups.

E. Recording Analysis

Conversations of the two focal groups were transcribed and analyzed by the author. The author took the following steps to do conversation analysis: firstly, identifying all the scaffolding episodes. In this step, "turn" was used as the standard unit. Two raters analyzed recording fragments of Group A and Group B individually and marked turns that contain peer scaffolding. They checked their results with each other to ensure the reliability of the marking process. Disagreement was solved by discussion. Then the author counted these 8 focal participants' contribution to peer scaffolding. Secondly, the author read these scaffolding episodes carefully and classified these peer scaffolding turns into different categories in reference to Xu (2016)'s finding of peer scaffolding functions. These functions are: increasing participation, providing words and expressions, providing opinions, correcting wrong usages' explaining to simplify tasks, task maintenance, and frustration control. Here is an example:

Example 1:

1 A: In my opinion, I think the first sentence is a good topic, because the second sentence is too specific. It is too general. If we chose the first sentence, we can give many examples of people and color of clothing and we can...叙述怎么说？

2 B：We can narrate.

3 A: Er...we can narrate (laughter) the different people and different colors of clothing. I feel how foolish I am to forgot that word.

In the above Example 1, A forgot how to say "叙述" in English, she asked B for help. B told her "narrate". With the help of B, A could finish her sentence. Thus, B offered A scaffold. Therefore, this is a scaffold of providing words. To guarantee the reliability of the classification, another rater also did the same classified work. Disagreements were solved by discussion. At last, the author counted the amount of each kind of peer scaffolding. The contribution of eight students to peer scaffolding was also counted.

IV. RESULTS

A. The Number of Peer Scaffolding

Based on the explanation of Xu (2016)'s research concerning seven functions of peer scaffolding, the author categorized peer scaffolding in group discussion into seven categories. Here are the results.

(1) Results of Group A

TABLE 4
PEER SCAFFOLDING IN GROUP A

	Increasing participation	Providing words and expressions	Providing opinions	Correcting wrong usages	Explaining to simplify tasks	Task Maintenance	Frustration Control	Total
Student 1	5	6	4	1	2	3	1	22
Student 2	1	1	5	2	2	4	1	16
Student 3	0	4	2	0	4	2	0	12
Student 4	0	0	3	0	3	0	0	6
Total	6	11	14	3	11	9	2	56

An overview of peer scaffolding in Group A is presented in Table 4. There were 56 peer scaffolds and 7 types of peer scaffolding in the recording of Group A. Student 1 provided the most scaffolds among the four students. She provided 22 scaffolds to her peers. Student 2 provided 16 scaffolds to her peers. Student 3 provided 12 scaffolds to his peers. Student 4 provided the least scaffolding. He provided 6 scaffolds to his peers. In terms of their contribution to scaffolding during experiment, Student 1 contributed the most, followed by Student 2. Student 3 and Student 4 contributed less than Student 1 and Student 2.

(2) Results of Group B

TABLE 5
PEER SCAFFOLDING IN GROUP B

	Increasing participation	Providing words and expressions	Providing opinions	Correcting wrong usages	Explaining to simplify tasks	Task Maintenance	Total
Student 5	11	6	11	5	3	3	39
Student 6	0	2	7	1	3	1	14
Student 7	1	1	11	3	7	1	24
Student 8	0	3	8	1	4	0	16
Total	12	12	37	10	17	5	93

Table 5 shows the detail data of peer scaffolding in Group B. There were 93 peer scaffolds in the discussion of Group B. Six types of peer scaffolding were found. Student 5 provided the most scaffolds during discussion. She provided 39 scaffolds to her peers. Student 6 provided the least scaffolds. She provided 14 scaffolds to her peers. Student 7 provided 24 scaffolds to her peers. Student 8 provided 16 scaffolds to her peers. In terms of their contribution to scaffolding during experiment, Student 5 contributed the most among the four students, followed by Student 7. Student 6 and Student 8 contributed less than Student 1 and Student 2.

B. Dynamic Changing Process of Peer Scaffolding

To learn about the dynamic changing process of peer scaffolding in small group discussion, the author adopted a DST research method that is plotting a graph of trendline. Here are the results.
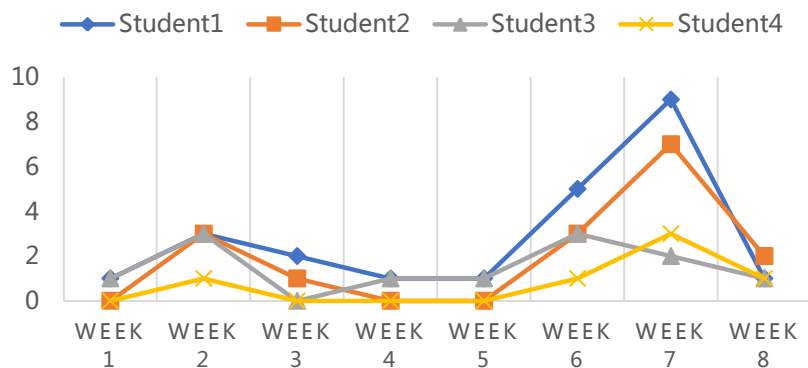

Figure 1 Changing Process of Each Student's Contribution to Scaffolding (Group A)

(1) Results of Group A

It is clear that the number of scaffolding each student provided were changing with time (see Figure 1). Generally, the changing trend of each student's contribution in each week was nearly the same, except for week 7. In week 7, the

trajectory of three students showed a rising trend, while Student 3's contribution to scaffolding showed a downward trend. In the first five weeks, the number variance of scaffolding in the whole group was small. After week 5, the trajectory showed an increasing trend and reached the top in week 7. However, all the four students' contribution trendline fell down after week 7, especially Student 1 whose trajectory showed a sharp downtrend.
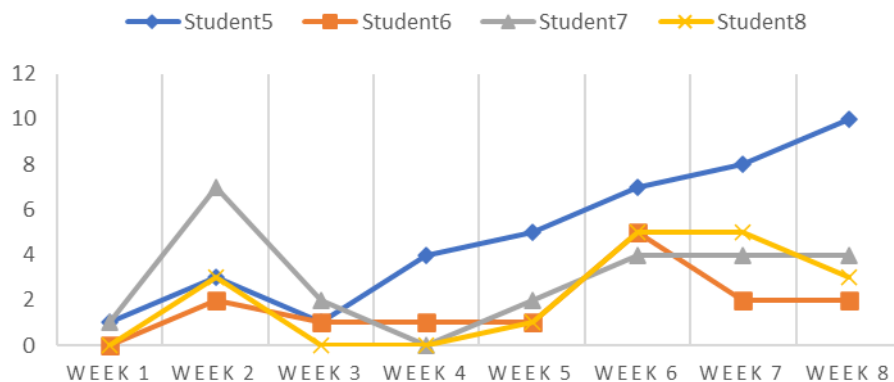
(2) Results of Group B

Figure 2 Changing Process of Each Student's Contribution to Scaffolding (Group B)

According to Figure 2, it was clear that the number of scaffolding each student provided was changing with time. The four trajectories had the same feature in the first three week, which showed a trend of rising up at first and then falling down. After week 4, they showed different developmental path. Generally, each of the four students' contribution to scaffolding trajectory was different from others. In addition, the terminal point of each student's trajectory was higher than the initial point.

C. Results of the Questionnaire of Students' Satisfaction to Peer Scaffolding

TABLE 6
STUDENTS' SATISFACTION TOWARDS PEER SCAFFOLDING

	Benefits of Group Discussion (n=28)		Comments on Peers (n=28)		Comments on Group Discussion (n=28)		Scaffolding Involvement (n=28)	
	M	SD	M	SD	M	SD	M	SD
Class A	4.107	0.609	4.236	0.550	4.329	0.478	3.814	0.830
Class B	4.086	0.679	4.314	0.540	4.371	0.498	4.079	0.621

As it is shown in Table 6, the overall feedback of 58 students was good for almost all the mean of four dimensions was higher than 4.0. However, the feedback on the dimension of scaffolding involvement from students in Class A was lower than other three dimensions (MD=3.814), which indicates students in Class A thought that they were not highly involved in peer scaffolding. According to the standard deviation of scaffolding involvement, there was a big disagreement among students in Class A. Compared with the results of scaffolding involvement dimension of Class A, Students' feedback in Class B was higher (MD=4.079), and the difference among students was smaller.

D. Results of Interview

Eight students from Group A and Group B were interviewed. According to students' self-evaluation and their comments on their peers, the author got the basic information of each student's performance during discussion (see Table 7).

TABLE 7
BASIC INFORMATION OF THE EIGHT STUDENTS' PERFORMANCE

	English Level	Role	Performance During Discussion
Student 1	High	Leader (Passive)	Seldom did improve participation work.
Student 2	Medium	Active Participant	Always explained the tasks.
Student 3	Medium	Ice breaker	The most active one; disinterest in others' opinions.
Student 4	Low	Passive Participant	Cautious; introversive; self-abased.
Student 5	High	Leader (Active)	Always lead the discussion.
Student 6	Low	Passive Participant	Talk less; self-abased.
Student 7	Medium	Active Participant	Always provided opinions.
Student 8	Medium	Participant	Self-abased, but gradually participated actively.

As for Group A, Student 1 was at the highest level of English among the four students, but she was not the most active speaker. Student 2 always provided ideas and explained tasks to her peers, but she was not satisfied with her

English level. Student 3 was the most talkative person in this group, he always acted as an ice breaker. However, he was not interested in others' views. Student 4 was viewed as the one who contributed least to group discussion among Group A. He was a man of few words and was cautious about expressing his idea for he thought he was not good at speaking English. However, he began to be more talkative when the discussion was processed in Chinese. In regard to students' performance in Group B, student 5 was a qualified leader in this group. The other three students actively participated in discussion. At first, Student 6 was passive. With the encouragement of her peers, she gradually began to actively exchange her ideas with others.

V. DISCUSSION

Question 1: What are the dynamic features of students' interaction in small group interaction?
After analyzing the results, the author got the following findings:
(1) Students' interaction in small group discussion had dynamic, complex, and nonlinear features.

According to the features of students' contribution to peer scaffolding, the number and type of scaffolding in each week were different, which showed a nonlinear and dynamic development trend. The dynamic changing process indicated that students' interaction was changing with time. As Hai (2014) pointed out that students' interaction system was influenced by students' internal and external factors. Based on the results of recordings and interview, the author found the following factors that may influence students' interaction in this experiment: students' English proficiency, students' willingness to communicate in English, grouping patterns, and discussion topics.

Students' English proficiency greatly influenced students' interaction. Valadi, Rezaee, and Baharvand (2015) found that individual's second language proficiency in general is a powerful modifying variable to their interaction in the case of second language use. Even students with higher English proficiency still admitted that they had trouble in expressing their ideas in English during discussion and their limited English level influenced their willingness to correcting others' mistakes. Student 4 whose English proficiency was relatively low admitted that it is hard for him to follow his peers' nonstandard English. Therefore, he seldom provided scaffolding for others. When students do not understand their classmates' strong foreign accent, they might not tend to interact further with them (Kayi-Aydar, 2013). Students with the highest English proficiency among their peers, such as student 1 and Student 5, contributed the most to peer scaffolding in group discussion. In addition, there were two wrong scaffolds in Group B, which was in accordance with Xu (2016)'s findings that students inevitably provide wrong scaffolding to their peers due to their limited English proficiency.

Students' willingness to communicate in English also influenced students' interaction. When communicating in a second language, it is of great importance to identify individual's reaction to conversation (Valadi et al., 2015). Some students held a negative attitude towards group discussion in English. The discussion recording suggested that both Group A and Group B were turn-taking interaction pattern in the first week. Most of them just expressed their idea in English one by one without real communication. Gradually, they began to communicate in both English and Chinese. Then, more and more peer scaffolds occurred. Another example was student 4's performance. Student 4 was the one whose willingness to communicate in English was lowest in his group. The discussion recording also indicated that he was the most passive one among the whole group. As for Student 1 and Student 5, the two students had the highest willingness to communicate in English in their groups. The recording results also revealed that they contributed the most to peer scaffolding in their groups. Similarly, Hai (2014), Zarrinabadi and Tanbakooei (2016) found that willingness to communicate is a predictor of students' participation in classroom communication. According to Hai (2014), although students' willingness to communicate is an important predictor of students' interaction, it can only predict 15% outcome. There should be other factors that influence students' interaction (Hai, 2014).

The grouping patterns were considered another factor that influenced students' interaction. Although some researchers suggested that students were not anxious in group interaction (Lightbown & Spada, 2010), three students in Group A admitted that they felt anxious or embarrassed during discussion. According to the results of the interview, students in Group A were just classmates. Students in Group B were roommates and they got along well with each other. In terms of the scaffolding of correcting wrong usage, Group B produced 10 scaffolds, while Group A only produced 3 scaffolds. In regard to scaffolding types, Group A had all the 7 types of scaffolding mentioned in Xu (2016)'s findings. However, there was no frustration control scaffolding in the discussion of Group B. In terms of the total number of scaffolds each group provided, Group B produced 93 scaffolds in total, while Group A produced 56 scaffolds in total. These results indicated that the interaction in Group B was more active than Group A. In addition, compared with students' feedback to the scaffolding involvement of Class A, Students in Class B were more involved. These results were in accordance with Xu and Cao (2012)'s finding that the pattern of fixed grouping on students' own willingness is more conducive, and it contributes to improve language output in the oral interaction.

Discussion topics also influenced students' interaction. Interesting and familiar topics facilitate students' interaction (Hai, 2014). The teacher in this experiment provided students different topics concerning different writing skills every week. The figure of the changing process of each student's contribution to peer scaffolding of Group A showed that students behaved more actively than before in week 6 and week 7. Some students in Group A said in the interview that sometimes the topic was too boring to talk for a long time. However, all the students in Group A as well as students in Group B mentioned that they were interested in the discussion topic in week 6 and week 7, when the discussion topic

was "the hazards of our school". Student 4, an introverted student, contributed 3 scaffolds in week 7 which reached the maximum of his contribution during the eight weeks. This proved that even introverted learners talk a lot with an interesting topic (Hai, 2014). Besides, learners tended to feel insecure about conversing on a topic about which they are not familiar with (Kang, 2005).

These factors above had mutual relations with each other, which greatly support that students' interaction was a dynamic system. Grouping patterns (the group size and familiarity with interlocutors), familiarity with topics under discussion (Cao & Philp, 2006) and students' second language proficiency (Mohammadzadeh & Jafarigohar, 2012) influenced students' willingness to communicate in second language. Thus, students' situational willingness to communicate could dynamically emerge and fluctuate moment-to-moment (Kang, 2005). As it is mentioned before, students' willingness to communicate influence the occurrence of peer scaffolding. Researcher also proved that the scaffolding provided by peers contributed positively to learner's second language development (Huong, 2007).

(2) Students' interaction in small group discussion had chaotic, unpredictable features and it is sensitive to initial conditions.

According to the figures of the two groups' contribution to peer scaffolding, the initial state of these two group's contributions to scaffolding was similar, however, the developmental paths of students' contribution to scaffolding of the two groups were obviously different. In terms of each student, the trajectory trends of four students in Group A were nearly the same. However, the trajectory trends of four students in Group B were totally different. The results showed that students in Group B were more actively involved in group discussion. Their cooperation was more stable than students in Group A, for there was no sharp drop in their contribution trajectories. The two groups had the similar initial state, but different endings. This finding also in accordance with the argument of Larsen-Freeman and Cameron (2008) that the dynamic system might present significant differences even if the initial conditions were similar.

In addition, although the group interaction pattern of Group A and Group B were similar at the very beginning, the two groups had different development path. According to Xu and Kou (2017), there are four types of group patterns in English classroom interaction: collaborative, turn-taking, dominant/passive and expert/novice. According to the recording of Group A, the group pattern of Group A changed with time. At first, it belonged to turn-taking pattern. Students took turns to express their ideas. Then it turned to be dominant/ passive pattern, in which Student 4 hardly provided any scaffolding to his peers and accepted his peers' ideas passively. Gradually, with the development of discussion, all the four students actively provided scaffolding for their peers from week 6 which showed a collaborative pattern. As for Group B, the initial group pattern was turn-taking in week 1, then it turned to be collaborative and lasted until the end. These phenomena were also the evidence of students' dynamic interaction.

(3) Students' interaction system had open, self-organizing, feedback sensitive and adaptive features.

Students' interaction system was open, for it always influenced by various factors. Students didn't only respond passively to these influencing factors. They tried to turn to their advantage. On the one hand, they tried to make themselves get involved in the discussion. For example, influenced by relatively low English proficiency, Student 4 wrote down what he was going to say before he expressed his opinions. Apart from that, he gradually turned to speak Chinese to make himself be involved in the discussion. Besides, Student 6 mentioned that her English level was lower than her peers, thus she chose to provide supplement information for her peers. Apart from that, students in Group A discussed in English in week 1 and all of them realized that it was not real discussion. Gradually, they began to speak Chinese to supply and simplify their opinions. They had begun to discuss in Chinese all the time since week 6, which may be one of the reasons why their interaction turned to be more active than before. However, students in Group B always discussed in two languages. When they came across difficulties in expressing their ideas during discussion, they turned to speak Chinese. Therefore, their effort made their discussion more productive.

On the other hand, although influenced by internal and external factors, such as discussion topics or students' own willingness to communicate, group members also tried to help their passive peers become more involved in the discussion. Li (2014) also found that some students acted as facilitator when they provide scaffolding for others. Student 5 noticed that Student 6 was self-abased, thus she took the advantage that they are good friends and directly asked Student 6 to express her idea without worrying about the "face". So, she frequently asked Student 6's opinion so as to help her become more involved in the discussion. With the encouragement of her peer, Student 6 gradually became brave enough to express her ideas. About 90% increasing participation scaffolds were offered by Student 5, which indicated that she did a lot to facilitate group discussion. As for Group A, the results of recording revealed that students in Group A more like to talk something unrelated to the tasks in Chinese, but some of the members offer task maintenance scaffolding to help to return to given discussion topics. Group members' self-organization facilitates group discussion and other students' self-organization (Li, 2014). These phenomena were in line with the feedback sensitive and adaptive features of dynamic system.

Question 2: What are the implications for future small group discussion design?

The findings from the present study indicated some important information of small group discussion activity in college English writing class. Here are some implications for the pedagogical purpose.

Firstly, group discussion could provide students with more opportunities to use target language and exchange ideas with each other. Many second language studies revealed that learner-centered discourse provided students with opportunities for negotiation, which is essential for second language learning and development (Antón, 1999).

According to students' feedback, students thought highly of the benefits of peer scaffolding. One student said that group discussion enabled her to exchange opinions with her peers in English without being worried about her low English proficiency level. All the eight students agreed that group discussion provided them with more writing arguments. Thus, group discussion is a good activity in English writing classroom.

Secondly, students are more involved in group discussion when they are asked to join up on their own willingness. The results indicated that students feel more relaxed and more actively express their ideas when they discuss with their good friends. Besides, during the discussion, they will correct their friend's mistakes without hesitation. However, for students who were not so familiar with each other, they care more about other students' face. Thus, even they don't understand their peers' words, they usually don't ask for clarify for they don't want to embarrass each other, which may lead the discussion to be a mere formality.

Thirdly, teacher's intervention and feedback during students' discussion are necessary. To learn about the real state of students' discussion, teacher in this experiment didn't offer any intervention. All the students interviewed in this study mentioned that they were unwilling to seek help from their teachers, for talking with teachers makes them anxious. Thus, they just discussed the given topic to figure out what the meaning of the given topic, which is time-consuming. Besides, lacking of teacher's guidance enabled dominant students in a group to take more powerful positions in the discourse and lead to no room for others to contribute (Kayi-Aydar, 2013). Therefore, teacher's intervention and leading-in when necessary are really helpful.

Last but not least, sufficient small group interaction strategy training is necessary. According to Xu (2011), interaction strategy training improves students' overall participation and interactive participation. Although the teacher did a simple small group interaction strategy training before the experiment, there were some non-interactive participation during students' interaction. Obviously, the strategy training was not sufficient enough. Sufficient small group interaction strategy training could help to improve student's use of interaction strategies during group works. Besides, the increased use of interaction strategies does good to students' overall participation and interactive participation (Xu & Kou, 2011) . Thus, more interaction strategy training should be involved in group work design.

VI. Conclusion

This study mainly focused on the dynamic features of students' interaction in small group discussion. The results indicated that students' interaction in small group discussion had all the dynamic system features. The developing trajectory of each student's contribution to scaffolding was dynamic and nonlinear. The interaction system was sensitive to initial state. Besides, the interaction system was open, adaptive, self-organizing and feedback sensitive, for it was easily influenced by other factors, such as students' English proficiency, students' willingness to communicate in English, grouping patterns, and discussion topics. Lastly, this study concluded with some implications for future small group discussion design, such as teacher's intervention and small group interaction strategy training.

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