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APPROPRIATING A REPRESENTATIONAL TOOL FOR COLLABORATIVE LANGUAGE LEARNING: A COMPARATIVE STUDY OF TWO TEACHERS' ENACTMENT

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Despite the expansive use of CSCL in language learning classrooms, there is limited research into teachers' enactments of the collaborative activities. An online technology or a good learning activity design alone can hardly guarantee teachers' effective classroom enactment for productive learning. This study compared two teachers' enactments of a collaborative learning activity in a Second Language classroom supported by a representational tool called Group Scribbles. Focusing on comparing the two teachers' instruction in enacting the lesson, this study aims to explore plausible strategies for teachers to synergize multi-layered activities in a multi-media language learning classroom environment. The strategies that influence teaching and learning effects are identified, including 1) explicitly articulating the objectives of the learning activity, 2) providing improvised feedback to scaffold and adjust students' work on an ongoing basis, and 3) controlling the tempo of the activity and maintaining students' enthusiasm.

Keywords: Enactment; orchestration; computer-supported collaborative learning; second language learning.

1. Introduction

Computer-supported Collaborative Learning (CSCL) views learning as building shared meaning, acculturating into social practices and participating in valued activities situated within a community of practice (Roschelle et al., 2011). In a CSCL environment, teachers are required to change their role from being a dominator to being a facilitator, to guide students' learning. Though the fact that that the way teachers enact the instructional practices is essential for the success of collaborative learning has long been recognized, few researchers have investigated "how difference in enactments of collaborative activities might impact students' learning outcomes" (Puntambekar, Stylianou, & Goldstein, 2007, p.82). CSCL research on interaction is mainly focused on examining the interactions among students that are aroused by using online technology for collaborative learning (e.g. Cakir, Zemel, & Stahl, 2009; Suthers, 2006). Generally, less attention is paid to teacher practices/instructions for facilitating and guiding collaborative learning in CSCL environments (Webb et al., 2008).

In the context of second language (L2) writing, this paper uses a comparative study (Merriam, 1998) approach to examining the enactments of a collaborative writing lesson by two teachers, and the impacts of such enactments on students' learning outcomes. In other words, this study focuses on analyzing how the enactments by two teachers differed and how these differences impacted students' learning outcomes. On the basis of these analyses, the strategies that may help assist teachers in orchestrating multi-layered activities in a multi-media language learning classroom environment can be identified.

2. Literature Review

2.1. *Social shaping of the representational tool*

Prior research on CSCL has highlighted the importance of representational aids, such as dynamic notations, knowledge maps, and simulation for collaborative learning performance (Fischer, Bruhn, Gräsel, & Mandl, 2002; Hmelo-Solver, Liu, & Jordan, 2009; Scardamalia & Bereiter, 2003; Suthers, 2006; Wegerif et al., 2010). Embedding representational tools in a CSCL environment can facilitate students' construction of multimodal representations of the domain and, thereby, guide their interaction (Slof, Erkens, Kirschner, Janssen, & Phielix, 2010). Yet some studies remain suspicious on the educational benefits of representational tools, and call for further research on how to best guide students' interaction (Elen & Clarebout, 2007; Van Drie, Van Boxtel, Jaspers, & Kanselaar, 2005).

The presence of a representational tool in the classroom along does not automatically benefit students' learning (Slof et al., 2010). A given tool offers affordances (action potentials) that may influence how learners engage in knowledge construction (Kozma & Russell, 2005), but do not causally determine their learning outcomes (Hakkarainen, 2009; Medina & Suthers, 2012; Oliver, 2011). Technology does not determine the nature of its implementation but coevolves with gradually in the transformation of instructional practices (Tuomi, 2002). Even though there are stable characteristics of tools that are

generalizable over different settings, the enactment of the activity that is designed based on a tool's affordances, to some extent, is still unpredictable (Dillenbourg & Tchounikine, 2007). The ability of the teacher to enact the activity to the specific teaching and learning situation is one key factor for the effectiveness of CSCL (Onrubia & Engel, 2012).

2.2. *Teachers' enactment*

In a classroom environment with the presence of a representational tool, some activities are computer-based, some not. Enacting effective collaborative activities may be daunting tasks for teachers, even if they have experience in enacting collaborative activities. Dillenbourg et al. (2011) coined the term "orchestration" to describe the design and enactment of dynamic and complex learning in networked classroom environments. This concept emphasizes the teachers' management of real time, and multi-layered activities in a context with multiple constraints (Dillenbourg, Järvelä, & Fischer, 2009; Dillenbourg et al., 2011). Different from traditional instructional design, in orchestration teachers are accommodating and coping with a new level of extrinsic constraints, including social, logistic, time, curriculum, discipline, assessment, and physical space (Dillenbourg et al., 2011). Dillenbourg and Jermann (2010) have proposed a series of factors related to orchestration, such as time management, reflection in action, improvised assessment. Yet, for most of researchers and teachers who are working on incorporating a technology in classroom learning, orchestration remains a useful but abstract concept (Prieto, Villagrá-Sobrino, Jorrín-Abellán, Martínez-Monés, & Dimitriadis, 2011).

A review of the literature on empirical studies reveals some researchers (e.g. Sandoval & Daniszewski, 2004; Schneider, Krajcik, & Blumenfeld, 2005; Tabak & Reiser, 1997) have investigated how teachers create opportunities for student interaction in group work through analyzing teacher discourse. Most of studies have examined how teacher-led discussions affected classroom interactions and identified successful strategies that teachers used in an inquiry based classroom (e.g. Puntambekar et al., 2007). Inquiry-based learning refers to forms of learning driven by a process of inquiry (Healey, 2005). The inquiry-based pedagogical practices are mainly researched in the context of science and mathematics education (e.g. Hakkarainen, 2003; Jaworski, 2006).

The findings of such enactment research may not be applicable for language learning. Research on classroom enactment of collaborative learning for language learning is still lacking. Thus this study is designed to understand the role that teachers play in orchestrating multi-layered activities in a representational tool supported language learning classroom for more productive learning outcomes.

3. Research Design

3.1. *Research context*

The study described in this paper is part of a three-year project for introducing Rapid Collaborative Knowledge Improvement (RCKI) to language learning classrooms in a

secondary school of Singapore (Looi, So, Toh, & Chen, 2011). The school provided a technology-rich environment for students. Each student was equipped with a laptop (Apple Macbook). Group Scribbles (GS), as a kind of representational tool for enabling students' multimodal representations and communication, was installed in the school's server. In the school's Chinese language lessons, every student was able to login in the GS system via their individual account on their own laptop.

The workspace of GS consists of a private space and a public space in a two-paned window (see Figure 1). Its lower pane is the user's personal workspace or private board whereas the upper pane is the public workspace or public board. The private board is provided with a virtual pad of fresh scribble sheets on which the user can draw or type. The users can share the scribble sheets by dragging them from the private space to public space. The essential feature of the GS is the combination of the private board where students can work individually and the group boards where students can post their work and position it relative to others', view others' work, and take items back to the private board for further elaboration. A student can select any group board by clicking the board number in the drop-down menu on the right-top, and browse all the postings posted on other groups' boards. The tool hence may make intra- and inter-group interactions more convenient. Users have opportunities to exchange their ideas and provide comments for one another without physical movement in classroom environments.

When exploring the affordances of GS for classroom-based learning, we proposed the concept of RCKI and its related nine principles (Looi, Chen, & Patton, 2010). RCKI refers to the notion of democratizing participation and idea refinement in the context of live dynamic classroom settings, that is, face-to-face collaborative knowledge construction and improvement over the duration of a class session, supported by certain technologies for lightweight instant interaction. RCKI is designed to address the constraints faced by classroom teachers when they are designing and implementing knowledge construction and improvement practices within the short duration of a

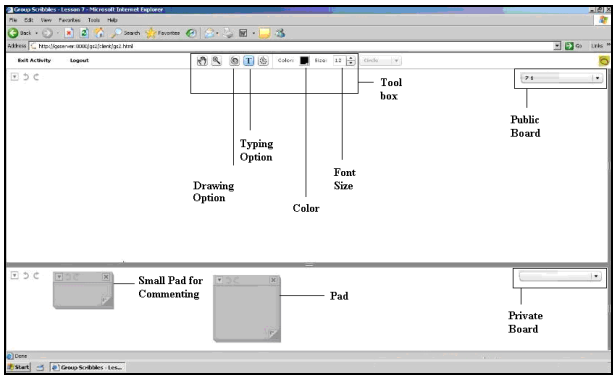

Figure 1. The user's interface of GS.

classroom lesson. "Rapid" can be interpreted from three aspects: 1) the activity is done within a limited time of participation; 2) a lightweight form of expression is adopted; 3) quick cycles of interaction by the participants should be encouraged. RCKI focuses on democratic knowledge sharing as well as cycles of individual and group knowledge enhancement. Some of nine RCKI principles are built upon the theory and principles of knowledge building proposed by Scardamalia (2002). Principles like "spontaneous participation" and "multimodal expression" emphasize promoting students' participation in the collaborative activity. The "symmetric knowledge advancement" principle aims to foster students' higher levels of collective cognition (see Looi et al., 2010; Wen, Looi, & Chen, 2011, for more details about RCKI principles and its guidance for L2 learning).

We believe that "if a teacher could not understand the essence of design behind activity design, s/he could only emulate a similar process of activity, but the efficacy of design might not be fully unlocked" (Wen, Looi, & Chen, 2012, p.151). Hence, alongside the technical trainings in which teachers and students developed familiarity with the functions of GS, a series of professional development sessions (one hour per week, about five weeks) were carried out to ensure that the teachers had a good understanding about RCKI principles and GS-based language learning design before the actual enactment of GS-based lessons. After that, altogether four GS-based Chinese writing lessons (60 minutes each) guided by RCKI principles, were co-designed by the teachers and researchers.

The GS-based collaborative writing lesson reported in this study is the last one, which is about argumentative essay writing. This lesson is considered representative, as teachers have already formed their own style of enacting GS-based collaborative writing lessons, after a certain period of enculturation and enacting GS lessons.

3.2. *Participants*

A total of 35 eighth-grade students and two teachers participated in this study. The students' age ranged from 14 to 16. They were from two Higher Chinese classes taught by the two teachers: Chin and Judy. Class E1 (N = 19) was taught by Chin and Class E2 (N = 16) was taught by Judy. Both classes of students were heterogeneously organized into groups of four members. In Singapore schools, English is regarded as students' first language (L1) and is the main teaching language in schools. Chinese is taught as a second language (L2) for the Chinese ethnic students. In most secondary schools of Singapore, students are channeled into "Higher Chinese" or "Normal Chinese" classes based on their language proficiency. Compared with the "Normal Chinese" class, the "Higher Chinese" class requires a high level of linguistic proficiency and cultural knowledge (Ministry of Education, 2004).

In the school, there were three "Higher Chinese" classes and four "Normal Chinese" classes in the eighth-grade. We selected two "Higher Chinese" classes as the experimental classes. These two classes were selected because no significant difference was observed in the school Chinese language examination scores of the two classes

(t = -0.265, p > 0.05). The results indicated that Chinese language proficiency of the two experimental classes was similar.

The two teachers participated in the study were not novice teachers. Chin had approximately 10 years of teaching experience, and Judy had five. Both Chin and Judy have had experiences of studying the Chinese language abroad (Chin for four years in Taiwan and Judy for three years in Mainland China). Unlike other local Chinese language teachers without overseas educational backgrounds, these two teachers were fully aware of the necessity and importance of mastering the Chinese language by Chinese ethnic students. To them, Chinese language played an essential role in creating a sense of cultural identity, preserving cultural heritage as well as cultivating students' thinking abilities. They were willing to try new teaching approaches to arouse students' interests in learning the Chinese language. Both teachers fully believed that every student had potential, and what teachers needed to do was to assist students to realize their potentials.

3.3. *Activity design*

The GS-based collaborative writing lesson reported in this study was co-designed by Chin, Judy and the author of this paper. The main learning objective of the lesson was to help students understand the three main components of an argumentative essay on a social phenomenon, including the cause of the phenomenon, its impacts and the possible solutions. Underlying RCKI principles, the designed collaborative writing activity included five main phases (see Table 1). In the lesson, students were encouraged to generate their group ideas via mining individual wisdom within the group and borrowing ideas from other groups. Respecting and encouraging cognitive diversity, the activity began with the creation and presentation of different ideas. In the subsequent phases,

Table 1. Overview and main phases of the activity.

Phase	Teacher-directed move	Student-initiated move
Phase 1 (P1)	Introduce to students the main purpose of the GS activity, help students recap strategies for argumentative writing and encourage students to reflect on the given topic and brainstorm ideas.	Brainstorm "reasons" for the given topic.
Phase 2 (P2)	Facilitate students to perform the task, ask students to explain the consequences and give comments on students' group artifacts.	Generate "Consequences" of getting plastic surgeries based on the reasons given by the peer group.
Phase 3 (P3)	Facilitate students to perform the task, ask students to provide solutions and give comments on students' group artifacts.	Summarize "solutions" based on the "consequences" given by the peer group.
Phase 4 (P4)	Encourage students to do FTF discussion to improve their group artifacts, synthesize and extract big ideas to be included into the group writing.	Synthesize and extract and improve the big ideas to be included in the group writing.
Phase 5 (P5)	Facilitate and ask students to present their group final artifacts, provide comments to them and summarize the whole lesson.	Present main ideas and the structure of group writing according to finalized group artifacts.

Figure 2. A graphic organizer for argumentative writing activity.

synergy of ideas was sought. The final phase of idea convergence and consensus seeking could lead to knowledge convergence (Fisher & Mandl, 2005) and advancement (Wen et al., 2011).

The topic for writing was "整容有罪吗 (Is plastic surgery a right thing to do?)". A template (see Figure 2) was uploaded as the background of the GS group board to provide tangible scaffoldings for students to accomplish the designed activity.

3.4. *Data gathering procedures*

This study compared the enactment of a collaborative writing lesson by two teachers, and explored its relation to students' learning outcomes by analyzing the teachers' instructional discourse. There were three main sources of data: 1) *teachers' instructional/plenary discourse in the classroom*; 2) *students' subsequent individual writing scores*; 3) *individual student feedback.*

While Chin and Judy were carrying out the lesson, two researchers sat in the class, observing teacher and student actions and taking down detailed observations notes. One video camera was set at the back of the classroom to record the classroom session. Students were required to provide feedback about the GS lessons after class. Each student took another 50 minutes to complete an argumentative essay on a same topic in the following Chinese language lesson.

A kind of video data analysis software called Studio Code was used to analyze teachers' instructional discourse. With Studio Code, we could represent teachers' instructional discourse chronologically to help understand how the two teachers facilitated GS activities. Chronological representation enabled a graphic representation of the chronology of discourse, allowing an understanding of how it changed over time (Hmelo-Silver et al., 2009; Puntambekar et al., 2007). In data analysis, firstly two researchers watched and transcribed all the video data. Then the two sets of transcripts were put into cross-referencing. Inconsistencies in the transcripts were resolved based on reviewing the video and negotiation. Next, the finalized transcript was segmented into units of "theme" by using semantic features such as ideas, discussion topic, or by regulative actions such as asking for an explanation or explaining on specific point (Henri,

1992; Wever, Schellens, Valcke, & Keer, 2006). Finally, the teachers' instructional discourse was coded based on the established coding scheme (see below). Using Studio Code, visual representations of the patterns of teaching practices were drawn.

The coding scheme was designed to capture five aspects of enactment (see Table 2). It was developed through an iterative process of creating codes, coding, modifying and refining codes. The procedures conducted were consistent with Miles and Huberman's (1994) recommendations for rigorous and meaningful qualitative data analysis. Considering the fact that most existing coding schemes are for inquiry-based learning and thus are not applicable for language learning, open coding was adopted to accommodate the particularity of the language learning context. The item "Relating to language" was added. This idea was borrowed from Swain and Lapkin's (1998) "language-related episodes", a concept they used to describe the moments when language learning may occur when they studied L2 learners' language use in collaborative dialogues. Parts of the coding categories of the study came from research on enactments of inquiry lessons (Puntambekar et al., 2007). "Relating to topic", for another example, referred to the way in which students were encouraged to think back about the topics that they had already learned, and connect that learning to the new topic that was being introduced. "Relating to topic" in this study referred to relating knowledge and strategies of argumentative writing to the current topic. "Focus on goals" referred to the speech that the teacher explicitly articulated the aim of lesson or the activity design to students. Additionally, based on GS affordances and the RCKI principles, thematic items such as "FTF discussion" and "Ideas" were highlighted, so as to ensure the activities to be completed with a high quality. The detailed coding scheme and its corresponding examples are listed in Table 2.

Students' learning outcomes were evaluated from two aspects: *students' subsequent individual writing* scores and *feedback from individual students*. The quality of students' written products was assessed with a writing rubric developed by the Ministry of Education of Singapore. The rubric has five parameters: 1) diversity of ideas; 2) appropriateness of evidence; 3) consistency in reasoning and justification; 4) novelty in ideas; 5) creativity and imagination. The full score was 70 points. A high score on these five dimensions indicated that the argumentative essay was well-structured and well-elaborated argumentative writing. All the essays collected were marked by another two teachers from the same school. The two sets of marks given were highly correlated ($r = 0.727$).

Table 2. Coding schemes with examples.

Category	Item	Interpretation	Example
Category 1: Ensure the activities can be completed as designed	Task introduction	Introducing how to complete the tasks	"In task 2, your group should come up with the 'consequences' based on the 'causes' that ha been posted."
	Time management	Reminding students of the task time	"Last 2 minutes. Use the time to complete your group's task."
	Providing encouragement	Encouraging or praising students' performance	"Group 2 did quite well."
Category 2: Ensure the activities can be completed with a high quality	Protocol	Rules for completing group task in GS-based learning environment	"Each group leader helps me to monitor the procedures of your group work."
	FTF discussion	Encouraging students to do FTF discussion	"Communicate. Let me hear your voice in the group verbal discussion."
	Ideas	Encourage students to share ideas and improve them consistently	"After visiting other groups' board, you need to improve your own existing postings."
	HOT	Encouraging skills like analysis, synthesis, categorizing, and evaluation	"If you disagree with the comments from your peer group, please give your reasons."
Category 3: Ensure students can understand the significance of the activity design	Relating to topic	Help students think back about the topics that they had learned, and connect that learning to the new topic that was being introduced.	"We have learned about the 'Five Fingers'. Remember an argumentative essay could be conceptualized from five perspectives: individual, family, friend, county and society. You can give reasons from these five perspectives."
	Focus on goals	Reminding students of the overall goal of the task in mind while engaging in the activities.	"Today, the ultimate goal of our lesson is to master the RES model for your argumentative essay writing."
Category 4: Help students master language knowledge	Relating to language	Episodes in which the teacher deliberate over lexical or grammatical choices (See Swain & Lapkin, 1998)	"The idiom should be 'Ru Huo Ru Tu'. The last character should be pronounced as 'Tu'."
Category 5: Help students improve cognitive skills	Asking students to explain or further think	Provide opportunities for students to explain their thinking	"Here, what does 'others' refer to?"
	Explaining specific point	Comment and elaborate on students' ideas	"Social influence here might be understood as plastic surgery is rampant in the community."
	Assessing or summarizing students' work	Provide evaluative response to group artifacts	"Group 5 provides reasons for the phenomenon of plastic surgery mainly from the individual and the society these two aspects."

4. Results

4.1. *Differences in teachers' instructional features*

The differences in the teachers' instructions could be understood from two aspects: 1) the amount/frequency of different categories of discourse produced; 2) the time distribution of different categories.

4.1.1. *Frequency*

The following bar charts depict the frequency of teachers' interactional discourse in different categories. The X-axis represents the coding categories. The Y-axis shows discourse frequency in different categories. These bar charts help visualize the quantitative differences in Chin's and Judy's instructional discourse.

Category 1, ensure the activities can be completed as designed: As shown in Figure 3, Judy spent more time on task introduction than Chin did. Yet, Chin managed class time more strictly than Judy did. She also more frequently praised and encouraged her students.

Category 2, ensure the activities can be completed with a high quality: As Figure 4

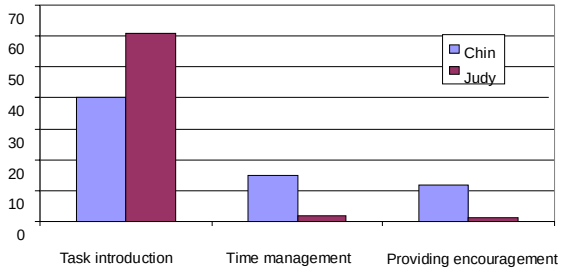

Figure 3. Frequency chart comparing Chin's and Judy's discourses in Category 1.

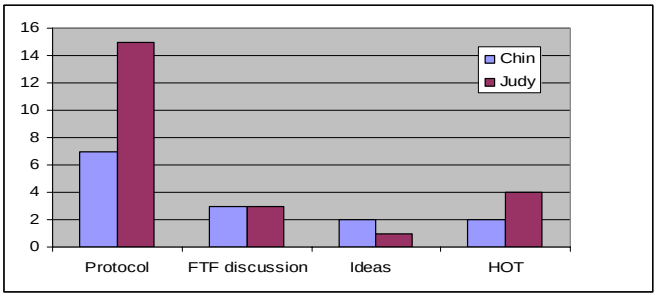

Figure 4. Frequency chart comparing Chin's and Judy's discourses in Category 2.

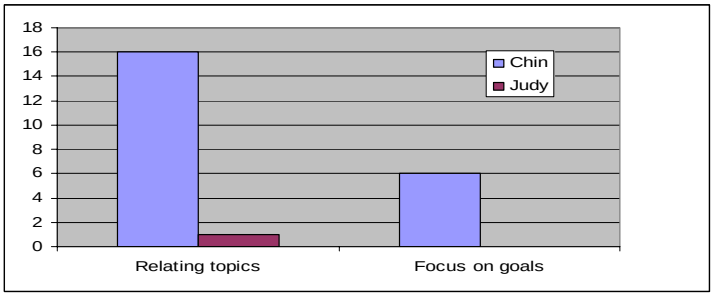

Figure 5. Frequency chart comparing Chin's and Judy's discourses in Category 3.

indicates, both teachers encouraged students to do FTF discussion to improve their ideas consistently, and to give comments or suggestions for others at the group or class level. Except for providing protocol, there was no obvious quantitative difference in category 2. Judy liked to provide more specific instructions on how to work collectively on GS. For example, she required each group to pick a different color to represent their group. She thought this might ensure the smooth running of the round robin activity. There was a potential drawback of this approach. Students might hence lose their individual identity in group work. In contrast, Chin preferred students to generate their own group protocols.

Category 3, ensure students can understand the significance of the activity design: Figure 5 shows that there were significant differences between Chin and Judy's instructional discourse in this category. Chin helped students make clear the learning objective and the connection between the collaborative writing activity design and learning content, rather than solely instructed students to follow the procedures strictly as designed as Judy did.

Category 4 & 5, help students master language knowledge & improve cognitive skills: As presented in Figure 6, no much difference could be seen between the two teachers' discourse in these two categories. Both teachers did not focus on correcting grammatical

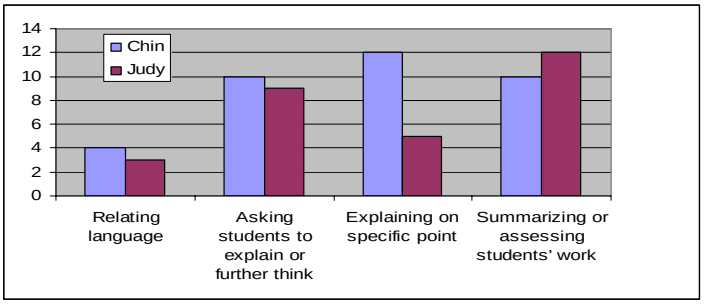

Figure 6. Frequency chart comparing Chin's and Judy's discourses in Category 4 & 5.

or syntactical errors in their instruction. Instead, they sought to scaffold students' cognitive development and problem-solving.

4.1.2. *Chronological representation*

In Section 4.1.1, the comparison of the instructional discourse by two teachers was only measured based on the calculation of frequency without taking into account the time of emergence. Though for some discourse categories there was no quantitative difference between the two teachers, qualitative difference in time distribution was noted. Using Studio Code, we further contextualized the teachers' instructional discourses. Visual representations of teachers' discourse patterns were attained. Figure 7 and 8 describe the discourses produced by the two teachers respectively. The top line of each figure indicates the time period for each phase of the GS activity (for more details, see Table 1). Each line of the figure depicts a discourse category (as indicated on the left part of the Figure). Bar codes were used to present each discourse unit. The length of the bar code represents the duration of that discourse.

From the chronological representation figures, we could tell that the enactment by both Chin and Judy were inconsistent with the lesson plan designed. They spent almost the same amount of time at the beginning phase to orient and introduce the activity, and at the last phase to evaluate group product and guide students to present their group work. But two teachers exhibited different patterns in enacting the activity. There were two major differences. First, Chin explicitly introduced the goals of the activity design to

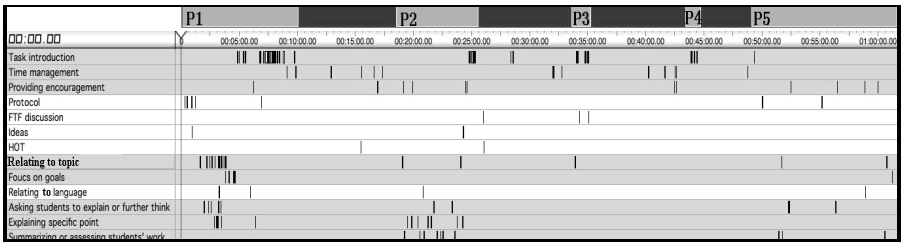

Figure 7. Chronological representation of Chin's discourse.

Figure 8. Chronological representation of Judy's discourse.

students at the beginning of the lesson. Yet, Judy did not. Second, Chin monitored the progress and quality of group work throughout the whole learning process and reacted immediately once problems arouse, whereas Judy offered her explanations and assessment only after students had completed the whole learning activity.

At the orientation phase (Phase 1), Chin made explicit the goals of the GS-based activity. Rather than assigning the task directly, she spent 5 minutes in introducing the CCS (Causes, Consequences and Solutions) model for the argumentative essay writing and guiding students to recall the related skills needed. Judy, however, spent about 7 minutes on introducing the writing topic. When introducing the task, Judy spent a lot of time to arouse students' interests in the given topic. The goals of the activity were left unattended. This finding is consistent with the results shown in the bar chart in Section 4.1.1. Chin made explicit the connection between the activity design and the learning content. Her students thus had a clear understanding of what they were expected to do and why they should do this, rather than passively followed the designed procedures. Yet in Judy's class, the picture was quite the opposite.

At the second phase of the activity, while students were brainstorming reasons for the popularity of plastic surgery, Chin mentioned the progress made by each group and provided plenary instruction (e.g. "If your group has posted sufficient 'reasons', now you need to group these given reasons. Do remember to think from the five perspectives mentioned in 'Five Fingers', the one that we have learned") to encourage the groups to proceed further. When the students had completed the first phase of the activity, Chin selected some groups' work to elaborate and comment upon (see Figure 7). Judy, however, never asked her students to categorize the ideas brainstormed. Moreover, at this phase, she seldom provided improvised feedback at the class level, though she walked around the class and monitored the progress of each individual group as Chin did.

At the last phase of the activity (Phase 5), that is group work presentation, Judy provided more comments to inspire students' thinking than Chin did. In addition, Judy spent more time on explaining the points that students might have their doubts and summarizing the achievement made by the group than Chin did. Although there was no much difference between the two teachers in terms of their discourse frequency for improving learners' cognitive skills, the chronological representation data revealed the qualitative differences on the time distribution.

4.2. *Differences in students' learning*

4.2.1. *Subsequent writing scores*

We started our analysis of student learning outcomes by examining whether the two classes performed differently in the subsequent individual writing. As shown in Table 3, the results of *t*-test indicated that there was significant difference in students' subsequent writing scores between the two classes ($t = 3.153$, $p < 0.01$). The mean score of Chin's class ($M = 47.530$, $SD = 5.906$) was saliently higher than that of Judy's class ($M = 41.875$,

Table 3. Comparison of subsequent individual writing scores between Chin and Judy's classes.

Class	N	Mean	SD	t-value	*p*-value
Chin's	20	47.525	5.906	3.153	0.003**
Judy's	16	41.875	4.846		

Note: ** $p < 0.01$

SD = 4.846). It indicated that Chin's class had bigger improvement after GS-based collaborative activity than Judy's class did.

4.2.2. *Feedback about the lesson*

In addition to writing performance, students' reflections on their learning experiences were also documented and analyzed. It might help researchers explain why significant difference was found in individual writing scores between Chin's and Judy's classes. Two semi-constructed questions were provided to guide students to give their feedback. 1) Collaborative writing and individual writing, which one do you prefer? Why? 2) What did you learn from the last GS lesson? The feedback from students helped us to explain why the enactments of the same collaborative writing activity by the two teachers led to different learning outcomes.

Students' reflections indicated that most of the students were positive about collaborative writing, except for two students in Chin's class and three students in Judy's class. Yet the reasons provided for the preference of individual writing to collaborative writing were different across students. Two students from Chin's class emphasized that they enjoyed the process of creation by themselves. The other student in Chin's class mentioned she liked both approaches, yet collaborative work may only be helpful for writing passages of a certain genre. Students from Judy's class felt it was easier to do individual writing than to do collaborative writing.

The predominate reason for adopting collaborative writing (given by 12 students from Chin's class and 9 students from Judy's class) was that it provided students with an opportunity to compare and exchange ideas with each other. For example, students from Judy's class pointed out that:

> "I prefer to write together with my group members as we can share our ideas, help each other to finish our writing."
> "I like group writing as we come to know others' views toward the topic, and we can choose the most suitable opinions through discussions."

Chin's students however, provided more detailed explanations for their preference of collaborative writing. In addition to sharing ideas, they noted that:

> "I like to write together in a group, because we can discuss with each other and provide ideas and suggestions for each other. My own idea might not be the best, but we can keep improving these ideas in group work."
> "… students own different ideas toward the same topic, thus everyone will be involved in intensive discussion on how to write an article. During this process, we can learn from each other, and in this lesson, our critical thinking and collaboration skills get improved."

The most obvious difference between the two classes was reflected in students' answers for the second question. All the 20 students from Chin's class noted that they learned that "Cause, consequences and solutions (CCS) are three essential parts of an argumentative essay." As one student expressed:

> "… CCS indeed help us better understand the process and the theme of essay writing. It portrays the whole thinking process and the way to find out the answers. Making use of this model, we can get the right way to conceptualize and compose."

However, no student in Judy's class mentioned CCS. Their feedback focused on "how to write together" or "how to complete a task with group members within a short period of time." It seemed that students in Chin's class could better understand the intent of teacher's activity design. This point might help us to explain the differences between two class students' academic performance.

5. Discussion

As a whole, the quantitative data showed that there were significant differences in students' learning outcomes of the two classes. The three main differences in the two teachers' enactments identified were: 1) the learning objectives and the connection between the writing activity design and the learning content were made explicit in Chin's class, whereas it was not evident in Judy's class. 2) Chin was able to improvise teaching to enhance students' performance at each phase of the activity. Judy, however, only commented on the students' group work at the end of the activity. 3) Chin strictly controlled the time of each segmented activity, and consistently encouraged and praised students. Judy did try to arouse students' interests in participating in the activity, yet she neglected to maintain this enthusiasm as the activity unfolded.

Making learning objectives explicit is probably the major factor that has led to the difference in students' performance in the subsequent individual writing. It is showed that Chin helped her students get a clear understanding of the purpose and focus of the collaborative writing activity. This result is consistent with the findings drawn from the students' feedback which revealed that students from Chin's class had a better understanding on the objective of the designed collaborative writing activity. Our results indicate that in enacting a lesson in a networked classroom, teachers need to make the learning objective clear to students (Hart, Mulhall, Berry, Loughran, & Gunstone, 2000)

and help them make connection between activities (Puntambekar et al., 2007), as in the case of in enacting lessons in classrooms without online technologies.

Our results demonstrate that compared with summative feedback, teacher's improvised feedback can better scaffold students' learning. The notion of orchestration has been put forward to refer to the process of flexible and productive coordination that the teacher needs to follow and adjust at different phases of learning in CSCL environments (Dillenbourg & Fischer, 2007; Dillenbourg et al., 2009). GS, as an online-based representational tool for recoding and persisting group artifacts, enables teachers to track progress of the group work and to provide immediate feedback. Our results support a key aspect of orchestration process: the need for the teacher to improvise and to provide feedback to accommodate the ongoing learning process in the classroom.

We also suggest that teachers be required to monitor the process and tempo of the ongoing work in enacting collaborative activities. Research has shown that time is an important factor for productive social interaction (Chai & Khine, 2006; Johnson & Johnson, 1989). In a networked classroom, the allotment, assignment and management of time for different types of activities deems essential for productive learning.

6. Conclusion and Limitations

This study compared the enactments of a collaborative learning activity by two Chinese language teachers to explore the potential strategies of classroom enactment that may enhance learning outcomes. The study aimed to provide insights to help teachers to appropriate online technology and to orchestrate multi-layered activities in a multi-media language learning classroom environment. The findings of this study reveal that there were differences in the enactment between the two teachers and these differences did influence students' learning achievements. The results suggest that language teachers need to 1) articulate the objective of the collaborative learning activity explicitly; 2) provide improvised feedback to scaffold and adjust students' work on an ongoing basis; 3) control the tempo of the activity and maintain students' enthusiasm. These strategies are consistent with traditional instructional principles, for example, making learning objectives explicit. In this paper, we do not put them into contrasting positions, or to be biased toward either of them. CSCL researchers do acknowledge the importance of teachers, and the social shaping of technology (e.g. MacKenzie & Wajcman, 1985; Overdijk, Diggelen, Kirschner, & Baker, 2012), but they pay less attention to studying teacher's enactments and their influence on students' learning outcomes. Unlike studies concerned with teacher's professional development that focus on investigating the relationship between teacher's beliefs, knowledge and teaching effects, this study provides a different perspective to track teacher's role in the process of teaching and learning in an authentic classroom environment.

In this paper, plausible strategies of teacher's instruction for enabling productive collaborative learning outcomes are identified and discussed. The limitations of this study should also be acknowledged. First, this study was carried out based on a single lesson and a comparison between just two teachers. Enactment styles vary among teacher with

different beliefs, pedagogy and content knowledge (Dimitriadis, 2010). The present comparative study was conducted under the assumption that the two teachers had the similar beliefs about students' language learning after a series of professional development sessions (e.g. providing the RCKI principles as guidance for GS-based activity design). The feature of comparative case study limits the generalizability of the findings. Yet, the findings of this study do point toward the importance of orchestrating collaborative activities in a multi-media language learning classroom environment. Second, this study focused on analyzing the differences in enactments between two teachers. The commonalities between them had not been taken into consideration, though they might influence the effects of the enactment as well. Moving forward, there is a need to involve more teachers, or to continue investigating the observed two teachers' enactments by taking into account of commonalities and particularities of their enactments.

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