EFL STUDENTS' PERCEPTIONS OF LEARNING VOCABULARY IN A COMPUTER-SUPPORTED COLLABORATIVE ENVIRONMENT[1]

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ABSTRACT
The present study was intended to explore EFL students' perceptions of learning vocabulary collaboratively with computers. We recruited 91 eighth-graders from three intact classes in a junior high school in Taiwan, assigning one class to learning individually without computers, another learning collaboratively without computers and the other learning collaboratively with computers. All participants took a pretest before three sets of vocabulary exercises in three periods; after each set, they took an immediate posttest; and, a month after the experiment, all took a delayed posttest. The computer group also completed a questionnaire and six students were interviewed. The quantitative data showed that students, learning collaboratively with computers, were not outperformed in vocabulary tests designed for individual study; however, they showed better retention, outperforming the others in the delayed posttest. From the qualitative data, more than 70% of the participants in the computer group reported a positive attitude and anticipation to learning vocabulary in such an environment. A further analysis found the nature of tasks, sharing of computers and grouping effective to their approaches to learning. Finally this study agrees that success is not guaranteed but deliberate design needs to be considered before learners are engaged in a computer-supported collaborative learning environment.
Key Words: computer-supported collaborative learning, English vocabulary learning, learner perception

INTRODUCTION

Collaborative learning has been widely applied in education since 1980s for its positive effects such as enhancing motivation and critical thinking skills as well as improving academic performance and long-term retention (Brown, 2008; Dillenbourg, Baker, Blaye, & O'malley, 1996). During the collaborative learning process where social interdependence and interaction take place (Salomon & Globerson, 1989), interpersonal skills, positive attitudes towards group work, and social relationships are also developed. A number of researchers agreed that collaborative learning has its root in Piaget's and Vygotsky's learning theories that elucidate how cognitive development and learning takes place during collaborative activities, as noted by Brandon and Hollingshead (1999):

> In Vygotskyian theory, learning occurs during interaction when students are exposed to a slightly higher level of difficulty than what they have already achieved cognitively. In Piagetian theory, learning occurs through interaction that produces multiple perspectives that, in turn, generate cognitive conflict in the individual student. (p. 117)

On the other hand, technology, whose applications have been widely used in language education, was found to increase learning motivation and interest, develop positive attitudes toward learning, result in higher-order thinking and better recall, as well as improve language skills (Stepp-Greany, 2002). The advance of technology has triggered its combination with collaborative learning and application in language classroom. It was assumed that this combination can bring about benefits from both sides. A number of studies advocating technology in

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support of collaborative learning revealed that the integration of computers into classrooms helps to increase collaborative behavior and social interaction among learners (Crook, 1994). Learning collaboratively in a technology-based environment was found to generate better learning effects than learning individually (Crook, 1994; Johnson & Johnson, 2004).

However, while technologies introduce a revolutionary classroom practice and human interaction, whether different technological applications have achieved equal degrees of pedagogical benefits in language teaching and learning is still questionable. Salaberry (2001), in a review study of technology use for second language learning and teaching, claimed that pedagogical effectiveness of different technologies is concerned with four major questions: (a) Is increased technological sophistication correlated to increased pedagogical effectiveness to achieve pedagogical objectives? (b) Which technical attributes specific to new technologies can be profitably exploited for pedagogical purposes? (c) How can new technologies be successfully integrated into the curriculum? (d) Do new technologies provide for an efficient use of human and material resources? (p. 51) These questions highlighted the importance of examining varying technologies separately in a particular instructional setting because pedagogical effectiveness lies in the way technologies are utilized and integrated into the curriculum (Salaberry, 2001; Zhao, 2003).

Computer-Supported Collaborative Learning

One of the emerging fields dealing with collaboration and technology in education is computer-supported collaborative learning (CSCL), a term first used by O'Malley and Scanlon in 1989 (Lipponen, Hakkarainen, & Paavola, 2004) and recognized by Koschmann as an emerging paradigm of educational technology in 1996. In reaction to the previous trend of designing computer programs centered on individual learners (Johnson & Johnson, 2004; Stahl, Koschmann, & Suthers, 2006), research of CSCL aims to explore how computers can be used to create an effective learning environment that supports collaboration in small groups (Koschmann, 1996; Stahl et al., 2006).

Although the bulk of previous studies has focused computer-supported collaborative learning on the use of network, which allows synchronous and asynchronous communication free of space limitation, the integration of technology and collaboration should not be exclusive to networking tasks or online communication at the expense of authentic face-to-face interaction where collaboration can also happen with the aid of computers (Stahl et al., 2006).

Despite of the seeming benefits of combining computers and collaboration, the CSCL issue should be tackled carefully in that both elements are involved with complex sub-issues (Stahl et al., 2006) that deserve further investigation. For example, Dillenbourg et al. (1996) indicated that factors, such as group size, group composition, nature of tasks, and communication media, may interact with one another in an intertwined way in which casual links can hardly be established between the learning conditions and effects of collaboration. Furthermore, studies under the label of CSCL involve a great variety in terms of methodological approaches, unambiguous definitions of CSCL, roles of computers, task types, learning goals, group composition, social interaction and instructional environments (Johnson & Johnson, 2004; Lipponen, 2002; Stahl et al., 2006; Strijbos, Kirschner, & Martens, 2004). Therefore, the effectiveness of CSCL should not be taken for granted without considering respective instructional settings where these variables interrelate (Strijbos et al., 2004), for fear of overgeneralizing the integration of technology into classrooms. In fact, not all studies with regard to technology-based collaborative learning reported satisfactory results in terms of group performance, interaction, and learning outcomes. Reflected upon the inconsistent findings, a number of researchers began to investigate some learner factors.

Learner Perceptions

One of the growing interests is aimed at understanding the learning process from a participant's viewpoint (Koschmann, 1996). Although CSCL has been recognized as an important field in education since the mid-1990s, it was not until the 21st century did more CSCL researchers start to look into student perceptions of their learning experiences in a computer-supported collaborative environment. One of the latest studies conducted by Gomez, Wu, and Passerini in 2010 aims at investigating the relationship between students' perceptions in different aspects. The finding revealed that perceived enjoyment of the computer-supported team-based learning is affected by perceived motivation and perceptions of team members' contributions. Motivation has an impact on the relationship between team interactions and perceived learning. Those who perceive that their education benefits from the team interactions will better enjoy learning and experience higher-level learning outcomes.

Although not pointed out directly in CSCL studies, the relationship of perception-process-product seems to receive more attention in recent years. Since learners' perceptions of learning environments play vital roles in

determining their approaches to learning during instructional processes (Biggs, 1993), studies investigating learning effects or outcomes should take these mediating factors into consideration. Although literature pertaining to learner perceptions has yielded similar results in support of implementation of collaborative learning or technology-based instruction in educational settings (e.g., Brown, 2008; Stepp-Greany, 2002), few studies have probed into learner perceptions towards technology-based, or computer-supported, collaborative learning. Some research also revealed discrepancy among learner perceptions when individual factors are considered. For instance, Smart and Cappel (2006) stated that the more experiences learners have with technology, the higher levels of their satisfaction in learning to use new technology are shown. There is also evidence that students' personal computer proficiency is related to their perceived effect of computer technology to improve their learning (Keengwe, 2007).

Vocabulary Learning

The critical importance of vocabulary in all languages is undeniable because it not only establishes cognitive systems of knowledge, but also facilitates the communicative and comprehensive interaction (Coady & Huckin, 1997) as a base for affective and social relationship to build up. L2 vocabulary acquisition, unlike the incidental learning in L1, requires more efforts and time in learning target words intentionally. L2 learners, particularly in the early phase of L2 learning, need to reach the threshold level of frequent words in the target language for their languages skills and linguistic knowledge to develop (Nation, 1990, 1993, 2001). Effective vocabulary learning reflects in the useful retrieval of receptive and productive knowledge and requires deep processing that enhances long-term retention of vocabulary (Craik & Lockhart, 1972). Hence, lexical tasks and instruction should be designed with an aim to activate learners' processing in depth and higher degree of involvement load (Hulstijn & Laufer, 2001). For example, students may profit more in acquiring unfamiliar words from CALL (computer-assisted language learning) software that offers sentence contexts, definitional or synonym cues, and optional word choices than from that which provides definitional information only (Kolich, 1991).

Purpose of the Study and Research Questions

The current study sets up a learning environment where learners collaborated to complete a series of vocabulary exercises on screen and attempts to account for the learning process and outcomes based on learners' perceptions of their learning experience. Three main research questions are addressed in the study: (1) Are there any significant differences between the group of individual learning without computers, the group of collaborative learning without computers, and the group of collaborative learning with computers in vocabulary tests designed for individual study? (2) What are EFL high school students' perceptions of learning vocabulary in a computer-supported collaborative environment?

METHOD

Participants

Three intact classes consisting of 91 eighth-graders in a junior high school in northern Taiwan were recruited. The three classes were randomly assigned to a group of learning individually without computers, another group of learning collaboratively without computers, and the other group of learning collaboratively with computers. Within the two collaborative groups, learners were grouped heterogeneously according to their academic performance in previous semesters. In each small group of each collaborative group, there were 4 to 5 students. Every student was assigned a specific role during the vocabulary exercise activity, including group leader, recorder/computer operator, timer, or checker/answerer. Students were able to discuss the role distribution with their group members and decided each person's role.

Study Design

The independent variables in the study were treatments to different groups, that is, whether the participants learned independently or collaboratively; whether they used the computers during the learning process. Their vocabulary learning effects were the dependent variables we focused. To probe into how learners perceived their learning in a computer-supported collaborative environment, the computer group was separated for a qualitative investigation. The study design is shown in Figure 1 below.

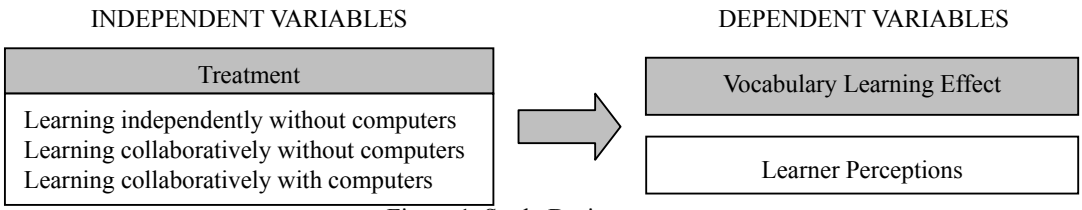

Figure 1. Study Design

Materials and Instruments

There were 5 sub-exercises for each set of vocabulary exercises: matching, filling in the blanks, spelling, unscrambling sentences, and crossword puzzle. An on-screen version with a different visual exposure was prepared for the computer group (see Figure 2 below). The vocabulary tests included one pretest in the form of a recognition checklist and two posttests, immediate and delayed ones, which were composed of recognition and production parts. The post questionnaire was designed to explore learners' perceptions of learning in a computer-supported collaborative environment, with some open-ended questions included.

Figure 2. Snapshots of vocabulary exercises
(Clockwise from top left: matching, filling in the blanks, spelling, word puzzle and unscrambling sentences)

At the end of the study, a semi-structured interview was conducted to probe into learners' perceptions towards their learning experience during the experiment and factors influencing their perception, participation, and performance. The questions included their general impression of the whole activity; their favorite, unfavorable, and the most helpful exercises; perceptions of the role assignment, participation, interaction, group composition, and group members during the collaborative process; the like or dislike of using computers in English class, perceptions of positive or negative effects of learning in such a collaborative environment; their anticipation and suggestion for similar activities in the future.

Procedures

Prior to the experiments, all participants first took a vocabulary pretest which measured their familiarity with the target words. The instructor then introduced target words to all participants in previous classes when teaching three individual lessons to which these words belong. The three groups then started to receive different treatments for vocabulary exercises in the following three weeks. In the control group, the participants completed each vocabulary exercise on a printed version individually without consulting other classmates, but they could refer to their own worksheet if needed. The participants in the experimental group without computers, also working on a printed version, needed to collaborate with their group members and finish the vocabulary exercises by discussing the answers. Those in the other experimental group with computers were asked to share computers in groups to complete the exercises on screen. The participants took an immediate posttest, consisting of 30 production and 30 recognition items, right after each set of vocabulary exercises to demonstrate their understanding of the word meaning in multiple-choice questions and the ability to actively recall a word in context and spell it correctly. After all the treatments ended, participants in the computer group were asked to complete a post-questionnaire with regard to their experiences of learning in such an environment. Four weeks after finishing the last set of vocabulary exercises, a delayed posttest was administered to all participants to measure their long-term retention of vocabulary. Six students in the computer group were selected for a later semi-structured interview. Data collected from the vocabulary tests, questionnaires, and interview were analyzed and compared quantitatively and qualitatively.

The vocabulary scores were first analyzed for descriptive statistics, with mean scores and standard deviation presented, to compare how the participants of each group performed in their individual achievement tests of vocabulary as a whole. Second, the scores were paired within each group and compared using paired-sample T-test to understand the vocabulary growth and forgetting rate. The differences of each score between the three groups were also analyzed using one-way ANOVA; the pretest, immediate posttest, immediate production, immediate recognition, delayed posttest, delayed production, and delayed recognition were involved. In addition to the respective scores, the study further probed into the immediate gain, delayed gain, and forgetting rate of each group. In addition to the vocabulary scores, the quantitative data in the post-questionnaire was analyzed descriptively in terms of frequency counts and percentages of respondents for each statement. The participants' degree of agreement was not transformed to scores for fear that type I error may be induced because of the limited number of participants in the computer group.

RESULTS AND DISCUSSION

Ninety-one participants were recruited in the study, but 13 of them failed to participate in the whole data collection process and lacked scores of complete vocabulary tests or the post-questionnaire. Therefore, their data was not accepted for analysis. Only 78 participants were included.

Learning Vocabulary Collaboratively with Computers

The result of mean scores and standard deviations of the vocabulary tests is presented in Table 1, showing a sharp increase in both gain and retention.

Table 1: Scores of pretest, immediate posttest, and delayed posttest

		Pretest (30)		Immediate posttest (60)		Delayed posttest (60)	
Group	N	M	SD	M	SD	M	SD
Individual learning without computers	27	.78	1.761	40.30	12.517	25.19	12.524
Collaborative learning without computers	26	.81	1.132	35.50	14.230	22.96	11.732
Collaborative learning with computers	25	1.24	2.314	35.68	13.372	25.44	14.451
Total	78	.94	1.783	37.22	13.397	24.53	12.806

The pretest, a recognition checklist of 30 target words, showed that participants were unfamiliar with these words, getting only .94 out of 30 on average. The immediate posttest and delayed posttest required participants to recognize the target words in the form of 30 multiple-choice questions and fill words in the blank based on contextual hints. The group learning collaboratively without computers scored the lowest in both posttests. The group learning individually without computers scored the highest in the immediate posttest, whereas the group learning collaboratively with computers scored highest in the delayed posttest.

According to the paired-sample *t*-test, as presented in Table 2, vocabulary growth within each group from the pretest to the immediate posttest, which was examined in terms of production and recognition sections, was significant, so was the difference between the pretest and the delayed posttest. Nevertheless, the rate of forgetting in each group was also found to reach a significant level .000 ($p< .01$), as indicated by the 5th, 6th, and 7th pair between immediate posttest and delayed posttest. Participants forgot much of the vocabulary in the delayed posttest, but the vocabulary gain compared with the pretest was still significant.

Table 2: Paired-sample *t*-test in each of the three groups

		Group		
		Individual learning without computers	Collaborative learning without computers	Collaborative learning with computers
Pair 1	Pre-ImPro	-6.940**	-4.950**	-7.143**
Pair 2	Pre-ImRec	-31.588**	-26.804**	-18.775**
Pair 3	Pre-DePro	-3.542**	-3.352**	-3.253**
Pair 4	Pre-DeRec	-16.201**	-13.948**	-12.125**
Pair 5	ImPro-DePro	6.122**	5.396**	5.894**
Pair 6	ImRec-DeRec	6.619**	6.143**	4.878**
Pair 7	ImPost-DePost	9.760**	9.360**	6.851**

Note. Pre=pretest, ImPro=immediate production, ImRec=immediate recognition, DePro=delayed production, DeRec=delayed recognition, ImPost=immediate posttest, DePost=delayed posttest; ***p<.01*

The results of one-way ANOVA on the vocabulary tests designed for individual study indicated that vocabulary scores of the pretest ($F (2, 75)=.531$, $p=.590$), immediate posttest ($F (2, 75)=1.094$, $p=.340$), and delayed posttest ($F (2, 75)=.288$, $p=.751$) were not significantly different between the three groups, so were the differences of immediate gain ($F (2, 75)=1.396$, $p=.254$), delayed gain ($F (2, 75)=.290$, $p=.749$), and forgetting rate ($F (2, 75)=2.765$, $p=.069$). The vocabulary exercises appeared to assist participants in acquiring vocabulary; the treatment of computers and collaboration did not influence the vocabulary scores to a significant extent, which could be attributed to the task type itself. Since vocabulary learning requires more individual effort than collaborative contribution, it is conceivable that the difference would be minor if the vocabulary exercises were identical. Nevertheless, it was interesting to find that while the group of individual learning without computers outperformed the other groups in the immediate posttest and acquired more words, the participants in this group seemed to have higher rate of forgetting, with an average mean 15.11 (SD=8.045) that was lower than scores in

the immediate posttest. By contrast, the two collaborative groups without computers and with computers forgot less vocabulary by the means of 12.54 (SD=6.831) and 10.24 (SD=7.474) respectively, lower than scores in their immediate posttests.

Vocabulary learning is considered a more individual task rather than a collaborative one; the three vocabulary tests are also designed so in mind. It is, therefore, reasonable that the participants in the group of individual learning without computers performed better in the vocabulary tests, an assessment that emphasizes individual learning effects. However, as seen in the statistics above, learning collaboratively seems to help learners remember vocabulary longer and forget less over a period of time despite of the individual-oriented exercises and assessment. In addition, with the aid of technology, or computers in the current study, learners appeared to have a better long-term retention.

Positive Attitudes Towards Learning in a Computer-Supported Collaborative Environment

To answer research questions 2, the current study examined participants' responses to the post-questionnaire and the semi-structured interview, which were designed to explore their perceptions of learning vocabulary in a computer-supported collaborative environment, and attempted to offer an explanation for the vocabulary learning results. Table 3 presents the results of participants' responses to the post-questionnaire.

Table 3: Participants' responses to the post-questionnaire

Statement	SD		D		N		A		SA	
	N	%	N	%	N	%	N	%	N	%
1. I like to learn English with the use of computer technology in English class.	0	0	0	0	9	36	9	36	7	28
2. I think activities through computer technology can help me in learning English.	1	4	2	8	9	36	9	36	4	16
3. I think using computer technology in English class can enhance my interest in learning English.	0	0	1	4	6	24	12	48	6	24
4. I think collaboration in group work is more required to complete an activity when computer technology is used in English class.	0	0	0	0	10	40	8	32	7	28
5. I think group work activity with the use of computer technology is more efficient through collaboration.	0	0	0	0	9	36	9	36	7	28
6. I think only one or two members are enough to take the responsibility to finish the group work activity with computer technology.	5	20	6	24	13	52	1	4	0	0
7. I hope I can operate one computer by myself when using computer technology in English class.	5	20	3	12	8	32	6	24	3	12
8. I think doing vocabulary exercises through computer technology are more interesting than doing identical exercises of printed version.	0	0	1	4	8	32	9	36	7	28
9. I think vocabulary exercises through computer technology enhance my memory for English vocabulary.	0	0	2	8	14	56	6	24	3	12
10. I think doing vocabulary exercises through computer technology would distract me from the English words.	7	28	7	28	10	40	1	4	0	0
11. I think learning English with the use of computer technology is suitable for me.	0	0	1	4	14	56	6	24	4	16
12. I am looking forward to the future opportunity of using computer technology in English class.	0	0	0	0	7	28	6	24	12	48
13. In general, I feel satisfied with the experience of learning English vocabulary in a computer-supported collaborative learning environment.	0	0	1	4	5	20	8	32	11	44

When asked about the perceived relationship of technology use and English learning, 64% of the participants claimed that they like to learn with the use of computer technology in English class, without any negative attitude reported from the rest. Eighteen students (72%) claimed that the use of computer enhance their interest in learning English, while only one student showed less interest in learning with computers. With regard to collaborative learning, while more than 60% of the participants were aware of the importance of collaboration in a group and agreed that group work activity with the use of computer technology is more efficient through

collaboration, not all of the students were able to play their individual role well. Instead, arguments were easily raised at times with respect to operation of computers. Those who were assigned less influential roles, such as timer or recorder, had a tendency be distracted from the task. In other words, they were not so attentive to the target words appearing in the exercises, compared with those in the individual group exposed to almost every target word. This was considered a chief reason why the computer group did not outperform in the immediate posttest. Compared with the printed version of vocabulary exercises, the on-screen version appealed to 64% respondents who found it more interesting to do the exercises through computers. Only one participant showed disfavor for doing on-screen exercises. While 56% of the participants were uncertain about the helpfulness of computer use in enhancing their memory of English vocabulary, 36% of the rest agreed to have better retention when learning with computers and only 8% had an opposite view. More than half (56%) of the students disagreed that they would be distracted from target vocabulary because of the computer, while only one participant reported the possibility of distraction. The rest 40% respondents neither agreed nor disagreed with the situation. When it comes to the whole learning experience in a computer-supported collaborative environment, 40% of the students agreed that the learning way is suitable for them, whereas only one student had no preference for the use of computer in English class. More than half (56%) of the participants, nevertheless, expressed an uncertain attitude towards the suitability of computer use for them. Despite of the uncertainty, up to 72% of them were looking forward to the future opportunity of using computer technology in English class. Generally, 76% of the participants felt satisfied with the experience of learning English vocabulary in a computer-supported collaborative learning environment. Twenty percent of the rest held a neutral view and only 4% showed dissatisfaction.

The open-ended questions included in the post-questionnaire were concerned with participants' favorite and most unfavorable part of the whole learning experience. The qualitative data revealed that most participants were fond of the use of computer in their English class because it was fun and different from the traditional way of learning; it was more time-saving than doing paper-and-pencil exercises. They enjoyed the playful effect of operating computers, which also allowed them to improve the computer literacy like keying in words. Besides, some students claimed to favor the variety of exercises in which they encountered target words repeatedly, but they seemed to have preferences for different subtasks. Each kind of exercise has been mentioned as the favorite by students of different learning needs and focus. In addition to the use of computer and variety of exercises, a few students mentioned the collaborative experience as their favorite. The major reason was the chance of discussing with others and working together to complete a task. Other respondents pointed out that collaboration improved the relationship between group members, led to better efficiency during the activity, and enhanced the impression of learned materials and interest in learning English. On the contrary, the most unfavorable part reported by participants included specific tasks which they could hardly complete in time or they considered too challenging, such as the fill-in-the-blank and unscrambling sentences. In spite of the different task content, one student felt bored with the repetitive framework of exercises after doing three sets. A number of students complained that sharing of computers resulted in collaborative and communicative problems when every group member attempted a chance to operate the shared computer. Those who were not given the chance to operate the computer tended to withdraw attention from the whole learning activity. In addition to task and grouping problems, some students were unsatisfied with the interface of the computer software, complaining that the answering square was difficult to move on screen such as exercises of matching and unscrambling sentences. The selected interviewees' responses to the semi-structured interview reflected findings in the post-questionnaire. Participants enjoyed the learning experience in a computer-supported collaborative environment in that computers aroused their interest and motivation to learn as well as participate in the learning activity. It was reported that working in a group enabled them to discuss and exchange opinions with others. During the collaborative process, the major concerns were sharing of computer and assignment of roles, both of which made it difficult to involve everyone fairly in learning tasks and vocabulary exposure. According to the interviewees, the group composition still had an effect on their participation. Most of them preferred grouping by themselves while still others like the heterogeneous grouping by the instructor to avoid possible arguments resulted from self-grouping.

Obviously, the use of computers can attract and motivate learners to participate in the group tasks and learning activities, but only half of the participants agreed that they benefited from the computer technology in learning English. The main reason may result from the task itself, the sharing of computer, and role assignment during the collaborative process. Since computers were attracted to almost all participants, none of whom expressed negative attitude, everyone was looking forward to operate the computer. The vocabulary tasks in the current study required less collaborative work, which caused possibility of attention dispersion of certain learners. Not all team members, for example, exerted equal mental effort on given tasks (Salomon & Globerson, 1989). This uneven student participation may result from different learner perception of their roles and relationship with other members in a group, and have an effect on the collaborative process as well as the team performance, leading to

some debilitating effects derived from social loafing, free-riding, or differential status. Although participants were asked to take the partial responsibility of each task, some group members tended to hide themselves once they were aware of the more proficient ones who would take care of the task, especially when the tasks were more disjunctive (Kerr & Bruun, 1983), in which the group performance depends on how well the most talented member does. Reflected upon the qualitative data, learners' perceptions with regard to the group composition (Graf & Bekele, 2006; Johnson & Johnson, 2004), nature of tasks, and individual accountability appeared to have an effect on learning approaches they adopted.

The current results suggested that long-term retention of vocabulary was highly related to the depth of involvement and deep processing during the learning process. In the collaborative group with computers, the learners motivated by the use of computers were engaged more in their learning with a deeper level of involvement load (Hulstijn & Laufer, 2001). This may account for their better performance in the delayed posttest than the other two groups without computers. Within this computer group, nevertheless, those who considered themselves having little access to the computers tended to withdraw from the learning task and thus gave much less attention needed for deep processing, lacking elaboration of mental representation (Hulstijn, 2001).

CONCLUSION

The present study, by means of both qualitative and quantitative research methods, probed into the relationships between learner perceptions, learning process, and learning outcomes in a computer-supported collaborative environment. Our participants showed great acceptance and interest in learning in such an environment, but the collaborative process was not as ideal as expected. As reflected in learners' perceptions, regardless of the role assignment to each group member, positive interdependence and individual accountability that were required in successful collaborative learning have not been well achieved in the current study. This unsatisfactory result may be attributed to the task, in which some members' efforts may be considered dispensable. Nevertheless, despite the fact that the task was hardly a collaborative project, the forgetting rate of vocabulary revealed that the two collaborative groups were able to retain the target vocabulary longer. Furthermore, of the two collaborative groups, the computer group even forgot less than the group without computers in the delayed posttest. This finding suggested that the combination of technology and collaboration in language learning had a long-term effect even though the task was not so collaboration-oriented. The significance of the study was limited due to the number of participants and study span. Therefore, it is suggested that future study be conducted with a greater number of participants and for a longer time span to know whether the effect of CSCL can be extended to other learning aspects. Finally, this study concludes that success of combining collaboration and technology is not guaranteed, but factors like group composition and task types need to be considered before learners are engaged in a computer-supported collaborative learning environment.

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