Constructing the Face-to-Face Collaborative Game-based Interacted Environment for Portable Devices in English Vocabulary Acquisition

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Abstract: This study is aimed to develop a face-to-face collaborative English vocabulary acquisition game system on portable devices, called Wireless Crossword Fan-Tan Game (WiCFG). One class of 32 primary school students in Taiwan participated in this study. Students' learning outcome, motivation, and attitude were collected and analyzed. In their small group interaction, we analyzed and generalized three interaction modes: "Face-to-face interaction", "Device-media interaction" and "Human-device interaction". Significantly, a "face-to-face portable-device-mediated interaction module" was proposed. The preliminary research findings indicate that adopting the WiCFG could improve the learning outcome of lower-achievement learners. Using the WiCFG had positive enhancements of learning motivation and engagement. In the group observation, using the WiCFG improved learners more interdependent in group collaborative learning and was generally well-received by the English teacher and the students.

Introduction

English learning has been highly valued in Taiwan for a long time. The Ministry of Education in Taiwan declared that all primary school students must take English course from third grade. Besides the government policy, parents also focused improving the English ability of their children. Parents sent their children to learn English in informal ways based on their financial resources. An investigation on the current implementation of EFL (English as foreign language) learning in Taiwan primary schools was published by the National Teachers' Association R.O.C. and Citigroup (2004). It notes that the bimodal distribution of children's English proficiency has been a significant issue in primary schools. Traditional teacher-centric instructional approaches appear to be unable to benefit different students' learning. One of the thorniest problems teachers face is that lower-achievement students lack motivation to learn based on different English learning background and ability. Teachers are eager for a solution to this problem.

Therefore, in this paper, we develop the Wireless Crossword Fan-Tan Game (WiCFG) in order to motivate learners to learn English vocabulary. The purpose of the study is to ascertain the effect of using the WiCFG system with Tablet PCs as compared to using paper-and-pens in English vocabulary collaborative learning in terms of the learning performance, the motivation to learn English vocabulary, and the cultivation of interactions.

Face-to-face Group learning and interaction patterns

The interactions in groups decide the positive or negative collaborative results. Students enhance cognitive learning from memory through the interactions and negotiations in the group (Zurita & Nussbaum, 2004). Face-to-face CL activities may probably come up with disagreements or different points of view, so group members need to cultivate abilities for communication. In the Johnson and Johnson model of collaborative learning, positive interdependence is the key issue of the learning community (Johnson & Johnson, 1998). Individuals share common goals and individual outcomes are affected by the actions of others. Also, competition is considered an effective way to stimulate people progress (Julian & Perry, 1967; Whittemore, 1924; Yu, 2001). A competitive learning environment obviously stimulates different feelings in winners and losers. It is imperative to consider how to design such an environment so as to motivate learners (Chang et al., 2003). In a competitive game-learning environment, students are motivated to make efforts to achieve better performance (Chang et al., 2003)

Chen et al. (2003) recently confirmed that intra-group communication patterns exert a significant effect on group performance. To represent intra-group communication, Liao (2004) relied on Milson's (1973) communication patterns and took all possible interactive links among three members into consideration in order to illustrate the small-group interaction patterns shown in Figure 1. In that figure, links represent oral, emotional, or physical communications. Ideal and dominant leaders are defined as positive examples, since they reflect the features of cooperative learning more completely than other patterns. In Figure 1, the interaction links are defined as (Liao, 2004):

1. Ideal (three bidirectional links). Three group members interact via multiple communication routes.
2. Dominant leader, with individual bidirectional links connecting three group members.
3. Cliquish, with one bidirectional link between two group members, thus putting the third member in a position of isolation.
4. Unresponsive, with only one unidirectional link. A group member may try to communicate, but the other two fail to respond.
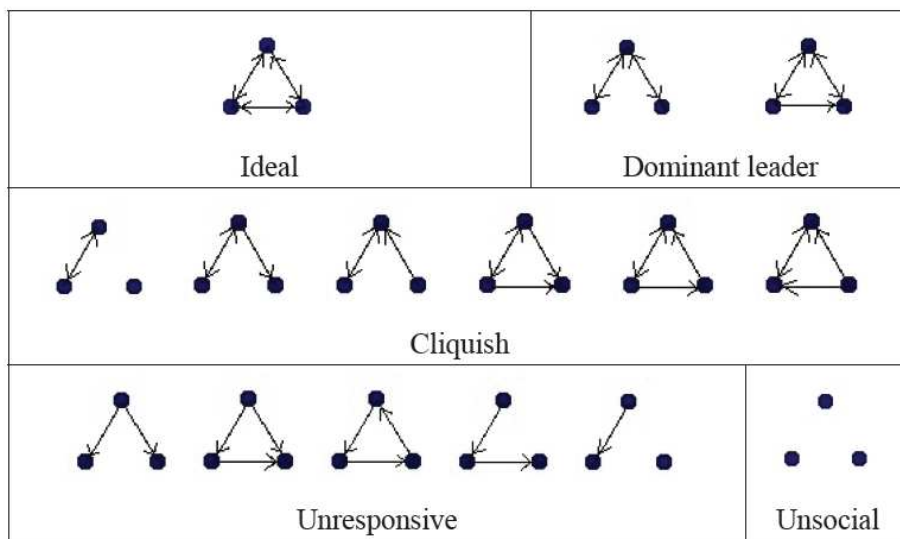5. Unsocial, with zero links. Group members simply do not communicate.

Figure 1. Small-group interaction patterns (Liao, 2004)

Mobile technologies and one-on-one digital classroom environment

Wireless and mobile technologies bring forth a unique opportunity to construct a seamlessly integrated learning environment (Joiner et al., 2003) and the notion of "one-to-one technology-enhanced learning" (1:1 TEL), a ratio of at least one computing device for each student, was coined (Cheng et al., 2006). A wireless technology enhanced classroom (WiTEC) which integrated with mobile devices, wireless communication, and network technologies can reduce the time for tedious work, engage students in learning activities, empower the teacher to monitor students' learning status, facilitate group collaborative learning, record teaching and learning processes as portfolios, and make portable wirelessly-networked technologies that has become ubiquitous and pervasive in the everyday lives of learners (Gay et al., 2001; Goldman & Kaufman, 2001; Liu et al., 2003)

CL is an important issue of 1:1 TEL, In the process of CL, it can be more convenient by using mobile devices. Mobility has dramatically increased portability and interactions between members and enables immediately exchange of different thoughts with appropriate amendments and responses. Studies (Inkpen, et al., 1995) show that compared with single-operator learning, the group collaboration learning would be a positive influence on performance of more effective cooperation for the achievement and joy.

WiCFG

In this study, we developed the Wireless Crossword Fan-Tan Game (WiCFG) gaming course environment. One class of 32 primary school students in Taiwan participates in this study. Each group contains three different level students (beginning, intermediate, and advanced). According to English used frequency, the English characters (from a-z) are dividedly distributed to group members equally, which group member can only see his/her own characters in "personal area" in WiCFG. Three group members share the same "group pubic area" to let members interact with each other synchronously. Group member can drag his/her own character from "personal area" to "group public area" to build the word collaboratively. Teachers can monitor the performance of each group, and collect all the results of groups in the data analysis area in teacher client.

Prior to the game, the teacher can assign the theme (ex: food, transportation, travel, etc.) to match the progress of the course. In the game beginning, group members need to build up the "word map" on public area collaboratively, they need to discuss which vocabulary should be chosen and negotiate with their own letters to accomplish word together. The word on the word map has to be negotiated and completed by the three group members with their own letters. The group which builds the most vocabulary matching the theme wins the game.

In order to understand whether deploying computer supported CL scenario by means of using Tablet PC with the WiCFG would benefit EFL vocabulary learning, we decided to examine the differences between using the WiCFG and paper-and-pens through the similar activity of English vocabulary (see Figure 2).

The research design of the study was conducted during the last semester of sixth graders who learn English as a foreign language in the NS elementary school of northern Taiwan. One class of 32 primary school students in Taiwan participated in this study. Classroom observers recorded the participants' interaction, motivations and involvement on the observation form, and four DV recorders focused on different assigned subgroups during the whole process. The participants were also asked to fill out a questionnaire which elicited information concerning their interface operation (in the experimental group only), attitudes, motivations and interaction. The interviewing data was collected a week after the survey was completed. Three successful and three less successful English learners were selected from both groups, based on these learners' performance during the activity. The length of each interview lasted from ten to twenty minutes. After each individual interview, we had a focus group interview for each subgroup. Participants were interviewed about their language background, interaction opinions during the learning process, and motivation especially focusing on the interaction. After all, the repeated measure ANOVA was used to detect significant difference among variables. Both qualitative and quantitative data were collected and analyzed.
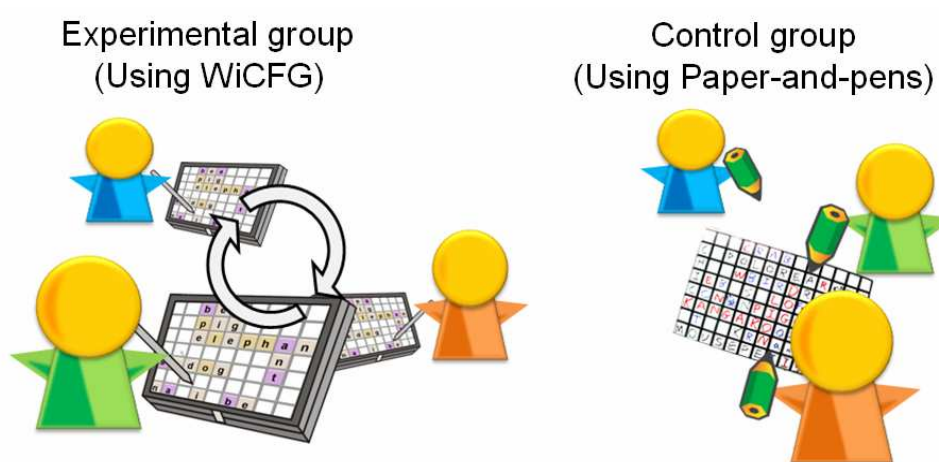

Figure 2. Experimental groups and control groups

Preliminary data findings and analysis

Learning performance of experiment group (E.G.) and control group (C.G.)

The data findings indicate that the result of the pretest (E.G., M = 10.20, C.G. M = 10.82) and the posttest (E.G. M = 12.46, C.G. M = 12.22). The results show that the students' scores in both groups improved after the activity. The analysis used the SPSS statistical software package, and the descriptive statistics were computed. According to the finding, in each instance, the mean posttest scores are higher than mean pretest scores. There are significant differences in the pretest/posttest of the experimental group (p = .002 < .05) and the control group (p = .001 < 0.5). The result indicates that there are no significant differences between the test scores for the two groups (F=6.127 , p=.11 > .05), for high-achievement users (t= 3.508, P = .468). By contrast, there are significant differences between the low-achievement users.

Student's endurability, engagement, and expectation effects

This study analyzed students' attitude toward to game using the WiCFG and using paper-and-pens by the endurability, engagement, and expectations following Read's related research. The questionnaire provides the list of items that were used for classifying the data in this study, grouped into three categories. The Likert five point scale implemented in the questionnaire transformed participants' ideas to quantitative data (From 5 to 1 point mean strongly agree, agree, neutral, disagree, strongly disagree). The result of the questionnaire is shown as follow.

Endurability: Items 5, 8, and 10 score averaged 3.87 and 3.67 in E.G. and C.G, which shows the game using both WiCFG and paper-and-pens are endurable and have continuity in both groups.

Engagement: In this category, items 6, 7, and 9 had the average score in E.G. of 3.87, which means using WiCFG is beneficial to help students concentrate their attention to the game. However, in C.G., items 6 and 8 only scored 2.65 and 2.41, this shows that control group students are easily interrupted and distracted.

Expectations: Items 2 and 11 scored 3.59~4.24 in both groups, which show that both using WiCFG and paper-and-pens is expected by students.

The group interaction observation

In the most of the control groups, the observation shows that the paper and pens only used by one or two students. Students hardly use the resource and materials at the same time. Therefore, some students do not collaborate with their group members. Contrary to the control groups, the experimental groups have more interaction between group members. Based on the equal resources the members have, students need to negotiate with each other to accomplish the common goal set by each group. Furthermore, when focusing on low-achievement learner in each group, we find that the low-achievement learner in the experimental group interact with other two members more often than in control group. Low-achievement learners were ignored because they could not get the resource in their group.

Face-to-face portable-device-mediated interaction module

In the study of small group interaction, we add the media-mediated factor and generalized three interaction modes as follow:

Face-to-face interaction: In the small group CL activity, the activity supports face-to-face communication and social interaction between participants.

Device-media interaction: By giving each participant a wirelessly portable device, this allows participants to move freely in the group to interact with their group members through their portable computers.

*Human-device interaction***:** More than the Device-media interaction, participants also interact in the way that using other group members' device in the small group. The system design makes information available to the participants and fosters their social interactions and provided the conditions necessary for successful CL activities.

Significantly, a "face-to-face portable-device-mediated interaction module" is proposed. The portable computers can be moved freely in the classroom. In a face-to-face portable-device-mediated environment, it is possible to create both a technological and a social network between in the group. While the users communicated face-to-face in a social network, they supported their work with the technological network created by the portable computers. It is importance to transfer information from both the technological network and the social network in an effective way.

Conclusions and Discussion

In this paper, we reviewed literature related to collaborative learning and competition, a collaborative-competitive module was embedded into this constructive learning environment. Learning by doing and sharing was highly emphasized in this study. We developed a handheld-based English vocabulary acquisition game called the Wireless Crossword Fan-Tan Game (WiCFG), which facilitates English vocabulary building for accumulative learning. The preliminary research findings indicate that adopting the WiCFG could improve the learning outcome of learners, and it is particularly beneficial for lower-achievement learners. Moreover, using the WiCFG has positive enhancements of learning motivation and engagement. In addition, using the WiCFG improved interdependence between group members in collaborative learning. Overall, the teacher and students agree that the use of WiCFG and the advantages of one-to-one technology enhanced group collaborative learning. In the study of small group interaction, we added the media-mediated factor and generalized three interaction modes and face-to-face portable-device-mediated interaction module.

With the advancement of technology today, the characteristics of technology enabled us to use the portable devices to discuss and collaborate synchronously. Based on this rationale, we propose this study. We hope that the WiCFG will be applied in more learning contexts to facilitate students' learning motivation and increase the fun in English learning in the future. In addition, we expect that other researchers will apply the idea to design more teaching activities that might benefit learners in other different learning contexts.

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