

CHAPTER 2

LITERATURE REVIEW

In this section, previous studies on interaction generated by CALL are discussed. Problems in these studies lead to the discussion of two aspects: the nature of collaboration and language teaching methodology. The first aspect, success of computer-supported collaboration in general educational contexts will be discussed. For the second aspect, the approach of task-based language teaching would be proposed as a guide for content design. Finally, a new paradigm of research method, the design-based research, will be introduced.

2.1 Previous studies on CALL

In the area of computer-assisted language learning (CALL), several studies have focused on the interaction among groups of learners when they sit together in front of one computer. However, the result was less than satisfactory, due to the lack of consideration for language teaching methodologies and for the nature of interaction. The following sections will briefly discuss these CALL researches and point out the gaps and flaws in them.

The shift of attention from individual instruction to peer interaction in computer-assisted learning could be traced back to the 1980s when researchers began to realize that behaviorism-based software design limited students' higher cognitive thinking, while constructivist-based software design still missed the account for social process (McLoughlin & Oliver, 1998). Thus some researchers in the field of EFL/ESL tried to put the computer into a social context and observe the degree of interaction in the discourse. However, few researches gained fruitful results. For example, Piper

(1986) used three text manipulation programs which consisted of two types of gap-filling programs and one program that re-ordering jumbled words in the study. Group members all came from different countries with various levels of English proficiency. The resulted discourse and patterns of negotiation were very limited. An obvious flaw in this research design was the nature of the software programs. They were, as Piper (1986) admitted, not communicative-oriented to generate expected talks. Based on this reflection, Abraham and Liou (1991) selected programs with the feature of open-endedness for pairwork. The result, compared with Piper's study, was similar in the failure to generate quantities of communication, though words at each turn and acts of interaction were longer than what Piper had found.

The two studies discussed above tended to indicate that the design of CALL tasks could influence the interaction among group members. To verify this argument, Beatty and Nunan (2004) compared the behaviorist model of instruction with the constructivist one, using ten pairs of subjects in a two-day session. However, the result was surprisingly different from general assumptions. It indicated that the constructivist model did not promote more exploration of the task; neither did it make students engage in a greater degree of collaborative discourse. The author maintained that this might be due to (1) the lack of scaffolding mechanisms in the free-exploring constructivist model, and (2) learners' self perception on ways of collaboration in the tasks.

The less positive findings in relation to interaction with CALL materials have lead to another inquiry to the very basic assumption: are CALL tasks more effective than individual work? Mevarech, Stern, and Levita's (1987) study found no evidence that learning alone or together generate a different level of achievement. Similar findings were also reported in Chang and Smith (1991). However, the activity types of

the CALL program Chang and Smith examined were limited to identifying terms, classifying words, applying rules, and making multiple choices, which were far from communicative in nature.

Despite the negative findings in previous researches, it was still too early to conclude that the application of CALL did not have the potential to achieve the intense interaction as that generated by non-computer activities. First, pairwork with the computer still succeeded in contexts of other subjects such as mathematics and science learning (Wegerif, 2004; Wegerif & Mercer, 1996). Modes of interaction and implementation should be checked in detail. Second, the CALL design in previous studies mentioned above tended to be technology-driven instead of focusing on teaching methodology. Jones (1991) addressing this point said, “An activity’s desired outcome in language-use and language-learning terms should determine the choice of technical means to achieve that outcome.” Activities such as gap-filling, reordering, classifying, and other behaviorist models were simple to design in the CALL programs but usually failed to yield enough learning context for higher cognitive development. Take researches mentioned previously as examples, activities such as simulation and machine-conversation in Abraham and Liou’s (1991) research were claimed to be constructivist in nature but originally were not designed for second language learning; and the constructive activity Beatty and Nunan (2004) conducted were actually composed of informational questions, intending to ask students to search for solutions in a packaged CD-ROM. In the two researches, methodologies for language teaching behind the program design were not elaborated.

To sum up, previous researches have paid very little attention to the theories of language teaching when it came to software design; nor did they explore the nature of interaction in a broader educational context. Therefore, in the following sections, two

issues will be addressed. First, the concept of interaction and its related implementation in computer-assisted learning will be discussed in depth. Second, literatures on the design of CALL with the consideration for the language teaching approach would be dwelled on. The target approach chosen in this study is “task-based language teaching” (TBLT), which bears obvious traits of social interaction and pair collaboration in its nature, and is considered possible to be integrated with the concept of interaction in the design of CALL.

2.2 Interaction, collaboration, and cooperation

Interaction, collaboration, and cooperation are three terms which seem to refer to the same phenomenon but actually bear different definitions. Confusion is easily caused in the review of literature. For example, collaboration and cooperation are considered synonymous by some researchers (Beatty & Nunan, 2004). In order to make the following discussion more accurate, clarification on the three terms must be sought.

According to Oxford (1997), interaction was the umbrella term for the other two, while collaboration was distinct from cooperation in the aspect of social constructivism. In the language classroom, interaction could be simply defined as interpersonal communication in numerous ways (Oxford, 1997). Activities which make learners exchange information usually had the element of interaction. Activities with the support of computer make learners learn “around” the computer together also can generate interaction. However, under the label of interaction, two subcategories still can be identified: cooperation and collaboration. Cooperation is characterized as learners doing things in a group with teachers assigning different roles for individuals. Cooperative learning “has taken on the connotation of a set of highly structured,

psychological and sociological based techniques that help students work together to reach learning goals” (Oxford, 1997, p.444). However, this mode of instruction suffers when learners only focus on doing their assigned tasks instead of discussion and negotiation. The imposed division of responsibility may deprive learners “of the opportunities to develop appropriate conversational and negotiation skills” (Beatty, 2003, p.108).

Contrary to cooperation, collaboration derives from social constructivism, holding that “learning is acculturation into knowledge communities” (Oxford, 1997). Learners do not learn to construct knowledge alone but through communication with others (McLoughlin & Oliver, 1998). In Vygotsky’s theory, the “others” refers to adult guidance or capable peers (1978, p.86). However, Wegerif and Mercer (1996) in their paper indicated that empirical researches found that “symmetrical pairs (pairs with same initial knowledge of the task area) learned more effectively than asymmetrical pairs” (p. 50). They also point out “the importance of the quality of group interactions and the construction of a shared understanding through language,” with supports of other research findings on positive correlation between friendships, the quality of interaction, and the outcome of learning (Wegerif & Mercer, 1996, p. 50).

2.3 Collaboration at the computer in general educational contexts

2.3.1 *The Computer in the IDRF Model*

Though findings in collaboration generated by CALL are less, successes in general educational contexts are a lot in the literature. A discussion on this aspect can give insights to the design of CSCL programs.

The role computers played in successful implementations of educational software could be framed in the “IDRF” model (Wegerif, 2004; Wegerif & Mercer,

1996). “IDRF” stands for *Initiation, Discussion, Response, and Feedback*. IDRF derived from the original version of “IRF”, describing the process which teachers initiate a question, learners respond, and finally teachers give feedback. IRF is a frequent pattern in teacher student dialogue. It transfers knowledge efficiently to students in the sense of traditional teacher-centered approach. However, IRF is criticized in the aspects that teachers fully control the interaction process, framing students’ input by teachers’ evaluation. The results are “preventing [students] from thinking for themselves and asking their own questions” (Wegerif, 2004, p. 5).

Educational software design based on IRF replaced teachers’ role by computers in order to simulate the control pattern over students still suffers the same criticisms. To deal with the flaw in IRF, Wegerif introduced the computer in this model and added on the “*Discussion*” process between *Initiation* and *Response*, making IRF IDRF. In computer-supported IDRF, a pair of learners may share one computer and interact with the computer (human-computer interaction) and with their partner (human-human interaction). Thus, the role the computer plays in IDRF could be divided into two kinds: tutor and resource. In terms of tutor, the computer keeps the merits of the IRF model. Computers’ simulation of the teacher’s role “can stimulate and direct the talk of children in order to meet the goals of predefined curriculum” (Wegerif, 2004). On resource, in the Discussion stage, learners can turn to their partner to discuss and to negotiate based on the information shown on the screen. The computer in this stage becomes “a more passive discovery learning source or environment” (Wegerif, 2004, p. 5). Empirical findings of IDRF pattern indicated the success of implementation in pupils learning science and moral issues (Wegerif, 2004; Wegerif & Mercer, 1998).

The *discussion* stage in IDRF is aligned with social constructivism on how

learners construct knowledge. To link the concept of collaboration discussed in the previous section, it can be put that a collaborative discussion is the desired quality of talk in the computer-supported IDRF model (Wegerif & Mercer, 1996). The following section elaborated more on the quality of talk.

2.3.2 *The Quality of Talk*

Different types of talk generate different levels of collaboration. In the project of Spoken Language and New Technology (SLNT), fifty primary school children in 10 schools were video-recorded when they collaboratively worked around computers (Mercer, 1996). Three patterns of talk were identified from observed data: disputational talk, cumulative talk, and exploratory talk. Detailed elaboration was as follows:

- (1) Disputational talk, which is characterized by disagreement and individualized decision making. There are few attempts to pool resources, or to offer constructive criticism of suggestions. Disputational talk also has some characteristic discourse features — short exchanges consisting of assertions and challenges or counter assertions.
- (2) Cumulative talk, in which speakers build positively but uncritically on what the other has said. Partners use talk to construct a ‘common knowledge’ by accumulation. Cumulative discourse is characterized by repetitions, confirmations and elaborations.
- (3) Exploratory talk, in which partners engage critically but constructively with each other’s ideas. Statements and suggestions are offered for joint consideration. These may be challenged and counter-challenged, but challenges are justified and alternative hypotheses are offered. Compared

with the other two types, in exploratory talk knowledge is made more publicly accountable and reasoning is more visible in the talk (Mercer, 1996, p. 369).

Although these three categories were derived from data of SLNT, the typology still can provide a reference for understanding the talk learners generate in doing collaborative activities at the computer (Wegerif & Mercer, 1996).

2.3.3 *Strategies to Facilitate Collaborative Talk*

Collaborative talk, or explorative talk, does not emerge from simply sitting pairs of learners down at the computer. Factors of learners' perception on collaboration and the design of program are all crucial conditions for the success. On learner' perception, Wegerif and Mercer (1998) indicated that coaching learners on how to collaborative talk before sitting at the computer benefited more than not doing so. Seven ground rules for explorative talk were provided as the followings:

- (1) all relevant information is shared;
- (2) the group seeks to reach agreement;
- (3) the group takes responsibility for decisions;
- (4) reasons are expected;
- (5) challenges are accepted;
- (6) alternatives are discussed before a decision is taken;
- (7) all in the group are encouraged to speak by other group members (Wegerif and Mercer, 1998, p. 200).

On principles of software design, data collected from the SLNT project implied the following strategies:

- (1) putting evidence which could be used in reasoning about choices clearly on

- the screen where children could point to it;
- (2) presenting choices embedded in a motivating narrative;
 - (3) making problems sufficiently complex to benefit from being analyzed through reflection and discussion;
 - (4) using a simple interface with multiple choice options rather than typed input;
 - (5) avoiding any encouragement towards turn-taking, e.g., not using discrete serial problems (Wegerif and Mercer, 1998, p. 202).

McLoughlin and Oliver (1998) also proposed several useful design strategies for teachers creating suitable learning context to foster explorative talk in CSCL.

Strategies on learners coaching and program design all implies one thing that teachers have to bear in mind: computer-supported learning does not warrant collaborative learning only if teachers taking contextual factors into consideration (Mercer, 1996).

2.4 Pedagogical Objectives and the Design of CALL

The previous section discussed the design and the implementation of computer-supported collaborative learning in general educational contexts. However, this coverage was not enough. A subject-specific discussion for the second language learning via computer should be included when EFL teachers consider introducing the computer into their curriculum.

Programs developed for computer-assisted language learning (CALL) vary a lot from the departure and the process of design. Hubbard's (1992) framework proposed a theory-driven (from language and learning assumptions) structure for the design of tutorial CALL courseware. Levy (1997b) in a CALL program survey summarized different points of departure, ranging from theories of instruction, theories of learning,

curriculum imperatives, experiments with a new technology, exercise types, learning problems, language skills to the delivery of materials toward a large number of students (p.86-88). The developing process also varied from more structured, discrete element styles to less structured, more iterative processes (Levy, 1997b). Levy argued that the departure of designing materials can start from either viewpoints of theoretical approach, pedagogical design, and teaching procedure. For what accounts most is the 'fit' and recycling dialogue between the capacity of the technology and pedagogical objectives. Salaberry (2000) agreed with this declaration which "confirms Richards and Rodgers's (2001) claim that the design of pedagogical activities may start at any one of the three levels" (p. 30). However, Salaberry (2000, 2001) still addressed the priority of pedagogical objectives identified in any technological implementation. This researcher agrees with this priority, for identifying pedagogical objectives could avoid the danger of using the right tool to do the wrong thing. The powerfulness of the computer is very tempting, alluring teachers to try all its' possibilities. However, the capability of the computer does not mean that it can replace all the other traditional ways of teaching and learning (Levy, 1997a, p. 207), if the pedagogical object is better achieved with non-computer approaches. It is important that one should always take the learning goals into consideration before introducing new innovation in.

2.5 Task-based Language Learning and Teaching

The previous section addressed that pedagogical objectives should be identified first before the design of CALL. Since the design of CALL in this study was theory-driven based on the connotation of task-based language teaching (TBLT), the following passages reviewed the TBLT approach and the pedagogical objectives

realized in the framework.

2.5.1 *TBLT Derived from CLT*

Communicative Language Teaching (CLT) which emerged in the 1970s has been the major trend in language teaching for over three decades. Meaningful input and real-life communication shifted previous beliefs on how language should be taught. CLT further was distinguished in a ‘weak’ and a ‘strong’ version. As Ellis (2003) summarized, the weak version believed that communicative competences could be taught systematically, while the strong version emphasized that learners could not acquire a language except by experiencing using language in communication. Under this distinction, tasks in the weak version were viewed as “a way of providing communicative practice for language items”, while in the strong version tasks function as “a means of enabling learners to learn a language by experiencing how it is used in communication” (Ellis, 2003, p. 28-31). Task-use in the weak version was called “task-supported language teaching”; in the strong version, it was called “task-based language teaching (TBLT)”. It was the TBLT that this study focused on.

2.5.2 *Rationale for TBLT*

To state the rationale for task-based language learning, the followings took the viewpoint of syllabus types, second language acquisition (SLA) and socialcultural theory to argue for the use of tasks in the curriculum.

Types of syllabus in language teaching could be categorized in two ways: synthetic/analytic and the Type A/Type B (Long & Crookes, 1992, 1993). The first categorization, synthetic and analytic syllabi, was with the viewpoint of learner’s role. In synthetic syllabi, learners were expected to re-synthesize segments of linguistic

items presented in the syllabus. Lexical, structural, notional, and functional syllabi were under the umbrella term of synthetic syllabi. The analytic syllabi, on the other hand, provided whole chunks of target language; learners were expected to induce rules from their innate knowledge. Task-based syllabus belonged to this syllabus type. The second categorization was Type A and Type B. Type A syllabi focused on “what is to be learned” while Type B syllabi focused on “how the language is to be learned” (Long & Crookes, 1992, p. 29). In type A syllabi, learning materials were pre-selected by the authority and assessments were set to determine the results of learning. On the other hand, type B syllabi emphasized the negotiation between teacher and learners. Learning materials depended on learner’s needs, and criteria of learner’s success were the guidance of assessments.

With the categorization, it is obvious to indicate that in Taiwan, English language textbooks used in the junior high school still expect learners to learn the second language from segments of linguistic items. These textbooks still focused on what learners should learn instead of how language can be learned. That is to say, synthetic and Type A syllabi are the main stream in junior high school. One reason for this phenomenon might be that synthetic and Type A syllabi are practical in the way that predetermined contents of the linguistic cumulation are easy to design and can suit the general public’s needs. However, problems with this kind of syllabus, as Long and Crookes (1992) pointed out, include:

- (1) lack of authenticity: contents are carefully designed to conform with target structures of lexis;
- (2) lack of research support: the linear way of learning conflicts several research findings;
- (3) interlanguage aspects: learners can not master the target items soon

after the instruction. Lengthy process of nontargetlike performance is required before reaching mastery. In other words, learners do not learn what they are taught (p.30-32).

As for the viewpoint of SLA, Skehan (1998, p.91) proposed that second language learning should “contrive the movement” through three stages of lexicalization, syntacticalization, and relexicalization. He took insights from first language acquisition and first language processing, indicating that in first language acquisition, contextual coded exemplars are first learned to achieve a communication purpose. Lexical items such as phrases or chunks were primarily learned in this stage. Later maturation triggers the automatic operation of Language Acquisition Device (LAD); lexical items were reorganized in a syntactical structure. In the third stage, the underlying system re-assembles lexical units which were easily accessible, serving as exemplars for different communicative functions (such as the use of formulaic language for native speakers). Exemplars produced in this stage could reduce the cognitive processing demand, while at the same time maintaining the analyzable features for later use. The sequence was illustrated in Figure 2.1.

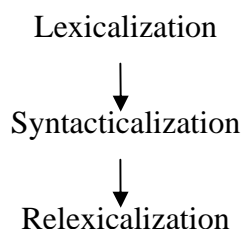


Figure. 2.1. Skehan's Sequence of exemplars of lexical items

For second language learners, Skehan assumed that the sequence mentioned above did not perform the same way as that in first language acquisition. The three stages of transforming language knowledge might get stuck in certain points. For example, learners in meaning-dominated contexts such as ESL (English as the second language) might stop in the first stage of lexicalization. They might depend largely upon exemplar-based way or memory-based form in language performance. Though language was easily accessible in this circumstance, it was running the danger of losing the ability to analyze or correlate language items. On the other hand, for learners in contexts such as EFL (English as the foreign language) in Taiwan, rule-based ways might be the major language learning style. Though the underlying form was accurate, heavy cognitive demands still results in awkward performance under real-time communicative pressure. Due to all these reasons, language teaching, in Skehan's proposal, should maximize the balanced development in analyzing the linguistic unit while at the same time "making some gains in terms of fluency and real-time language processing" (Skehan, 1998, p. 91). To achieve this object in the curriculum of junior high schools in Taiwan, tasks used as supplementary materials were a possible way to put it into practice.

Thirdly, from the viewpoint of socialcultural theory (SCT), tasks were the tools that could facilitate learning in two ways. First, from the concept of mediated learning, socialcultural theory held that "higher forms of mental activity are mediated" through "interactions...with other members of our culture and with the specific experiences we have with the artifacts produced by our ancestors and by our contemporaries" (Lantolf, 2000, p. 79). While mediation might occur externally (by others in social interaction and by artifacts) or internally (by self through private speech), external mediation was the means to make internal mediation achieved (Ellis, 2003, p. 176). In

other words, the final goal of individual development was “to improve control over their own mental activity” (Lantolf, 2000, p. 80). Thus tasks in this sense served as the external mediation which could trigger individuals’ internal mediation for learning. Also, in SCT, the main means of mediation was through verbal interaction. In verbal interaction, learners first tried out the use of language and subsequently internalize, or self-mediated linguistic forms and functions. Language acquisition thus occurred in the shared process of verbal interaction between the individual and other persons. In this sense, tasks could construct collaborative learning situation in which the process of language acquisition was triggered (Ellis, 2003, p. 177-178).

2.5.3 *Definition of a Task*

Different definitions of a “task” could be found in research studies and language pedagogy. Some referred to activities that people engaged in their daily lives, while some specifically emphasized aspects of linguistic processing (Nunan, 1989). Each definition reflected different dimensions in its own right. To comprehensively correlate these definitions, Ellis (2003) summarized nine important versions of definitions and identifies six major scopes: perspective, authenticity, language skill, cognitive processes, and outcomes. According to each scope, he concluded that there were six criterial features of a task:

- A task is a workplan.
- A task involves a primary focus on meaning.
- A task involves real-world processes of language use.
- A task can involve any of the four language skills.
- A task engages cognitive processes.
- A task has a clearly defined communicative outcome. (p.9-10)

2.5.4 *Categorization of Language Learning Tasks*

In the design of task-based materials, an understanding of categories of tasks could give the teacher directions and insights. Classifications of language learning tasks, according to Ellis (2003), could be divided into four: pedagogic, rhetorical, cognitive, and psychological classification. Each classification was briefly discussed in the followings.

First, the pedagogic classification basically used language skills (such as listening, speaking, reading, and writing) and general teaching activities (such as ordering, comparing, problem-solving, and sharing personal experience) to distinguish different kinds of tasks. The advantages of this classification were in the ways that tasks could be easily integrated into the traditional syllabus. However, as Ellis (2003) indicated, breaking tasks into parts of language skills was running the danger of losing the sense of “holistic and experiential learning” (p. 211), which was the essential element in task-based approach.

Second, the rhetorical classification used discourse domains and text genre to categorize tasks. For the level of beginners in this study, long passage of texts would be over their head. Thus details in this classification would be omitted here.

Third, the cognitive classification contained three types: information gap activity, reasoning-gap activity, and opinion-gap activity. In the information gap activity, learners transferred what they knew to the other learners. Information here usually meant a predetermined fact. In the reasoning-gap activity, learners were “deriving some new information from given information through processes of inference, deduction, practical reasoning, or a perception of relationships or patterns” (Prabhu in Ellis 2003, p. 213). In the opinion-gap activity, learners expressed their feelings or attitudes in a certain situation. There was no correct answer to this kind of

tasks but only a variety of personal responses.

The last classification was psycholinguistic one. It included four dimensions: (1) Interaction relationship, which focused on who held the information, (2) Interaction requirement, which focused on whether interaction was required in task completion; (3) Goal orientation, which focused on whether the task needed an agreed goal and collaboration result, and (4) Outcome options, which indicated whether a single or several outcomes were accepted in a task. In this classification, Ellis indicated that research findings showed that tasks with features of mutual supplance of information, interaction requirement, a convergent goal, and one single outcome were more effective in promoting negotiation.

Besides the four classifications, Ellis also pointed out that these classifications mentioned above were not fixed ways to distinguish tasks. Different contexts needed customized taxonomy in order to cater to individual needs. “There is currently no accepted single typology of tasks nor is there any consensus regarding the choice of organizing principle for constructing such a typology” (Ellis, 2003, p. 216). However, these existing classifications could provide teachers with informative reference for balancing the type of tasks they selected in the syllabus.

2.5.5 Implementing task-based Instruction

Two opposite ideas of task-based instruction were summarized by Skehan (1998). The first idea treated tasks as structure-oriented, in which a particular structure was made salient through the manipulation of implicit learning materials, aiming at triggering learners’ hypothesis-formation processing. Learners had to use specific language structure in order to achieve the tasks. Tasks such as an information-gap description or focused task belonged to this group. The second type

of instruction treated tasks as communication-driven. It claimed that real-world tasks per se generate lexis, and learners would thus incorporate such lexis into syntactic patterns. One example was the lexical approach advocated by Willis (1990). Directions of structure-oriented and communication-driven approaches were complementary in certain ways. The two types, one focus on meaning and the other on forms, have advantages and drawbacks in each (Long and Robinson, 1998, p.19-21). A balanced design between form and meaning was needed.

Besides the categories mentioned above, Willis (1996) and Skehan (1998) suggested three stages for TBLT instruction. The three stages included pre-task, during-task, and post-task stage. In the pre-task stage, a topic was introduced, language items were deductively or inductively taught, the process of task-doing was demonstrated, and preparation time was allowed to organize the content for the next stage. In the during-task stage, tasks were selected properly to achieve a balance of the three goals of fluency, accuracy, and complexity. In the post-task stage, important language forms were identified, analyzed, and practiced. Learners were encouraged to notice the gap between their interlanguage and target language.

In this study, I mainly focused my attention on how the CSCL program was realized in the second stage: during-task stage. By designing a task-based CSCL program, I observed how a pair of learners interacted with the program and with their partner. Since this program served as a supplementary material, it was assumed that the sequence of introducing language items in the pre-task stage was already conducted in the traditional regular syllabus. That is to say, target learners for this programs study were those who had already obtained the target grammar rules in class. As for the post-task stage, it was assumed that teachers would conduct it in the classroom setting in order to help learners notice the language gap which was

identified in the CSCL program.

2.6 Roles in Computer-supported Tasks

The quality of interaction is one important reference to determine whether a CALL program works or not (Abraham & Liou, 1991; Piper, 1986; Beatty & Nunan, 2004). In the previous sections, the issue of interaction is discussed in two aspects: (1) Intense interaction, which studies of CALL failed to stimulate, still existed in pair work in contexts of computer application in other subjects. Under these contexts, quality of talk between learners was identified (discussed in 2.3), and (2) In task-based language teaching, interaction was realized in socialcultural theory in that verbal interaction during tasks could trigger mediation (discussed in p.20). However, none of the above discussed in detail the roles that pair members take during the interaction. Some studies have discussed that “expert mediation” was more effective in developing academic language, while “peer mediation” was more effective for learning everyday functional language (Ellis 2003, p. 195). Still, how expert and peers achieved mediation, especially in the context of CSCL, was not fully elaborated. Therefore, a gap exists in that how learners play their roles and how these roles facilitate learning in the learning context collaborative CSCL tasks.

2.7 Design-based Research

Design-based research (DBR) was adopted in this study to derive useful insights and design principles of CSCL tasks. Since DBR is an emerging paradigm for educational inquiry, a brief discussion on DBR is necessary before moving on to details of research design in next section.

DBR is an inquiry which aims to understand the complicated interaction between theories and interventions in an authentic learning ecology through cycles of design and analysis (Design-based Research Collective, 2003). The emerging of DBR is to solve the problems that root in traditional educational researches. Traditional researches on education have been criticized that outcomes are detached from the conditions of real practice or that conclusions could be predicted by experienced teachers (Dede, 2005, p. 4). Also, many research findings are derived from the rigid experimental control, but the neat control of variables are impossible and unreasonable for educational practitioners to duplicate in their complicated local context (Hoadley, 2004). Thus, in order to take contextual factors into consideration and generate usable knowledge, DBR does not deliberately control contextual variables. Instead, the location of research usually takes place in “buzzing, blooming confusion of real-life settings where most learning actually occurs,” and that DBR usually involves multiple variables and complex social interaction (Barab, 2004). Under these conditions, DBR treats educational interventions as “enacted through the interactions between materials, teachers, and learners...a product of the context in which it is implemented” (Design-based Research Collective, 2003, p. 5). Also, intervention in DBR is viewed as “opportunities to examine core theoretical issues and explore learning” (Barab, 2004, p. 10). Through cycles of design and reflection, DBR intends to find out how variables affect the designed intervention and to pinpoint key components of an intervention and conditions for success. Also, through iterative design process, theories which interventions embody are reflected, criticized; then in the design process new domain-specific theories are formulated, providing details for activity design (Bobb, Confrey, diSessa, Lehrer, & Schauble, 2003).

With the potential to bridge the gap between educational researches and real

practice and with the intent of “producing new theories, artifacts, and practices that account for and potentially impact learning and teaching in naturalistic settings” (Barab, 2004, p. 2), important characters of DBR, according to the Design-based Research Collective (2003), include (1) Intertwine goals of designing learning environments and developing theories, (2) Through continuous cycles of enactment and redesign, (3) Sharable theories and implications were desirable, (4) Authentic settings interacting with learning conditions must be accounted for, and (5) Methods used in the process document and connect enactment to outcomes (p. 5).

In short, as Barab (2004) put it, DBR “is conceived not just to meet local needs, but to advance a theoretical agenda, to uncover, explore, and confirm theoretical relationships” (p. 5).

The study conducted by Hoadley (2002) provides an example on how DBR was applied in a CSCL program. The aim of Hoadley’s study was to understand how an online-discussion tool, SpeakEasy, could enhance collaborative learning. Hoadley and his colleagues first invited several participants to conduct the usability test on the initial prototype. Based on the participants’ reaction, the researchers adjusted their software and introduced this tool to classes in the middle-school science classroom, aiming to trigger students’ online discussion on science-related topics. The researchers first observed that some students with great enthusiasm might hinder other students from accessing the computers in the classroom. Therefore, the researchers and the instructor designed several classroom activities to regroup students. Also, the researchers observed that girls tended to attribute anonymous comments on the discussion board; however, some students in the interview mentioned that they avoid reading anonymous comments, which might defeat the purpose of productive discussions. This finding was different from previous related theories on the

advantages of anonymity. Through the analysis on students' on-line behaviors and interviews with students, the researchers found that half of the students tended to first navigate others' comments before contributing their own comments. When most of the comments were contributed anonymously, they would do so. Thus the researchers adjusted their discussion tool again. Students had to make comments before they could browse others' opinions. This new intervention successfully decreased the numbers of anonymous comments. The process of repetitive dialogues among the researchers, the software, and the students in this study indicated how DBR was realized in the learning context.

2.8 Summary of Chapter 2

In this chapter, previous studies on CALL have been reviewed, with regard to the discussion on interaction at the computer in general educational contexts. Also, in order to make the program design realize in pedagogical objectives, task-based language learning and teaching was reviewed. To derive the design principles in a complicated learning ecology, the method of design-based research was also reviewed. In the following chapter, research design and the prototype of the CSCL program will be introduced.