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CALL for Researchers: Capturing a Ubiquitous Influence of Technology

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Introduction

The last few decades saw a dramatic progress in information communication technology (ICT).   The new technology challenged many taken-for-granted assumptions about human communication.   In terms of classroom settings, ICT brings with it certain communication patterns and, at the same time, poses the question about adaptation of classroom communicative practices.

In order to understand the interconnection and the mutual shaping of classroom communicative practices and technology, I conducted a study that focused on the variability in the patterns of communication in a Japanese classroom.   Given the spread of new technologies to other languages and cultures around the world, adapting the ICT to local educational circumstances should be given more serious consideration in future educational and technology planning.   Understanding educational practices with technology in various contexts might inform educators who plan to use technology in their classrooms what to expect and what not to expect.

Purpose of Study

This study proposes a research design that includes micro and macro perspectives by combining qualitative and quantitative methods as well as two kinds of theoretical framework: Mehan's (1979) IRE (initiation, response and evaluation) framework and Halliday's (1985) systemic functional framework.   A step-by-step procedure is described using a study that examined the uses of computers as well as patterns of communication in an English as a foreign language (EFL) class at a middle school in Japan.

The field of foreign language education has been in the forefront of the use of new technology to facilitate students' learning process.   Multimedia capabilities enhanced the potential applications of computers in foreign language education by providing audio-visual presentations and interactions tailored to the needs and interests of different individuals or groups of learners.   In classroom settings involving education technology, interactions are elaborated not only by participants but also through the mediators of actions such as ICT.   In classrooms, both the teacher and the students have to understand the classroom context and the norms for participation in that context in order to carry out learning activities.

Educational technology might introduce a context that might not be familiar to the teacher and the students, and some confusion might occur in the first phase of technology implementation.   In order to understand a ubiquitous influence of technology in the field of Computer-Assisted Language Learning (CALL), it is important to conduct replication studies that apply the same method to different groups of people and learn whether findings in the earlier study apply to those different groups

of people.

Theoretical frameworks

The nature of classroom discourse has been a focus of research for scholars who are interested in the effects of classroom interaction on learning. Understanding classroom communication is not a simple task. Cazden (1986) described classroom communication as a "problematic medium," since differences in how, when, where, and to whom things are communicated can not only create slight misunderstandings but also seriously impair effective teaching and learning. On the other hand, as Johnson (1995) argued, if teachers understand how the dynamics of classroom communication influence second language students' perceptions of and participation in classroom activities, they may be better able to monitor and adjust the patterns of classroom communication. This understanding will help create an environment that is conductive to both classroom learning and second language acquisition.

The underlying structure of classroom language has been characterized as following a pattern of acts: an initiation act, a response act, and an evaluation act, commonly referred to as IRE (Mehan, 1979; Sinclair & Coulthard, 1975). Occasionally, teachers can place their students in small groups so they have more opportunities to control their own talk, to select which topics to talk about, and to direct their talk to whomever they wish. A classroom-based research suggested that "the process of classroom interaction determines what language learning opportunities become available to be learned from" (Allwright 1984: 156); therefore, "any second language learning that takes place must in some way result from the process of interaction the learner takes part in" (Ellis 1990:91). In short, teachers must recognize that the dynamics of classroom communication are shaped by the classroom context and the norms for participation in that context in order to understand the communicative demands placed on their second language students. As Johnson (1995) suggests, the patterns of classroom communication determine the ways in which second language students use language for classroom learning and second language acquisition.

The role of communication in classrooms can also be described within Halliday's (1985) systemic functional framework. In an attempt to analyze communication, Halliday introduced a conceptual framework for interpreting the social context of a text. "Text" here refers to a language event under description, observed as spoken or as codified in writing, as used by Firth (1957). Halliday's approach focuses on the study of activity systems for learning. For Halliday, when analyzing a text, it is important to consider the environment within which a language event is performed and interpreted. He calls this environment "context of situation," an environment within which every act of meaning is performed and interpreted.

Halliday (1985) suggests that the context of situation can best be understood in terms of three components which he calls field, tenor, and mode. Field refers to what is happening in an activity. Tenor refers to the participants in the activity and what their roles are. Mode refers to the channel of communication and the role of the language in the activity. This tripartite framework has been used by scholars whose research studies involved multimodal communication. Kleifgen (1999), for example, adapted Halliday's framework and proposed a way to assess the context of the learning situation around websites and other electronic materials. She argues that such analysis should include the content, the participants, and the way users interact with these websites and with other users through them. In short, because of the current trend in language learning in which activities are increasingly group-oriented and project-based, adapting Halliday's framework for describing and interpreting the context of learning seems appropriate.

Although analyses of classroom communication have been existent for decades, these are dominantly on the traditional approaches to language teaching and learning. As the integration of computers in language classrooms bring about demographic changes in the participants and norms for communication, the traditional classroom discourse also changes. Modern language classrooms using computers need more elaborate views of classroom discourse structure which involve not only a teacher and students but also computers and third parties from outside the school. A close look at how languages are used in a classroom might reveal changes in schools that are happening as new approaches to learning develop with the advancement of educational technology.

This study proposes a research design that combines qualitative and quantitative methods as well as two kinds of theoretical framework: IRE framework and a systemic functional framework in order to understand the context of language learning with technology. Figure 1 shows the proposed research design.

Figure 1
Research design
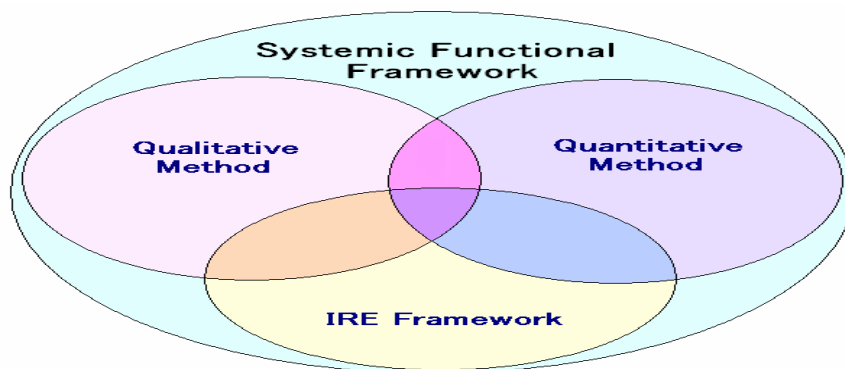
A case study is presented as an example of using the proposed research design for classroom research.

Methodology

<u>Rationale</u>

The case study investigated the uses of computers and patterns of communication in an English as a foreign language class.   A rigorous description of the classroom with and without ICT was necessary to understand whether or not the educational practices are influenced by the use of ICT.   In order to obtain relevant data, a combination of quantitative and qualitative methods was chosen.

This study used an ethnographic approach to explore the context and the norms for participation in EFL classrooms with and without ICT.   I focused on the observation of the teacher and the students in both a regular classroom and a computer room.   Three days a week over a three month period, I observed the class sessions in a computer room.   These were supplemented with observations of the same participants in their regular classroom.   The data collection techniques included note-taking, interviews, questionnaires (See Appendices A and B), and written documents such as the teacher's handouts and students' project work.   The teacher interview served as an additional source of information for investigating the context in which ICT was used to support the teacher's professional objectives.   The length of the interviews was approximately five hours in total, and they were tape-recorded for the purpose of analysis.   This approach was useful in order to understand what was happening in the classroom and to construct an overall picture of the context of the classroom.   The collected data could also be used for the purpose of a discourse analysis of classroom interactions.   Discourse analysis has the advantage of giving attention not only to the function of individual utterances but also to how these utterances combine to form larger discoursal units.

A quantitative method was also used to provide a general description of classroom activities.   Argyrous (2000) states that when there are different total numbers of cases that need to be compared, the relative frequency distribution can be used to compensate for the difference.   In this study, because of the difference between the number of class sessions that were held in a regular classroom and those held in a computer room, a comparison of relative frequencies was used.   Frequency in this study means counts of occasions and does not reflect the amount of time spent on a particular activity.   The data were coded into binary variables with value "1" when an utterance occurred and value "0" when an utterance did not occur.

The influence of technology in foreign language learning and teaching is reflected in the data presentation.   Halliday's (1985) systemic functional framework

was used to describe and analyze the overall picture of the context of learning. Mehan's (1979) IRE framework was used to analyze the uses of languages in specific contexts.   Frequency of different kinds of activities is discussed in relation to the use of computers.   Patterns of communication in the classroom are described and analyzed in a narrative fashion.   The data included not only computer-mediated interactions between the teacher and the students but also interactions taking place among students as they worked at the computers.

Setting

The setting chosen for this case study was a public middle school in Hiroshima, Japan.   The school participated in the Advanced Educational Network Project which was sponsored by Japan Telegraph and Telephone Corporation and supported by the Japanese Ministry of Posts and Telecommunications.   Sixty other corporations, organizations, and individuals provided financial and technical support for this nationwide project that involved 1,014 schools.   It was near the end of the 5-year project when I collected the data.   The school had installed the necessary infrastructure and received teacher professional development support from the project during the first two years.   After almost three years of participation in the project, the teachers and the students at the school were familiar with ICT and had been using the World Wide Web, e-mail, video-conferencing, chat, and so forth.

Participants

There were 148 ninth graders in 4 classes with approximately 34 to 35 students in each class at the school.   The participants in this study were a Japanese teacher of English as a foreign language and 34 students in the ninth grade.   The ninth graders were in the middle of preparing for high school entrance examinations that usually focus on grammatical skills of English.   There were six classes each day, and one class session was 50 minutes long.   Because there was only one computer room at the school, the teacher had to sign up to use the room for his classes every week.   The EFL class in this study met three to five times a week, depending on the school's extra-curricular and test schedule.   The teacher in this study used the computer room three times a week and the regular classroom twice a week on average.

Evidence

In this section, the classroom communicative practices are presented using Halliday's (1985) systemic functional framework with its three components; field, tenor, and mode.   Field refers to what is happening: that is, an overall picture of the EFL

class.　Tenor refers to the participants and their roles: that is, what the norms for participation are; how the participants take turns in an interaction; and who is in control of an activity.　Mode refers to the channel of communication and the role of the language in the activity: The analysis of mode centers around how the language and other channels of communication were used in the classroom.　In addition, the classroom interactions are analyzed following Mehan's (1979) IRE framework.

Field

　　　Based on the characteristics of recurring activities, I grouped them into 7 categories; information gathering, collaborative inquiry-based study, online conference, presentation, grammar translation, read aloud, and other.　Table 1 summarizes the definitions of the activities.

Table 1

Definition of each activity

Activity	Definition
Information gathering	Students locate, evaluate, and collect information from a variety of sources.
Collaborative inquiry-based study	Students select the topic, identify questions, issues or problems, conducted the inquiry, and conclude the inquiry in pairs or in groups
Online conference	Students participate in chat or discussion groups on certain topics on the Internet.
Presentation	Students put together their work on certain topics and present it to each other or in front of the whole class.
Grammar-translation	Students learn rules of grammar and their application in translating passages from one language to the other.　Grammar is taught with extensive explanations.
Read aloud	Students read passages in English aloud after the teacher.
Other	Students listen to an audiotape, sing a song, watch a video, use picture cards as a visual aid, etc.

During the observation, certain kinds of classroom learning activities occurred more often or only when computers were involved.   Figure 2 shows the comparison of relative frequencies of activities.

Figure 2
Comparison of relative frequencies of activities[a]

Comparison of relative frequencies of activities
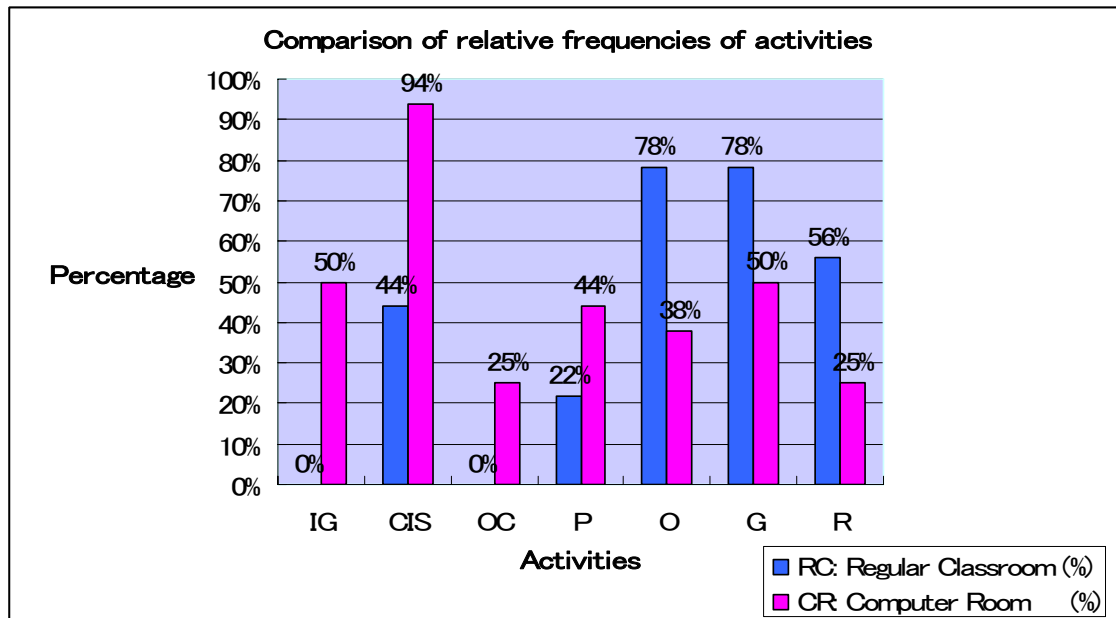
[a]The names of the activities are abbreviated as follows:

IG: Information gathering   CIS: Collaborative inquiry-based study
OC: Online conference   P: Presentation
O: Other   G: Grammar-translation
R: Read aloud

        The data show that a wide range of activities involving information gathering, collaborative inquiry-based study, online conference, and presentation were promoted by the use of computers.   Online conference activities involved the use of discussion groups on the Internet and, therefore, were observed only in the computer room. However, with lower frequencies, some of the same activities such as collaborative inquiry-based study and presentation were also observed without the use of computers.
        A close examination of these activities that occurred in the regular classroom revealed that these activities were occasioned by the uses of ICT and then overflowed into the regular classroom.   For instance, on one occasion, the students prepared for their presentations in the regular classroom.   The actual presentations took place in the computer room using PowerPoint slides three days later.   On another occasion, the students organized their findings on a topic in groups in the regular classroom.   They

used information that they found on the Internet when the previous class session was held in the computer room, and put them together to create posters.

In sum, different activities were observed with different frequencies of occurrence depending on the classroom environment. The field notes and video-taped observation revealed that the technology-enhanced activities overflowed into the class sessions in the regular classroom.

Tenor

The classroom interactions with ICT became more complex because ICT occasioned more student-centered learning activities in a variety of modalities. These multimodalities made classroom interactions more multifaceted than the original IRE framework (Mehan, 1979) can explain. During the activities promoted by ICT, the students worked in groups most of the time. In such a collaborative learning environment, the turn-taking mechanism shifted away from the pattern that was predominant in the teacher-centered classroom environment. In addition, different kinds of learning activities and patterns of communication were related to each other.

The change in the participation structure implies a change in the roles of the teacher and the students. The role of the teacher in the student-centered activities shifts from a content specialist, presenter, and knowledge provider to a learning specialist, facilitator, and knowledge organizer (Pollard & Pollard, 1993). The data in this study also showed this shift in the participants' roles. The teacher referred to his role as an information provider in his classroom in the teacher interview, but he also wanted his students to take charge of their own learning. The following is an excerpt from the teacher interview (The excerpt was translated into English by the researcher.):

> In Japan, the students read textbooks and study grammar in middle
> school EFL classes. The method is rather toward
> information-transmission type. The students have to memorize a lot,
> and it comes to the point that there is too much memorization. They
> don't have enough opportunities to write, speak, and express with their
> own words. I want them to develop skills to look for information, think
> for themselves, and express their thoughts in English.

The students were also aware of the different role they were expected to play in the student-centered activities. The following is an excerpt from the student questionnaire (The excerpt was translated into English by the researcher.):

> I learned much more than when just using the textbook. Also, I

remember the things I learned better in the activities such as language
study and environmental study because I did the research myself.   I was
also able to be in charge of my own learning.

The students recognized that they were expected to take charge of their own
learning.   They also seemed to be aware of the different ways to communicate in
certain kinds of activities.   The fact that there was almost no confusion among the
students when the teacher let them work on their own and interact with each other
without much control showed that the norms for participation in classroom discourse
were understood by the students.

The student-centered classroom is not so common in Japan.   Anderson (1993),
for example, points out certain characteristics of Japanese students' classroom behavior
such as reluctance to initiate and engage in lively discussion of their personal opinions,
unwillingness to ask questions for clarification and to volunteer answers, and a tendency
to talk only when there is a clear cut answer to a question.   He also refers to
characteristics of the Japanese communicative style such as "group-mindedness,
consensual decision-making, formalized speechmaking, and listener responsibility"
(p.102) and argues that "classroom dynamics do not exist in a vacuum, but reflect the
kinds of interaction prevalent in adult society, as well as the processes through which
children are socialized into that society" (p.103).

The way the teacher structured his classroom activities reflected on his
intention to encourage students to express their thoughts and to facilitate discussions in
the classroom.   The teacher allocated many hours for student activities.   For example,
over 13 class sessions, the students worked on a topic they called "Language Study."
The students conducted group research on how English and other languages were used
in the world.   They looked up language maps on the Internet to investigate different
uses of English in different countries and regions.   At the end of the 13th class session,
the students presented their findings.   The following excerpt from the teacher interview
confirms the teacher's intention (The excerpt was translated into English by the
researcher.);

…and Japanese have a tendency not to consider expressing one's ideas as
a virtue, so, uh, I think this kind of learning activity that introduced
self-expression was effective.

Further data in this study showed this shift in the participants' roles.   As
described later in the Mode section below, the teacher gave explanations of the activity
at the beginning and when he saw the students were confused, but he interacted more

with individual students and groups than the whole class.   The overall evaluation came at the very end of each topically related set (Mehan, 1979), that is, a larger unit organized around a specific topic that is composed of more than one sequence.   The length of a topically related set varied depending on the nature of a project and the amount of work the students accomplished.   There was a great deal of interactions among students during the group research.   The shift of the classroom participation structure shaped role relationships between the teacher and the students.   The teacher was acting as a facilitator and the students were the center of the group research activities.   The classroom became more student-centered when the students worked on group projects.

Mode

The data from this study showed that the classroom interactions with ICT became more complex because ICT occasioned more student-centered learning activities.   The analysis that follows illustrates where the initiation-response-evaluation tripartite structure prevailed and where it broke down.

The following is an example of an IRE sequence observed in the regular classroom.   The teacher (T) called on a student (S) to translate a sentence from English into Japanese.

T: Okay, then number 522.   The girl playing the piano is my sister.   Next?
S: Piano o hiite iru shojo ha kare no imouto desu [The girl playing the piano is my sister].
T: Yeah, well, either "imouto [younger sister]" or "oneesan [older sister]."

In this example of a basic IRE sequence during a grammar-translation activity, the teacher called upon the student as part of the initiation act, indicating that it was her turn to respond.   The student immediately responded by giving an answer in Japanese. After the student provided the answer, the teacher evaluated the content of the answer. This is an example of the basic individual nomination procedure, in which the task and the person who is to respond are identified clearly.   The participants were aware of the norms for communication that were developed over previous interactions between the teacher and the students.   Both participants produced and interpreted behavior in a manner that was acceptable to others in the classroom.   In the grammar-translation and read aloud activities, the tripartite IRE sequential pattern predominated in teacher-student interaction with and without ICT.

When the students were engaged in other types of learning activities, different participation structures were observed.   The following is an interaction that took place

during a presentation activity.

T: Let's work on it so you can complete your presentation.   Okay, then go ahead and start.

Ss: (Take turns to present their findings, decide who says what, make changes to their presentation notes, help each other, critique each other's work, stand up and pretend that they are presenting in front of the class, etc.)

T: (Walks around and answers individual students' questions.)

T: Shall we use the laser-pointer?

Ss: (Look at the teacher.)

T: Oh, it's broken.   Never mind.

Ss: (Take turns to present their findings, decide who says what, make changes to their presentation notes, help each other, critique each other's work, stand up and pretend that they are presenting in front of the class, etc.)

T: (Walks around and answers individual students' questions.)

In the above sequence, the teacher's initiation and the students' response showed characteristics of what Mehan (1979) called directive sequence, in which a directive calls for respondents to take procedural action.   The students started working in groups, initiating and responding to each other.   The teacher walked around the classroom and answered individual students' questions.   This sequence was composed of a series of a student initiation (question) and a teacher response (answer).   The teacher's second utterance was an informative sequence that serves the purpose of passing on information, ideas, and opinions (Mehan, 1979).   The students looked at the teacher but went back to their group work when they found out that the laser-pointer was broken.

The above sequence continued until the closing phase, which showed the directive and informative sequences by the teacher.   A clear evaluation act by the teacher to the whole class was not observed during the students' group work.   In this activity, two types of sequences; IRE and IR, occurred simultaneously.   During activities that were promoted by the use of ICT, the students worked in pairs or in groups most of the time.   In such an environment, the turn taking mechanism shifted away from what observed in the more teacher-centered classroom environment.

In sum, the data indicated that student-centered learning activities were promoted by the use of ICT and that these activities, in turn, occasioned certain types of interactional sequences other than IRE.   In addition, types of learning activities shaped patterns of communication.   In the grammar-translation and read aloud activities, the tripartite IRE sequential pattern was predominant in teacher-student interactions with

and without ICT.   During information gathering, collaborative inquiry-based study, presentation, and online conference activities, the students worked in a student-centered learning environment and the turn taking mechanism was different from that found during the teacher-centered grammar-translation and read aloud activities.   Emphasis on collaboration and group-oriented activities using ICT shaped the dynamics of classroom communication.   With the teacher's help, the students developed certain interactional skills that helped them participate in learning activities successfully.

Conclusions

The use of the proposed research design revealed a comprehensive picture of CALL.   The study used a combination of qualitative and quantitative methods.   To begin with, it used relative frequencies to give a general description of the classroom activities.   Following the overall description of the classroom activities, an ethnographic approach was used to examine what exactly happened in the classroom. The uses of ICT and classroom activities were described and analyzed using Halliday's (1985) language variation framework.   The classroom interactions were then described and analyzed following Mehan's (1979) IRE framework.

The findings of the case study imply that new communicative practices are emerging in classrooms when ICT is involved.   In addition, the new communication patterns may be related to changing roles of teachers and students.   The data showed that the activities promoted by the use of ICT influenced the way the teacher and students interacted with each other in the classroom.   Emphasis on collaboration and group-oriented activities using ICT shaped the dynamics of classroom communication. The student-centered activities promoted complex communication patterns such as IR between the students and combination of IRE and IR that occurred simultaneously. With the teacher's help, the students developed certain interactional skills that helped them participate in learning activities successfully.   The learning activities that were occasioned in the computer room overflowed into the regular classroom, as the teacher and the students continued working within the same topically related set without using the ICT, while keeping the characteristic of the student-centered classroom interaction.

The changes in the participation structure in classroom interactions were associated with the changes in the social roles of the teacher and the students.   The data in this study showed a shift in the participants' roles.   The teacher's view of the nature and pedagogy of language teaching was shifted from a teacher-centered knowledge-transmission style to a more student-centered constructivist approach to instruction.   The students also recognized the change in their roles and took charge of their own learning whenever possible.   ICT contributed to these changes.

Educational and scientific importance of the study

This study used a combination of quantitative and qualitative methods and two different of framework.   The detailed description and analysis of language classrooms using the above research design might offer a thorough understanding of the process and consequences of educational technology implementation in language learning.

It would be beneficial to conduct similar studies in other language classrooms to see if other researchers find that the use of educational technology occasions changes in pedagogy, student-teacher interactions, and roles of the teacher and the students. Students' and teachers' expectations for their roles, language learning, and classroom communication may vary in different contexts, and teachers might have to consider the situation in their own classrooms and make appropriate decisions.

According to Thomas (2003), one of the functions a replication study performs is to "apply the earlier method to a different group of people or different set of events in order to learn whether conclusions derived from the earlier study apply equally to those different people or events" (p.199).   A larger sample size or multiple case studies in different locations might allow generalization of a ubiquitous influence of technology on language learning around the world.

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Appendix A
Teacher Questionnaire

1. What subject do you teach?

2. Do you use ICT in your class?

3. Do you use ICT? If yes, do you use ICT at work and/or at home?

    If yes, what features of ICT do you use?
    Please select the one(s) you used before: World Wide Web, E-mail, Database, Chat, Discussion groups, Video-conferencing, other.

    If no, what features of ICT would you like to use in the future?
    Please select the one(s) you would like to use: World Wide Web, E-mail, Database, Chat, Discussion groups, Video-conferencing, other.

4. What are your opinions and/or comments on the use of ICT at school?

Appendix B
Student Questionnaire

1. From your own experience, to what extent do you think ICT is useful to learn English?   Please select one from the following:
    Very useful, somewhat useful, not useful

2. If you selected very useful or somewhat useful in Question 1, what kinds of activities do you think are useful?   Please give an example.

3. How would you like to use ICT at school or at home in the future?

4. You are learning English at school now.   How do you think you will use English in the future?