CHAPTER 3

METHODOLOGY

3.1   Introduction

This chapter outlines the research methodology design used in this study. It begins with a description of the research design followed by the sample population, research instruments, and procedures that were used to collect and analyze the data. The instructional design, structure of the web template and the instructional materials used in this study are also included.

The purpose of this study was to examine the effects of OC on the reading performance of ESL (English as a Second Language) students. It also investigated the patterns of interaction demonstrated by ESL students during OC. The process of knowledge construction is made visible by studying the patterns of interaction. Furthermore, it examined the differences in the patterns of interaction when ESL students worked on different reading tasks collaboratively online. Lastly, it explored the nature of the relationship between the patterns of interaction and the reading performance of ESL students during OC.

The study employed the following data collection procedures i.e. pretest and posttest, reading tasks, transcripts of online discussions, and written protocols from students' assignments. Data were collected from diverse sources to help triangulate the findings and provide a more comprehensive understanding of the role of online collaboration and reading performance. Triangulation which provides a multiple

perspective on a single phenomenon is a useful technique for validating findings (Cohen, Manion & Morrison, 2007).

3.2   Research design

To examine the effects of OC on the reading performance of ESL students, this study employed the one group pretest and posttest design (Mertens, 2010; Seliger & Shohamy, 2001). It involved providing treatment to an intact ESL class. According to Seliger and Shohamy (2001) treatment refers to anything done under controlled circumstances to a group or groups in order to measure its effect. In this study the treatment in the form of OC was provided to the intact ESL class.

The effect of the treatment was measured through the use of pretest and posttest reading comprehension scores, and the scores obtained from reading tasks before and after OC. The reading comprehension pretest and posttest were administered prior to and after the 14 weeks of OC. The reading tasks were carried out every week for nine weeks throughout the semester.

This one group pretest and posttest design used the subjects as their own controls thus eliminating the need for a control group design (Seliger & Shohamy, 2001). The comparison was made between the students' performance without intervention (before collaboration) and their performance with intervention (after collaboration). The advantage of this design was that "it controls a number of extraneous variables which can affect the homogeneity of subjects when more than one group is involved" (Seliger & Shohamy, 2001, p. 139). Furthermore, since the same

group was used for both pretest and posttest, it did not need to be matched to another group.

However, the main disadvantage of this design was that there was no certainty that the changes and differences experienced by the subjects were a direct result of the treatment. Hence in this study, there might be concerns that without comparison to any other groups, it would be difficult to judge whether reading gains were due to online collaboration or whether they would have occurred through taking any other reading course. This concern, however, was unfounded in this study as the ESL students were registered for only the Reading for Specific Purposes course for the semester. They were not exposed to any other reading programmes or courses in the university because each semester, they could only take one English language course. The other subjects that they took for the semester were their accounting-related core subjects such as Financial Reporting 1, Management Accounting and Control, Public Sector Accounting, Quantitative Business Analysis, and Islamic Civilization (Appendix A). Therefore, there was no question that the reading results from the pretest and posttest were due to online collaboration.

Seliger and Shohamy (2001) assert that the pretest may "sensitise the subjects to specific aspects of the treatment" and this can "confound what is measured by the posttest" (p. 139). In this study this shortcoming was addressed through the use of ESL students' reading task assignments and the online transcripts when they worked on the reading tasks.

Data from the online discussions facilitated the study of the dynamics of peer group interaction which revealed the group processes that brought about the co-

construction of knowledge. It also made possible the study of the evolution and development of the patterns of interaction during collaboration. To do this the online transcripts were analyzed for the patterns of interaction demonstrated during OC. Besides shedding light on the overall patterns of interaction, the online transcripts were also analyzed for the differences in the patterns of interaction when ESL students worked on different reading tasks. This was done by comparing the patterns of interaction demonstrated by ESL students when they worked on different reading tasks. Lastly, the relationship between the patterns of interaction and reading performance was examined by determining if there was a correlation between the patterns of interaction demonstrated and the overall reading scores of the groups.

The online discussions were carried out on the Reading for Academic Purposes (RAP) website. The RAP was created to facilitate interaction and to capture the online discussions of the groups. Further explanation of the RAP is presented under "Instructional design" section (p. 132).

3. 3   Subjects

The subjects in this study included an ESL class studying in University Teknologi MARA (UiTM), a local university in Malaysia, and an English language lecturer.

An intact ESL class was used as the subjects for this study. ESL students were then grouped based on their English language proficiency. Lastly, stratified sampling

was used to select the three groups for the qualitative analysis of the transcripts of the online discussions.

3.3.1 The ESL class

The study involved an intact ESL classroom of students who were enrolled in the Degree in Bachelor of Accountancy programme at the Faculty of Accountancy in UiTM, a public university in Malaysia. The faculty was selected because it had computer laboratories that facilitated this online study. A pre-existing class or an intact class was used in this study so as not to disrupt the classes and the timetable arranged by the faculty. This was because students who took different courses within the faculty were grouped together for their English language classes.

The duration of the Bachelor of Accountancy programme is four years which is equivalent to eight semesters. The programme requires students to complete four English language courses offered by the Language Center of the university, as part of the requirements to graduate (Appendix A). In the first semester, students are required to take "College English" which mainly focuses on grammar, followed by "Communication and Negotiation in the Workplace" in the second semester. "Reading for Academic Purposes" and "Speech Communication" are to be taken in semester four and semester six respectively.

A fourth semester Bachelor of Accountancy class was selected for this study. The English language course that the sample population of this study was required to take was Reading for Academic Purposes (Appendix B). The fourth semester students

were selected because they had been in the university for at least three semesters and had completed two semesters of English language courses i.e. "College English" and "Communication and Negotiation in the Workplace". Since they have had 28 weeks (i.e. two hours per week for 14 weeks per semester) of English language exposure in the university, they possessed a certain level of English language ability that would enable them to communicate in the written form needed for OC. Prior to this, the subjects of this study had eleven years of primary and secondary education where the medium of instruction was the Malay language. They had also studied the English language as a subject up to Form 5 (i.e. equivalent to Grade 11).

The fourth semester class comprised 28 "bumiputra" (sons of the soil or indigenous people of Malaysia) students, four male and 24 female students. These students were between 19 and 20 years old. About 20% of the students were from high income earning urban families, 35% came from middle income urban families and the other 45% came from low income earning rural families. All the students passed the "Communication and Negotiation in the Workplace" course. Two students (7.14%) obtained grade A (80% - 89%), three students (10.71%) scored grade A- (75% - 79%), eight students (28.57%) scored grade B+ (70% - 74%), nine students (32.14%) scored grade B (65% - 69%), five students (17.86%) scored grade C+ (55% - 59%) and one student (3.57%) scored grade C (50% - 54%). The grades obtained by the students were based on the university's grade bands (Appendix C). Although the majority (60.71%) of the students scored grade 'B', it was nevertheless a class of mixed abilities where English language proficiency was concerned. This was evident in the reading comprehension pretest which was held prior to the RAP course. The pretest was scored

upon 30 marks. The average score obtained by the students was 13.73 marks, which was below the 50% pass mark of 15. Five students (17.87%) obtained above 20 marks, followed by eleven students (39.27%) who scored between 15-19 marks. 12 (42.86%) students failed to meet the pass mark of 15. Of these, six students (21.42%) scored between 11-14 marks and the other six students (21.42%) obtained 9 marks and below.

3.3.2 The group members

Group processes and mediating processes influence CL. Webb and Palincsar (1996) note that structuring of the groups is important because it influences group processes that in turn, influences language learning. In line with Webb and Palincsar's (1996) recommendation, this study took the following factors into consideration when structuring the groups: group composition and group size. The mediating factor was the online environment since this medium allowed students to interact with responsive, dynamic environments that support learning (Wu, Farrell & Singley, 2002).

Students in the intact ESL class were divided into groups of four. Each group comprised students of mixed English language abilities. The students sat for the pretest that consisted of one reading comprehension passage and 12 questions (Appendix D).

ESL students were categorized as high, average and low proficiency students based on the scores they obtained in the pretest. Students who scored above 20 marks were categorized as high proficiency students. Those who scored between 15-19 marks were categorized as average proficiency and those who scored below 15 marks were

categorized as low proficiency students. The students' results for the previous semester's English course were used to confirm the classification.

The students were divided into groups of four. Each group comprised a high, an average and a low proficiency member. The fourth member was made up of a student either of average or low language ability. Seven groups were formed from the intact ESL class of 28 students.

The rationale for constructing the mixed ability groups was based on Vygotsky's (1978) concept of the ZPD. He defined it as "the distance between the actual developmental level as determined through independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (p. 86). Therefore, in a mixed ability group there are levels of cognitive differences between the group members that are conducive for cognitive growth. This is further corroborated by Azmitia's study (1988) which discovered that when novices were paired with experts on a model-building task, they improved significantly while equal ability pairs did not.

The Kruskal-Wallis test was carried out on the pretest scores of the groups to determine if there were differences in the language ability between the groups. The groups' mean scores in the pretest were examined to see if there were significant differences in terms of the groups' English language ability. The results of the Kruskal-Wallis test in Table 3.1 show no significant difference in the pretest mean scores of the seven groups, p>.05 (N=28, χ_r^2 = 1.18, p = .879). Thus, the results indicate that there was no significant difference between the seven groups in the mean ranking of their

pretest scores suggesting that there was no difference between the groups in terms of their language ability.

Table 3.1

Results of the Kruskal-Wallis test (mean rank) comparing the pretest reading scores between groups

Groups	Mean Rank
A	14.75
B	13.62
C	14.25
D	15.50
E	14.12
F	13.88
G	15.38
χ^2	1.189
p	.879

From the seven groups, three groups were investigated to trace the dynamics of their peer group interaction. The selection of the groups was based on their performance in the reading comprehension pretest and posttest scores. The reading comprehension pretest was administered prior to the RAP course and the posttest was administered after the RAP course.

The three selected groups were groups A, D and E. Group A recorded the largest difference (7.5 marks) in terms of increased mean score in their posttest whereas group D registered the least difference (3.88 marks) in their posttest mean score. Group

E recorded an average increase (5.63 marks) in their mean score. The stratified sampling procedure was used to ensure that the groups that registered the highest, average and the lowest improvements in the posttest mean scores were sufficiently represented. The overall mean difference was 5.75.

Stratified sampling is the process of selecting a sample in such a way that identified subgroups in the population are represented in the population in the same proportion that they exist in the population (Mertens, 2010). Table 3.2 shows the pretest and posttest scores obtained by ESL groups.

Table 3.2

Sampling selection based on pretest and posttest scores by groups

Groups	Pretest mean score	Posttest mean score	Mean difference between posttest and pretest
A	12.88	20.38	7.50
B	13.63	20.25	6.63
C	13.75	19.13	5.38
D	14.63	18.50	3.88
E	13.50	19.13	5.63
F	13.50	18.13	4.63
G	14.25	20.88	6.63
Overall mean difference	13.73	19.48	5.75

To ensure interaction in the group, students were given a reading task to discuss. They were to reach a consensus before submitting the group's answer to the instructor. Students were not assigned roles although certain studies indicate that it is one way to get group members to take responsibility for active participation in the

group (Webb & Palincsar, 1996). However, according to Cohen (1994) roles do not have a consistent effect on group interaction. If the labour is divided and each person is given a different role, the result may be that each person would quietly work on his or her own task, resulting in little interaction at the group level.

3.3.3 The instructor

This study required an English language lecturer who was familiar with the use of the computer to teach and was willing to work with the researcher for 14 weeks.

Purposive sampling was employed in the selection of the English language instructor to implement the RAP online course. The role of the instructor for the online language course was undertaken by an English language lecturer who was a graduate from a local university with more than 15 years of experience teaching English for Specific Purposes at the Language Center in UiTM. She was familiar with the RAP syllabus because she has been teaching the RAP course to the students at the Faculty of Accountancy for a few semesters. More importantly she has experience using the computer to teach English. Furthermore, she also was able to provide feedback to the researcher regarding the RAP course materials. The above reasons pointed to the suitability of the English language lecturer to undertake the role of instructor for the RAP course.

3.4   Data collection

This study used a variety of research procedures because sociocultural researchers emphasize employing methods that document cognitive change (John-Steiner & Mahn, 1996). Therefore, quantitative and qualitative approaches that can reveal the development of cognitive processes were employed. Moreover, researchers point out that a single approach to understanding the teaching and learning process produces limited and sometimes misleading data (Cohen, Manion & Morrison, 2007; Patton, 1990). Both qualitative and quantitative methods have a place in the performance of effective research. Patton (1990) also advocates that in the investigation of human behaviour and attitudes, it is most beneficial to use a variety of data collection methods as each can build upon the strengths of the other. Data collected from diverse sources will allow for the triangulation of the findings (Cohen, Manion & Morrison, 2007). Triangulation is a useful technique as it provides multiple perspectives on a single phenomenon. Furthermore, it is one way of increasing confidence in one's findings (Thomas & Nelson, 1996)

As a result, a multi-pronged system of data collection procedures were used to gather the data to answer the research questions raised in this study. Data collected included pretest and posttest scores, reading scores obtained before and after collaboration, online transcripts and students' written protocols. The following section presents a detailed description of these data collection procedures.

3.4.1   Pretest and posttest

Pretest and posttest (Appendix D) were administered to investigate the effects of OC on the reading performance of ESL students. The pretest was administered prior to the OC whilst the posttest was administered after the ESL class had undergone the 14 weeks (i.e. one semester) of OC. ESL students had to cover the RAP course within the semester to enable them to sit for the final examination at the end of the semester.

One set of question was used for both the pretest and posttest. This means that the reading passage and the 12 questions were identical in every way for both sets of tests. The passage had a Flesch reading ease score of 33.9 and a Flesch-Kincaid grade level of 12. The difficulty level of the reading passage was consistent with the difficulty level of the reading passages used in the RAP course. Hamsik (1984) suggests that readability formulae developed to assess reading difficulty for native English readers can be used with ESL students in the selection of appropriate reading materials. The passage comprised 12 questions of open-ended and multiple-choice types. The questions tested ESL students' reading skills, which included Vocabulary, Understanding Sense Relationships within and between Sentences, Making Inferences, Paraphrasing, Identifying Main Ideas and Identifying Writer's Point of View. The test was scored upon 30 marks. To ensure reliability of the scoring procedure, two lecturers teaching the RAP course scored the test papers. Any discrepancies in a student's score were resolved by a third lecturer, who was the Resource Person of the RAP course.

The items were built based on Bloom's Taxonomy (Appendix E). Bloom's taxonomy has six levels of cognitive difficulty i.e. knowledge, comprehension,

application, analysis, synthesis and evaluation. Two lecturers from local universities who specialize in the area of reading were enlisted to ensure the reliability of the categorization based on Bloom's Taxonomy. Questions 1, 2, 7 and 11 were categorized under comprehension, questions 3, 6, 9 and 10 were categorized under analysis, questions 4 and 8 were categorized under application, question 5 under synthesis, and question 12 under evaluation. There was no question under the knowledge category as it was considered too basic for the RAP syllabus requirement. Appendix F shows the pretest and posttest questions which were categorized based on the six levels of cognitive difficulty in Bloom's Taxonomy.

The maximum score for all 12 questions was 30 marks. The rationale for using the same test for both the pretest and posttest was to counter the instrumentation threat. Thus, the types of questions and the level of difficulty remained "equivalent". The fact that the posttest was conducted 14 weeks later after the pretest would dispel concerns that students' results could be influenced by the fact that they had memorized the same questions (Mertens, 2010). Furthermore, the instructor did not discuss the answers with the students and the pretest papers were not returned to them that may in any way affect the outcome of the posttest.

The pretest and posttest employed both open-ended and multiple-choice questions. The term "open-ended" is used to refer to those questions which elicit a completely subjective response on the part of the testees. The use of both types of items was based on the testing format of the RAP final examination. Although critics of multiple-choice items say that the process involved in the actual selection of one out of four options bears little relation to the way language is used in real-life situations,

Heaton (1995) argues that they "are a useful means of teaching and testing … knowledge of grammar, vocabulary, etc. rather than the ability to use language" (p.27). Although Heaton mentioned only grammar and vocabulary, this statement holds true for a skills-based paper like RAP that tests vocabulary and reading skills.

Content validity is often established using content experts to make judgments (Mertens, 2010). Hence, the content validity of the test was assessed by a panel of experts. The test was reviewed by the panel before it was pilot tested. The panel consisted of the Resource Person for the RAP course, a testing expert from one of the universities in Malaysia, and an officer from the Malaysian Examination Council. These are all senior English language lecturers who have been teaching English for more than 15 years. The panel was asked to evaluate the suitability of the passage and the questions. For the purpose, they were each given a copy of the RAP course outline. Fry (1990) contends that the subjective judgments of teachers and the researcher could assist in the selection of materials for the appropriate audience and purpose. The panel members were unanimous in their agreement that the passage was of average readability level and was suitable for the RAP course. In addition, they also agreed that the questions in the test were representative of the RAP content. A specification matrix listed the items in the pretest and posttest to the RAP course content (Appendix G). The matrix shows that the items in the questions covered the appropriate content area.

After acquiring the content validity, a pilot test was carried out to establish the reliability of the pretest and posttest. Thirty students who were in the fifth semester of the Bachelor of Accountancy course were chosen to participate in this test. These students were chosen based on their RAP results the previous semester. A stratified

sampling procedure was used to ensure that the high, average and low proficiency students were sufficiently represented. Using the UiTM grade bands (Appendix C), a student with high English language proficiency was one who scored 80% (Grade A and A+) or above; a student who was of average proficiency obtained scores between 60% to 79% (A-, B+, and B); and a student with low proficiency was one who scored 59% (grade B- and below) and below. Ten students from each level of English language proficiency were selected. The internal consistency reliability of the questions was estimated using Cronbach alpha correlation analysis. The coefficient correlation was .81 suggesting that the test was reliable. According to Brown (2004), internal-consistency estimates are the ones most often reported in language studies because they have the distinct advantage of being estimable from a single form of a test administered only once.

3.4.2   Reading tasks

While the pretest and posttest investigated the effects of collaboration on ESL students' reading performance at the end of the semester, the reading scores obtained before and after collaborating on a reading task every week were used to examine the effects of collaboration after each reading task. The analyses of the weekly reading scores was important to address the limitation of the one group pretest and posttest design, which was that there was no certainty that the changes experienced by the population were a direct result of the treatment since the posttest was carried out 14 weeks after OC. Similar to the pretest and posttest, the same set of questions were used

for the weekly reading tasks before and after OC. The weekly reading scores which were obtained before and after collaboration were analyzed for the effects of OC on students' reading performance for each task.

Every week ESL students completed a reading task after learning a new reading skill. First, individual ESL students completed the reading task on his/her own and sent his/her answers to the instructor. Subsequently, ESL groups discussed the same task as a group and then submitted the group's answers to the instructor. Therefore, there were two scores for the same task i.e. reading scores before collaboration (individual) and after collaboration (group).

The RAP syllabus covered nine reading skills (Appendix B). All the notes for the nine reading skills were posted on the RAP website weekly. ESL students were able to view the web-based notes whenever they went online. After learning a new skill, the reading task for that skill was also posted online. Hence, ESL students were required to go to the RAP website to check for their weekly reading task. This allowed them to view the RAP notes while they were working on the reading task either individually or collaboratively with their group members.

Each reading task comprised questions that tested the skills covered in the RAP course content. They included reading skills like Vocabulary, Previewing and Predicting, Identifying Main Ideas and Supporting Details, Distinguishing between Fact and Opinion, Understanding Sense Relationships within and between Sentences, Making Inferences, Paraphrasing, Recognizing Sentence Patterns, and Identifying Writer's Point of View. The number and types of questions for each reading task were varied depending on the reading skill. There were five questions for the Vocabulary

task, one for the reading task of Previewing and Predicting, three for Identifying Main Ideas and Supporting Details, ten for Distinguishing between Fact and Opinion and five for Identifying Sentence Patterns. Meanwhile, there were four questions each for Understanding Sense Relationships within and between Sentences, Making Inferences, Paraphrasing and Identifying Writer's attitude.

The same panel of experts (who evaluated the pretest and posttest questions) was enlisted to test the content validity of the reading task as suggested by Mertens (2010). They were in agreement with regard to the suitability of tasks which were representative of the RAP content. Appendix H shows the tasks, task instructions, outcome options and the categorization of the task according to Bloom's Taxonomy. All the tasks had one possible outcome except for the task of Previewing and Predicting which had multiple outcomes possible. Like the pretest and posttest, the reading tasks were also categorized based on Bloom's Taxonomy of cognitive domain. The same two lecturers who were enlisted earlier to ensure the validity of the categorization for the pretest and posttests, assisted in this process.

3.4.3   Online transcripts

The online transcripts of ESL groups were used to identify the patterns of interaction during OC; examine the differences in the patterns of interaction when ESL students worked on different reading tasks; and explore the nature of the relationship between patterns of interaction and ESL students' reading performance.

The transcripts of the online discussions were captured on the RAP website which comprised two main functional areas i.e. RAPCourse and RAPProfile. RAPCourse included pre-reading, reading, post-reading activities and RAPInteractive activities. ESL students discussed the pre-reading activities in RAPInteractive. There was one task with two activities. The first activity required ESL students to complete the task individually. The second activity which was based on the same task required group effort. Hence, the online discussions were obtained from the RAPInteractive. The RAP design is further explained in the "Instructional design" section (p. 132).

The online transcripts were obtained when ESL groups worked on different reading tasks. As was mentioned in the section above, ESL groups completed different reading tasks each week after learning a new reading skill. There were altogether nine reading skills taught. Thus, each group conducted nine online discussions which corresponded with the nine reading tasks. They included reading tasks on Vocabulary which was carried out in week 1, Previewing and Predicting in week 2, Identifying Main Ideas and Supporting Details in week 3, Distinguishing between Fact and Opinion in week 4, Understanding Sense Relationships within and between Sentences in week 5, Making Inferences in week 6, Paraphrasing in week 7, Identifying Writer's Point of View in week 8 and Recognizing Sentence Patterns in week 9.

According to Wertsch (1994) online discussions support the investigation of group processes during collaboration because it makes visible how knowledge emerges through interactions. The written nature of online interaction makes the invisible visible, thus enabling researchers to understand the full impact of the online interaction in the language classroom. In addition, the discussion leaves a thread, which facilitates

the study of the evolution and development of the interaction. Therefore, data from the online transcripts could explain the group processes that brought about the convergence of shared meanings during interaction. The data could further reveal the patterns of interaction which would, otherwise, be difficult to track.

3.4.4 Written assignments

The written assignments of ESL students were used to investigate the effects of OC on their reading performance. After learning a new reading skill, ESL students completed a reading task that tested them on the new reading skill. First, they worked on the reading task on their own and then they submitted a copy of their individual written assignment via the RAP website to the instructor. Subsequently, ESL groups worked on the same reading task (which they had earlier completed individually). The groups' written assignments were also submitted via the RAP website to the instructor. To examine if OC helped improved ESL groups' reading performance, the individual written assignments (before collaboration) and group written assignments (after collaboration) were printed out and analyzed to look for similarities or differences in the individual and group work. Appendix I presents a sample of the individual and group written assignments on Previewing and Predicting submitted by Group A.

3.5   Data analysis

This section describes how both qualitative and quantitative procedures were used to analyze the data obtained in the study. For the purposes of answering the research questions both descriptive and inferential statistics were employed.

3.5.1   Pretest and posttest

Data obtained from the pretest and posttest were used to investigate the effects of online collaboration on the reading performance of ESL students. Both the pretest and posttest were based on the same set of questions. The justification for using the same set of questions for both the pretest and posttest was to ensure that the types of questions and the level of difficulty remained "equivalent". The total maximum score for the tests was 30 marks.

The pretest was administered prior to OC which provided the individual students' scores. The posttest was administered 14 weeks later at the end of the semester after online collaboration. The scores from the pretest and posttest were analyzed at both the individual and group levels. This was necessary to examine the effects of OC on the reading performance of ESL students at the individual and group levels.

This section presents the analysis used at the individual level. Firstly, ESL students' pretest and posttest overall total scores and scores by questions were quantitatively analyzed to get the mean scores. This produced two main results i.e. the

overall total mean scores and the mean scores by questions. The overall mean scores for both tests would reveal whether OC had a positive effect on the overall reading performance among ESL individuals. The results of the mean scores by question would disclose whether there was an improvement in the individual student's performance for each question.

Subsequently, paired samples t-tests were carried out on the overall total mean scores and the mean scores by questions for the pretest and posttest. According to Brown (2004), "the t-test applies regardless of the size of the two samples and is therefore, much more commonly used in language studies" (p. 165). This would reveal if there were significant differences between the overall total mean scores and the mean scores by questions for the pretest and posttest. The results would show if online collaboration had resulted in significant improvements in the overall reading performance of the individual students. Moreover, it would show if there were significant differences in the pretest and posttest mean scores by questions. This was important in two ways. Firstly, the result of the paired samples t-test on the mean score by question would be able to identify the questions in which students showed significant improvements after OC. This meant that students had benefited significantly from collaboration when answering those questions. This was especially important for this study as the questions were categorized based on Bloom's Taxonomy (Appendix F). Hence, the results of the paired samples t-test on the mean scores by question, would shed light on the effects of OC on the levels of cognitive domain. Secondly, it was important to discriminate which question showed significant differences in the pretest and posttest mean scores because sometimes the mean scores for the posttest

may have shown an increase but the difference may not be significant. Significant differences would mean that OC had a positive effect on the individual students' reading performance.

While it was important to investigate the effects of OC on the reading performance of individual students, it was equally important to examine the effects of OC on the performance of ESL groups. The same quantitative analyses carried out on the pretest and posttest scores at the individual level were also carried out at the group level. There were altogether seven groups in the study. The pretest and posttest scores of the four group members were added together to arrive at a single group score. Then the groups' pretest and posttest overall total scores and the group scores by questions were quantitavely analyzed to get the mean scores. This provided the groups' overall total mean scores and the mean scores by questions. The groups' overall mean scores for the pretest and posttest would reveal if OC improved the overall reading performance of ESL groups. The results of the mean scores by question would disclose whether the performance of ESL groups for each question had improved.

Whilst higher mean scores in the posttest would indicate that the overall performance of ESL groups had improved, it would not reveal whether the differences in the improvements were significant. Likewise, higher posttest mean scores by question would show improvements in ESL groups' performance but it would not show if the differences by questions were significant. To find out if the differences in the mean scores were significant, paired samples t-tests were carried out.

Paired samples t-tests were carried out on the overall total mean scores and the mean scores by questions for the pretest and posttest. The results would reveal if there

were significant improvements in the overall reading performance of the ESL groups after OC. Moreover, it would show if ESL groups showed significant differences in the pretest and posttest mean scores by questions. As was mentioned in the previous section which discussed analyses at the individual level, it was essential to look at the results of the paired samples t-test by question because they differentiated between the mean scores by questions that showed significant differences and those that did not. The t-test results on the overall total score for the pretest and posttest only provided limited information regarding the overall performance of the groups but was not able to discriminate between the questions which showed significant improvements. Furthermore, the questions, which were categorized based on Bloom's Taxonomy of cognitive domain could help provide further information regarding the levels of the cognitive domain which students benefited during OC.

It was necessary to look at ESL students' performance at both the individual and group levels because the t-tests identified the types of questions in which individual ESL students and ESL groups showed significant improvements. So, the results of the t-tests would reveal not only the effects of OC on reading performance among ESL students, they also would identify which level of cognitive domain benefited from OC. Additionally, the results would also identify the types of questions which ESL individuals and groups showed improvements in.

3.5.2 Reading tasks

Just like the data from the pretest and posttest, data from the reading tasks were used to examine the effects of OC on the reading performance among ESL students. In addition, these data were also used to investigate the nature of the relationship between the patterns of interaction and the reading performance of ESL students during OC.

The reading scores obtained from the reading tasks were used to answer the two research questions mentioned in previous paragraph. There were altogether nine reading tasks given out throughout the semester. This number corresponded with the nine reading skills in the RAP course content. Ten (10) marks were given for each reading task. Therefore, ESL students could score a maximum 90 marks for the nine reading tasks.

After learning a new skill, ESL students were required to complete a reading task based on the skill that they had just learnt. The notes for the new reading skill together with the reading task were posted online and students had to log in to view the task. There were two activities for each reading task. First, students completed the task on their own and submit their individual assignment via the web to the instructor. Then they were to complete the same reading task but this time by collaborating with their group members. They were to submit the group assignment after their discussion. The individual and group written assignments were then graded. Each group assignment obtained only one score. For example if Group A scored 9 marks for a particular reading task, then all four members of the group were awarded 9 marks each. Therefore, the individual scores were scores before collaboration and the group scores

were the scores after collaboration. The reading scores obtained by the individual students and the groups for all nine reading tasks were quantitatively analyzed.

Firstly, the data were used to investigate the effects of OC on the reading performance of ESL students. Like the pretest and posttest, the reading scores obtained before and after collaboration were analyzed at both the individual and group levels. First, the overall total mean scores before and after OC for all the nine reading tasks were compared. This would show whether the overall performance of individual students were better or otherwise after collaboration. Then the mean scores of the different reading tasks before and after collaboration were examined. This would reveal which reading tasks showed improvements or otherwise after collaboration.

Paired samples t-tests were employed to further examine the effects of OC on the reading performance of individual students. They were used to compare the overall total mean reading scores of individual students before and after collaboration. The t-test results would reveal if the overall performance of individual students showed significant improvements after OC. Subsequently, paired samples t-tests were also used to compare individual students' mean reading scores for different reading tasks. The results of the t-tests would reveal if the differences in the mean scores for the different reading tasks were significant. It would further indicate which reading task registered significant improvements after OC. Like the pretest and posttest, the reading tasks were categorized based on Bloom's Taxonomy. Hence, the statistical information would reveal the effects of OC on ESL students' levels of cognitive gain.

Similarly, the overall total mean scores and the mean scores by questions of ESL groups before and after collaboration were compared. The results would reveal

whether the performance of ESL groups have improved after OC. To investigate if the mean scores were significant, paired samples t-tests were applied. They were utilized to compare ESL groups' overall total mean scores and the mean scores by reading tasks before and after collaboration. The statistical results would reveal if the difference in the groups' overall total mean scores and the mean scores by reading task were significant. Additionally, the information would again reveal which level of the cognitive domain showed significant improvements after OC.

So far, the individual and group reading scores were used to investigate the effects of OC on the reading performance among ESL students. Besides that, the overall total reading scores of ESL groups after OC were also used to examine the nature of the relationship between the patterns of interaction and the reading performance of ESL students. The reading performance of ESL students was measured by the reading scores obtained by ESL groups for the reading tasks Previewing and Predicting, Paraphrasing and Identifying Sentence Patterns. This was because only the online transcripts of Previewing and Predicting, Paraphrasing and Identifying Sentence Patterns were analyzed for patterns of interaction.

First, descriptive statistics were used to compare the mean scores for the three reading tasks of Previewing and Predicting, Paraphrasing and Identifying Sentence Patterns. Then the Kruskal-Wallis one-way analysis of variance was used to examine if there was a significant relationship between the three scores. The results would show if there was a difference in the reading performance of ESL students when they completed the three reading tasks collaboratively. To establish the relationship between the patterns of interaction and the reading performance, Spearman's rank-order

correlation was used. This would be explicated in the following section under "Online transcripts".

3.5.3   Online transcripts

Data from the online transcripts were used to determine the patterns of interaction demonstrated by ESL groups during OC. Once the patterns of interaction were established, differences in the patterns of interaction between different reading tasks were examined. Additionally, the relationship between patterns of interaction and reading performance was investigated.

There are various definitions of the term "interaction". According to Schrire (2006), interaction in a computer conferencing environment, relates to those messages that are responses to others both explicitly and implicitly. Gunawardena et al. (1997) define interaction as "the totality of interconnected and mutually responsive messages" (p.407). Henri (1992) used Bretz's (1983) definition of interactivity which comprises three steps. The first step is communication of information, the second is a first response to this information and the last step is the second answer relating to the first. Regardless of the differences in the definition of interaction, content analysis or interaction analysis of computer transcripts is regarded as essential to assessing the quality of the learning experience in computer conferencing. According to Schwandt (1997) content analysis is a generic name for a variety of textual analyses that typically involves comparing, contrasting, and categorizing a set of data. Garrison and Anderson

(2003) consider interaction as the component that defines the educational process and is essential for meaningful learning.

Jordan and Henderson (1995) describe interaction analysis as an "interdisciplinary method for the empirical investigation of the interaction of human beings with each other and with objects in their environment" (p. 1). They further add that interaction analytic studies perceive learning as a distributed, ongoing social process. Hence, evidence of learning having taken place must be found in understanding the ways in which people learn collaboratively. Online transcripts allow for the close analysis of interaction that takes place between participants (Gunawardena et al., 1997). Therefore, the online transcripts were used to identify the patterns of interaction demonstrated by ESL groups. According to Schwandt (1997) content analysis can involve both numeric and interpretive data analyses.

The online transcripts for the reading tasks of Previewing and Predicting, Paraphrasing and Identifying Sentence Patterns of groups A, D and E were investigated to identify the patterns of interaction in this study. The following sections explain the rationale for the selection of the groups and the reading tasks.

From the seven groups in this study, the transcripts of three groups were investigated for patterns of interaction. The groups were formed based on the students' English language proficiency. This was confirmed by the results of the Kruskal-Wallis test which show that there was no significant difference in the pretest mean scores of the seven groups suggesting that the language ability of the groups was similar. Refer to 3.3.2 (p. 94) for the explanation on how ESL students were divided into mixed ability groups.

The selection of the groups was carried out once the language ability of the groups was established. Groups A, D and E were selected based on their performance in the pretest and posttest. Groups A, and D were identified because they obtained the highest and the least increase in their posttest mean scores respectively (refer to Table 3.2, p. 97). Group E obtained an average increase in their pretest and posttest mean scores. Therefore, these groups were taken to be sufficiently representing the intact ESL class.

The online transcripts of groups A, D and E were investigated for the patterns of interaction. These transcripts were the result of online discussions of ESL groups when they worked on different reading comprehension tasks. The selection of the transcripts was based on the task types and the level of cognitive domain (Appendix H). The task type for Previewing and Predicting was open-ended. Closed tasks were used for both Paraphrasing and Identifying Sentence Patterns. In addition, the reading tasks were further discriminated for levels of cognitive difficulty based on Bloom's Taxonomy of cognitive domain. The categories of cognitive domain for the reading tasks for Previewing and Predicting, Paraphrasing and Identifying Sentence Patterns were comprehension, application and analysis respectively. These reading tasks were chosen for the different levels of cognitive domain and task types they represented.

After identifying groups A, D and E and the reading tasks of Previewing and Predicting, Paraphrasing and Identifying Sentence Patterns, the transcripts of the online discussions were analyzed for patterns of interaction. Both qualitative and quantitative procedures were used to analyze the online transcripts.

3.5.3.1 Qualitative analysis

Research studies have found that social interaction among peers is important to learning (Bonk & Cummings, 1998; Dykes, 2001; McIsaac et al., 1999; Moller, 1998; Morgan & O'Reilly, 1999). Therefore, interaction analysis is essential to assess the quality of learning and the quality of interaction (Jordan & Henderson, 1995). According to Gunawardena, Lowe and Anderson (1997) interaction when viewed as a whole shows the patterns of knowledge construction. They further add that it is important to "detect the emergent pattern, the degree to which all the participants have contributed their own pieces at each stage of its construction, and the extent to which the participants report or demonstrate relevant learning" (p.416). To study the interactions that took place during OC, qualitative analyses were employed to identify, label and categorize the transcripts from the nine discussion protocols produced by the three groups when they worked on the three different reading tasks of Previewing and Predicting, Paraphrasing and Identifying Sentence Patterns.

An adapted version of Gunawardena et al.'s (1997) Interactive Analysis Model was used for this purpose. This model is applicable to this study because it focused on CL as a process of knowledge construction and shared meaning making. Gunawardena et al. developed the model based on an asynchronous online debate for professionals in the field of distance education and graduate students conducting research in the field. In contrast, the subjects in this study were undergraduates engaged in synchronous OC. It was felt that Gunawardena's model needed to be modified before it could be applied to the online transcripts of this study for two reasons. First, Gunawardena's model was

developed based on a highly structured formal debate of a group of professionals who possess certain levels of cognitive structures which the students in this study did not possess. Also, the ESL undergraduates in this study were not yet proficient in the English language to put forward arguments like that of Gunawardena et al.'s participants. Second, the topic of discussion among Gunawardena et al.'s participants was the theory and practice of distance education whereas ESL students in this study collaborated on reading comprehension tasks. Therefore, it was felt that the disparity in the level of difficulty of the subject matter between the two studies required adaptations to Gunawardena et al's Model. For that reason, Phase IV: Testing and modification of proposed synthesis or co-construction of Gunawardena et al.'s Model was not used.

The adapted version of Interactive Analysis Model (Appendix J) for this study consisted of four interactive phases i.e. Phase I: Sharing of Information; Phase II: Discovering Inconsistency among Ideas, Concepts, or Statements; Phase III: Negotiating for Meaning/Co-constructing Knowledge; and Phase IV: Making Agreement Statement(s)/Applying Newly-Constructed Meaning. According to Gunawardena et al. the Interactive Analysis Model begins with phases which represent the lower mental functions (Phases I and II) and moves to phases with higher mental functions (Phases III and IV).

The four interactive phases used for this study were adapted from Gunawardena et al.'s (1997) Interactive Analysis Model. Each interactive phase was further discriminated by the operations present. The operations used for the four interactive phases in this study were adapted from Gunawardena et al. (Appendix K) and Sringam and Geer's (Appendix L) models. In this study, there were six operations for Phase I:

Sharing phase. All five operations in Gunawardena et al.'s model were adopted. The other additional operation "Challenging others to engage in group discussion" was adopted from Sringam and Geer's (2001) model. All the three operations used in this study for Phase II: Discovering Inconsistency phase were adopted from Gunawardena et al.'s model. For Phase III: Negotiating for Meaning phase, the four operations were adopted from Sringam and Geer's model. Lastly, the two operations for Phase IV: Making Agreement phase were also adopted from Sringam and Geer's model. The interactive phases and the operations adopted were based on their suitability in relation to the content area of reading.

Interaction analysis employs content analysis techniques and focuses on studying the interactions that took place between participants. Content analysis was used to analyze the online transcripts. According to Schwandt (1997) content analysis is a generic name for a variety of textual analyses that typically involves comparing, contrasting, and categorizing a set of data. Content analysis was employed in this study because it is concerned with the investigation of patterns of interaction for examining co-construction of knowledge. It is not for the investigation of the process of communication or specific speech acts as in discourse analysis.

Gerbic and Stacey (2005) claim that content analysis of computer conferences provides a rich source of data for researching and understanding online learning. De Wever et al. (2005) point out that content analysis aims at revealing information found below the surface of the discourse transcripts, i.e. latent content. The content analysis of this study involved breaking down the messages into units of meaning (Henri, 1992). Henri's system of content analysis involved breaking the messages down into units of

meaning and classifying these units according to social, interactive, cognitive and metacognitive content. Gunawardena et al. (1997) proposed using a message as a unit of analysis because in their analysis of asynchronous online debate, they felt that it was difficult to separate a message into meaning units as "each message was likely to include several arguments which advanced the case". This was not a problem in this study whereby data were obtained from synchronous discussion. The messages posted in synchronous discussions were made immediately in direct response to the messages posted just before. Moreover, the messages posted were short and carried out in a conversational style that did not include several arguments in one message. Hence, this study adopted Henri's units of meaning to classify only the interactive content because this study was concerned with the patterns of interaction. The other three content areas proposed by Henri were not used.

The process of analyzing the online transcripts was conducted once the Interactive Analysis Model and the unit of analysis were identified. This was done in two stages i.e. Stage 1: Coding, and Stage 2: Checking reliability.

3.5.3.1.1 Stage 1: Coding

Firstly, a coding sheet was developed based on the adapted version of the Interactive Analysis Model which consisted of the interactive phases and the operations in each phase. For example, the code "Phase I A" referred to "Phase I: Sharing phase" and "Operation A: Expressing a statement of observation or opinion" (refer to Appendix J). Each participant's message was then broken down into units of meaning

and marked according to the phase (Phases I-IV) it represented and the operations (expressing, negotiating, applying etc…) demonstrated by ESL group members. An example of the coding matrix is given below. Four columns were created. The first column indicates the user name. The second column shows the time the discussion took place. The third column shows the message posted and the fourth column shows the coding of the interactive phase and the operations which correspond with the message in the third column. The code (W2/GrpD/PP/15.09pm) in Excerpt 1 means that the online transcript was taken from week 2 from group D when they worked on the reading task of Previewing and Predicting. The message was posted at 15.09 pm. The numbers in the message column indicate which parts of the message were referred to, and they correspond to the numbers indicating the interactive phases and operations used in the fourth column.

Excerpt 1: (W2/GrpD/PP/15.09-15.11pm)

User name	Time	Message	Interactive phases/ Operation types
Alexandra:	15.09	what bring the college success? (1) the students . the administration n the lecturer (2)	Phase I E: Identifying a problem (1) Phase I A: Expressing an opinion (2)
Jc3yLiaNa	15.10	ya, all (3)	Phase I B: Expressing agreement (3)
Tarabas	15.10	yep (4) and..enough and modern facilities....(5)	Phase I B: Expressing agreement (4) Phase I A: Expressing an opinion (5)

As can be seen in Excerpt 1, Alexandra's message was broken down into units of meaning. The first meaning was when he identified the problem of the reading task

which was to predict the contents of the topic "College Success" (Appendix H). That meaning was coded as (1) under Phase I E: Identifying a problem. Although the topic "College Success" was general in nature, Alexandra was able to focus on what brought about college success. Then he proceeded to state his own opinion that students, administration and the lecturers contributed to college success. This was coded as (2) under Phase I A: Expressing an opinion. Jc3yLiaNa agreed with Alexandra's opinion on what contributed to college success. Although Jc3yLiaNa's message comprised two words "ya, all" the meaning was clear. She agreed with Alexandra. Therefore, her message was coded (3) under Phase I B: Expressing agreement. When Tarabas posted "yep", the meaning was clear. It meant that she agreed with Alexandra that students, administration and the lecturers contributed to college success. Hence, it was coded (4) under Phase I B: Expressing agreement. In addition, Tarabas added that modern facilities also contributed to college success. This was coded (5) under Phase I A: Expressing an opinion. It was clear that she was stating her opinion that facilities also contributed to college success.

It was important to follow the threads of discussion when analyzing the messages. This was because ESL groups used short and informal conversational style to communicate. For example, if we were to look at the message posted by Jc3yLiaNa, "ya, all" in isolation, it would not have made sense. Therefore, the data analysis was carried out by reading the messages in the sequence in which they were posted and coding them accordingly. This is in line with Gunawardena et al.'s view of looking at interaction as "the entire gestalt formed by the online communications among the

participants" (p. 407). Thus, such analysis described the process of peer group interaction through which knowledge construction occurs.

The transcripts were read and reread several times to get a sense of the discussions before coding began. Several days elapsed after the first coding, before the second coding was carried out. This was to allow for fresher perspectives and objectivity when coding. Appendix M provides specific examples of coding for the interactive phases and operations.

3.5.3.1.2 Stage 2: Checking reliability

Rourke, Anderson, Garrison and Archer (2001) describe interrater reliability as "the extent to which different coders, each coding the same content, come to the same coding decisions" (p. 6). Interrater reliabilty is essential in content analysis as some amount of subjectivity may be unavoidable in coding transcripts. Hence, a senior TESL lecturer with a PhD qualification from a local institution of higher learning was enlisted to check for reliability.

Three online transcripts, one each from the reading tasks of Previewing and Predicting, Paraphrasing and Identifying Sentence Patterns, were randomly chosen for the rater to analyze. A column was created in the transcripts for the rater to code the messages. The rater was also provided with a copy of the adapted version of the Interactive Analysis Model (Appendix J) with the coding system for the interactive phases and the operations.

The researcher explained the Interactive Analysis Model to the rater. After the rater underwent a period of training to code the data, she was instructed to analyze and code the transcripts independently based on the Interactive Analysis Model using the coding system prepared. The analyses of the rater were compared to the ones done by the researcher. The mean percentage of the total agreement in the three transcripts was computed. The mean percentage was used as the indicator of interrater reliability in the coding of the online transcripts. The mean percentages of the transcripts on Previewing and Predicting, Paraphrasing and Identifying Sentence Patterns were .82, .81 and .84 respectively. Nevertheless, all disagreements regarding the coding of the messages were discussed until an agreement was reached. Problems were initially encountered because of the ambiguity of the messages when analyzed in isolation. Subsequently, the researcher coded the rest of the transcripts based on these agreements.

3.5.3.2   Quantitative analysis

Once the interactive phases and the operations were identified, non-parametric statistical analyses were employed. Non-parametric statistical techniques were used in this study because of the small sample size. According to Mertens (2010), non-parametric test is used when the assumption of normality cannot be met, with small sample sizes, and with ordinal (rank) or nominal (categorical) data. Bryman and Cramer (2001) also state that non-parametric or distribution free tests are not dependent on assumptions about the precise form of the distribution of the sampled populations.

To investigate the patterns of interaction, descriptive statistics (using frequencies and percentages) and inferential statistics (using Friedman analysis of variance and Wilcoxon signed-rank test) were used. The Friedman analysis of variance and the Spearman rank-order correlation were employed to examine the differences in patterns of interaction between reading tasks. Finally, the Kruskal-Wallis test and the Spearman rank-order correlation were used to explore the relationship between patterns of interaction and reading performance.

3.5.3.2.1 Patterns of interaction

After the nine online transcripts were coded, the frequencies of operations that were generated were tabulated. The total number of operations generated by groups A, D and E when they worked on the selected reading tasks was computed. Percentages of operations used and percentages for operations by interactive phases were also created to facilitate making comparisons. Descriptive statistics using frequencies and percentages not only provided an overall picture of operations used by ESL groups, but also presented the patterns of interaction.

To determine if there was a difference between the operations used by interactive phases, two non-parametric statistical techniques were used. Inferential statistics using the Friedman analysis of variance by ranks and the Wilcoxon signed-rank test were employed to make within subjects comparison on the frequency of operations used across the four interactive phases.

Qualitative analyses of the online discussions were examined to gather additional evidence to support the quantitative analyses.

3.5.3.2.2 Patterns of interaction and reading tasks

Both quantitative and qualitative analyses were carried out to examine the differences in patterns of interaction and different reading tasks.

Quantitative analyses involved using the Friedman analysis of variance and the Spearman rank-order correlation tests. The former was used to compare the frequency of operations between the three selected reading tasks, paying special attention to the differences in the frequency of overall operations and the frequency of operations by interactive phase. The Spearman rank-order correlation test was used to determine the relationship in the overall pattern of operations demonstrated between the three reading tasks. The frequencies of operations were ranked under each interactive phase and computed using the Spearman rank-order correlation coefficient between the different reading tasks. Separate analyses were carried to determine whether there was a similar pattern in the use of operations between the reading tasks e.g. Previewing and Predicting with Paraphrasing; Previewing and Predicting with Identifying Sentence Patterns; and Paraphrasing with Identifying Sentence Patterns.

3.5.3.2.3 Relationship between patterns of interaction and reading performance

Descriptive data using means and standard deviations were used to provide numerical descriptions of the overall reading scores (reading performance) between the selected reading tasks of Previewing and Predicting, Identifying Sentence Patterns and Paraphrasing. For each reading task, the reading scores of ESL students in groups A, D and E (12 students) were added together to arrive at the overall reading scores. Subsequently, the Kruskal-Wallis test was carried out to compare the reading scores of the selected reading tasks to see if there was a difference in their reading performance.

The Spearman rank-order correlation was used to examine the relationship between patterns of interaction and reading performance of ESL groups. The first analysis using the Spearman rank-order correlation coefficient was for the purpose of determining whether there was a correlation between the frequency of overall operations used and the overall reading scores of the groups. Additionally, it attempted to establish if the total number of operations generated was related to the overall reading performance. The second analysis was to establish whether there was a correlation between the operations used by interactive phase and the overall reading scores. The results would reveal which interactive phase was related either positively or negatively with the overall reading performance. The third analysis was to investigate the correlation between the frequency of operations demonstrated and overall reading scores. This was to determine which operation was positively or negatively correlated with reading performance.

3.5.4   Written assignments

ESL students' written assignments were used to examine if OC improved ESL groups' reading performance. Both the individual and group assignments were qualitatively analyzed to examine the effects of collaboration on ESL students' written work. Moreover, the written assignments were examined to gather additional evidence to support the quantitative analyses regarding the patterns of interaction.

3.5.5   Data analysis framework

Table 3.3 presents a summary of the analysis employed when answering the research questions in this study.

Table 3.3

Data analysis framework

Research Questions	Data Sources	Techniques of Analysis
1. What are the effects of online collaboration on reading performance of ESL students?	1. Pretest and posttest scores of 28 ESL students	Quantitative analysis • t-tests on individual ESL students' mean scores by question • t-tests on ESL groups' mean scores by question
	2. Reading scores of nine reading tasks of 28 ESL students before and after collaboration	Quantitative analysis • t-tests on individual ESL students' mean scores by reading task • t-tests on ESL groups' mean scores by reading task

2. What is the pattern of interaction demonstrated by ESL students when they collaborate online?	1. Nine online transcripts of groups A, D and E when they worked on the reading tasks of Previewing and Predicting, Paraphrasing and Identifying Sentence Patterns.	Qualitative Analysis
		• Content analysis of online transcripts to identify operations and interactive phases using predetermined categories of the Interactive Analysis Model (Appendix J) adapted from Gunawardena et al. (1997) and Sringam and Greer's (2001).
		
		Quantitative Analysis
		• Descriptive statistics
		  - Frequency and percentages of operations and interactive phases
		• Inferential statistics
		  - Friedman analysis of variance by ranks
		  - Wilcoxon signed-rank test

	2. Individual and group written assignments of groups A, D and E.	• Qualitative Analysis - Analyze the written assignments to compare

Table 3.3, continued

Research Questions	Data Sources	Techniques of Analysis
		similarities or differences in the individual and group work.
3 What are differences in the patterns of interaction when ESL students work on different reading tasks collaboratively online?	Nine online transcripts of groups A, D and E when they worked on the reading tasks of Previewing and Predicting, Paraphrasing and Identifying Sentence Patterns.	Quantitative Analysis • Friedman analysis of variance by ranks • Frequency and percentages of operations and interactive phases • Spearman rank-order correlation
4 What is the nature of the relationship between the patterns of interaction and the reading performance of ESL students when they collaborate online?	1 Reading scores obtained from groups A, D and E on the tasks of Previewing and Predicting, Paraphrasing and Identifying Sentence Patterns 2. Nine online transcripts of groups A, D and E when they worked on the reading tasks of Previewing and Predicting, Paraphrasing and Identifying Sentence Patterns.	Quantitative Analysis • Descriptive statistics - Means and standard deviations of reading scores • Kruskal-Wallis test • Spearman rank-order correlation

3.6   Instructional design

Instruction can be defined as a purposeful interaction to increase a learner's knowledge or skills in a specific, pre-determined fashion (Ritchie & Hoffman, 1996). This section describes the web design in this study. It also outlines the instructional procedure and the instructional materials used.

3.6.1   Web design for RAP

The course that was designed for delivery over the Web was Reading for Academic Purposes (RAP). It is compulsory for the fourth semester Bachelor of Accountancy students from UiTM to take the RAP course. The number of contact hours for the RAP class was two hours per week. The course objectives were for students to comprehend academic texts and to apply their critical thinking skills.

For this study, the course was designed to be supported by the web. The educational approach to the teaching and learning of this course was through collaboration. Computer supported collaborative learning has been acknowledged to facilitate sharing and distributing of knowledge and expertise among community members (Cole & Wertsch, 1998; Lipponen, 2002; Stahl, 2002). For this study, the objective was to facilitate collaboration and to gather evidence of the interaction that took place to investigate knowledge construction.

The design of the RAP template was aimed at creating a collaborative learning environment to maximize students' knowledge building. Considerations were given to

instructor-learner communication and content-learner communication when designing the RAP website (Miller, 1999). The former included decisions regarding the form (synchronous and asynchronous communication) and configuration of interactions (between instructor and students, and students and students).

3.6.2 Structure of the web

The web course was for Reading for Academic Purposes (RAP). To provide the structure for student activity, the web template was divided into two functional areas i.e. RAPCourse and RAPProfile (Appendix N). The design of the structure took into consideration Dick and Reiser's (1989) instructional sequences i.e. motivating the learner, explaining what is to be learned, helping the learner recall previous knowledge, providing instructional material, providing guidance and feedback, testing comprehension, and providing enrichment or remediation. Figure 1 shows the structure of the web for RAP.

```
                    ┌──────────────┐
                    │    login     │
                    └──────────────┘
                            │
                    ┌──────────────┐
                    │   Main page  │
                    └──────────────┘
                            │
            ┌───────────────┴───────────────┐
    ┌──────────────┐                 ┌──────────────┐
    │  RAPCourse   │                 │  RAPProfile  │
    └──────────────┘                 └──────────────┘
            │                                │
    ┌──────────────┐                 ┌──────────────┐
    │  Pre-reading │                 │  Assignment  │
    └──────────────┘                 │    grades    │
            │                        └──────────────┘
    ┌──────────────┐
    │   Reading    │
    └──────────────┘
            │
    ┌──────────────┐
    │ Post-reading │
    └──────────────┘
            │
    ┌──────────────┐
    │RAPInteractive│
    └──────────────┘
```
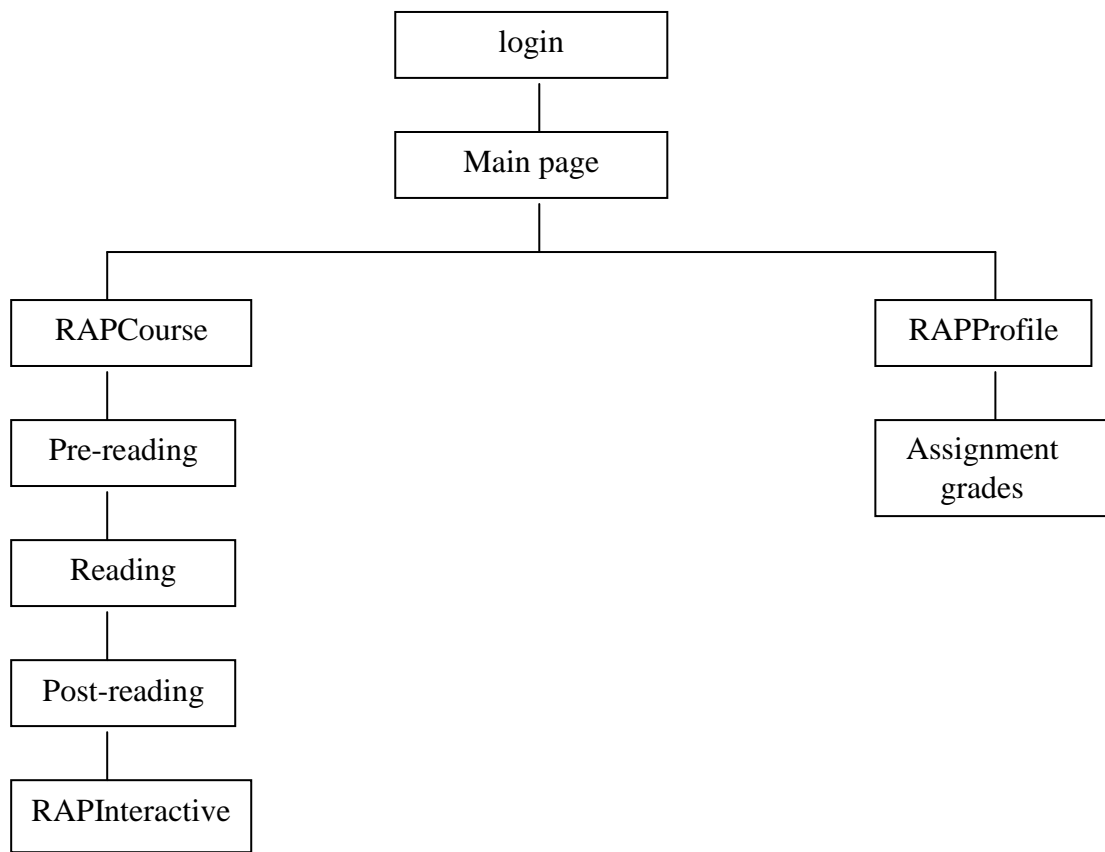
Figure 3.1: RAP web structure

3.6.2.1 RAPCourse

RAPCourse listed course requirements (course outline, syllabus, scheme of work and test specification), bulletin board (for notices of assignment deadlines, changes in the course), and activities. The reading topics for the course were Vocabulary and dictionary skills, Previewing and Predicting, Identifying Main Ideas and Supporting Details, Understanding Sense Relationship between and within

Sentences, Making inferences, Identifying Sentence Patterns, Distinguishing between Fact and Opinion; Paraphrasing, and Identifying Writer's Point of View.

The following were the activities on the RAPCourse:

(a)   Pre-reading activities required students to solve a problem related to the skill taught first individually and then as a group;

(b)   Reading activities comprised reading passages that required students to comprehend the passage;

(c)   Post-reading activities comprised answering questions based on the passage (reading activities).

(d)   The RAPInteractive was a discussion database in which most of the course interaction took place.

3.6.2.2 RAPProfile

This was a directory of course members including students in the class and the instructor. The space enabled members to introduce themselves to their course classmates. Each individual profile contained the student's name and contact information, educational background, personal interest and a photograph. RAPProfile also contained assignment grades in private documents contained in each student's portfolio.

3.6.3   Instructional materials

The materials used in this study were guided by the requirements of the syllabus. There was no textbook for this course. However, materials were taken from recommended texts, magazines, journals, newspapers and the Internet. A sample of the material is given in Appendix O. The selection of materials included different text types like narrative, argumentative, expository, and dialogues (Appendix P).

3.6.4   Nature of RAP course

This section describes the instructional procedures and the implementation of the RAP online course.

3.6.4.1 Instructional Strategy

Dick et al. (2001) define an instructional strategy as, "… the general components of a set of instructional materials and the procedures that will be used with those materials to enable students mastery of learning outcomes" (p. 189). The instructional design process used in this study was guided by Dick et al.'s (2001) instructional strategy that comprises five major learning components. They include preinstructional activities, content presentation, learner participation, assessment and follow-through activities.

3.6.4.1.1   Preinstructional activities

Three factors were considered before beginning formal instruction. These included motivating the learners, informing them of what they would learn and ensuring that they had the prerequisite knowledge to follow the instruction. The main motivating factor was to inform the students of the relevance of the course in helping them not only to further improve their reading skills but also to facilitate their collaborative skills. The students were also motivated because they able to use computers for their English language classes rather than sitting down in their classrooms for English lessons.

Besides that, students were informed of the objectives of the course, so that they were able to focus on the study strategies on these required outcomes. The course content, course outline, syllabus, the scheme of work and the test specification were provided on the opening page of the RAP. These were located in RAPCourse and RAPInteractive. Students could view these pages any time they wished. Lastly, students' knowledge of the content area to be taught was appraised through brainstorming, discussions or interviews. This was done with the intention to promote students' active recall of relevant mental contexts in which the new content could be integrated.

During this phase of the course, some of the skills students were required to engage in included (a) elaboration (recall of prior knowledge); (b) advance organization (preview the lesson); and (c) selective attention (focus on the skills to be taught in the lesson). The activities took place in the RAPCourse and RAPInteractive.

3.6.4.1.2 Content presentation

Textual support was given to develop students' reading skills. This was accomplished by providing notes on all the reading skills covered in the syllabus. These included notes on reading skills such as Vocabulary, Previewing and Predicting, Identifying Main Ideas and Supporting Details, Distinguishing between Facts and Opinions, Understanding Sense Relationships within and between Sentences, Making Inferences, Paraphrasing, Identifying Sentence Patterns skills, and Identifying Writer's Attitude. These notes were provided in RAPCourse Content under their respective headings. Besides that pre-reading activities for all the reading skills were also included to initiate the students to the content area of the course.

During this phase of the course, some of the skills students were required to engage in were (a) selective attention (attend to key ideas of the lesson); (b) inferencing (guess meanings in context); (c) elaboration (relate new information to prior knowledge); (d) questioning for clarification; (e) resourcing (look for resources to aid their comprehension); and (f) collaborating (with group members). Most of the activities took place in RAPCourse and RAPInteractive.

3.6.4.1.3 Learner participation

To enhance the learning process, activities that were directly relevant to the objectives of the course were provided. These included pre-reading activities, reading activities, and post-reading activities which were located in RAPCourse and

RAPIntercative. To develop students' skills in using new information gained from the Content Presentation component, scaffolding was provided by the instructor, other students (group members and classmates), and experts.

During this phase of the course, some of the skills students were required to engage in were (a) resourcing (look for resources to aid their comprehension); (b) grouping (classify concepts, ideas etc…); (c) summarizing (summarize information learnt); (d) application (apply rules to solve problems); (e) elaboration (recall of prior knowledge); (f) inferencing (guess meanings in context); (g) collaboration (working with peers to construct knowledge); and (h) questioning for clarification. Most of the activities took place on RAPCourse, RAPInteractive (Discussion Forum and Work Assignments), and RAPExpert. Collaborative learning tasks and group discussion would help students to practise what they have learnt.

3.6.4.1.4   Assessment

Another important component of instructional strategy is assessment. This was necessary to develop students' ability to evaluate their own performance to enable them to discover if there were gaps in their knowledge.

During this phase of the course, some of the skills students were required to engage in were (a) self-evaluation (judge own level of performance); (b) elaboration (recall of prior knowledge); and (c) questioning for clarification. Most of the activities took place on RAPCourse (Quiz and Past Year Examination Questions), RAPInteractive (Discussion Forum and Work Assignments), and RAPQuiz.

Collaboration with their group members would help develop students' ability to evaluate their own performance.

3.6.4.1.5 Follow-through activities

The final component of the instructional strategy is follow-through activities. This was to develop students' skills to transfer skills learned to new tasks.

During this phase of the course, some of the skills students were required to engage in were (a) inferencing (guess meanings in context); (b) resourcing (look for resources to aid their comprehension); (c) elaboration (recall of prior knowledge); and (d) application (apply rules to solve problems). Most of the activities took place in RAPCourse and RAPInteractive (Discussion Forum and Work Assignments). Discussions, additional practice on similar activities, and assignments were used to develop students' ability to transfer what was learnt.

3.6.4.2 Implementation of RAP course

First of all, the instructor introduced ESL students to the RAP website. The students were given a lesson to explore the RAP website and to clarify any issues that they were unclear about. Then, the ESL students in the intact class were divided into groups of four. Each group comprised students of mixed English language abilities.

Subsequently, ESL students were briefed on the tasks that they had to carry out for the RAP course. They were to do pre-reading activities, reading activities and post-

reading activities. The pre-reading activities were meant to be collaborative activities. There were two activities for the pre-reading activities. Activity 1 required ESL students to answer the questions on their own individually first. They then submit their answers to the instructor in RAPChat. Then in Activity 2, they had to collaborate with their group members before they could submit the group's answers to the instructor. First, they had to share their individual answers (from Activity 1) with their group members and then the group had to collaborate and come to an agreement as to what the group's answers should be. At the end of Activity 2, the respective groups were to submit the group's answers to the instructor via Work Assignments in RAPInteractive. Both Activity 1 and Activity 2 were based on the same questions. The only difference was that the former required individual work whereas the latter was based on collaborative group work. Whilst the pre-reading activities required collaboration, the reading and the post-reading activities were individual activities.

ESL students were also briefed that the notes for the respective reading skill topics were given in RAPCourse. They were told to read the notes and to refer to them while collaborating with their friends. They were also told that if they needed extra help, they could contact the instructor under RAPExpert.

The nature of the course was such that the ESL students were not exposed to any other reading course (online or otherwise) that might account for the gains in their posttest at the end of the semester. Hence, the posttest results were a result of the 14 week RAP online course.