CHAPTER THREE

METHODOLOGY

3.1 Introduction

In Section 1.2, it was mentioned that research on CAI for the subject Geography is very much lacking in Malaysia.. It is important to study academic achievement and students' perception of CAI in a Malaysian context. The main focus of this study is to establish the effectiveness of CAI on achievement and students' perception in using computers.

3.2 The Subjects

Form Four Geography students of a secondary school in Temerloh, Pahang were selected for this study. Three classes of Form Four Geography students sat for a pre-test on a Form Four Geography topic. The selected topic was "Natural Forest of the World". The purpose of the test was to determine the level of students' prior knowledge of this topic. The score for this test would also be the Pre-CAI and Pre-Non-CAI achievement score of the study.

This test was also important for the selection of sample subjects for the CAI study. Students whose scores were average were selected. This was to ensure that the selected subjects had the ability to learn and improve academically. Finally, two groups consisting of sixty students were selected based on their average score. The first sample,

the CAI group (n = 30) followed the IMI package. The second sample, the Non-CAI group (n = 30) was taught using traditional classroom teaching method.

The Non-CAI group served as a control group for the CAI study. A Post-test after the CAI treatment was conducted. The achievement data was compared between the groups and analyses were done to determine the significance of the gain. The Pre-CAI achievement score of the students in the CAI group ranged from 20.0 to 31.5 marks (Mean = 25.47). The Pre-Non-CAI achievement score for the Non-CAI group was between 17.5 and 27.5 (Mean = 22.45)

Most subjects in the CAI group who had completed the Pre-CAI Questionnaire on students' perception towards CAI mentioned that they had no computer knowledge (about 73.3 %). This indicates that the CAI facilitator has to spend more time to explain on how to operate the learning software used in this study.

3.2.1 Students' Prior Knowledge Achievement

The mean prior knowledge achievement score for the whole CAI group was 25.47 (SD = 3.31) (n = 30). The mean prior knowledge achievement scores for the CAI group were 24.43 (SD = 3.63) for boys (n = 15) and 26.50 (SD = 2.69) for girls (n = 15).

The mean prior knowledge achievement score for the whole Non-CAI group was 22.45 (SD = 3.10) (n = 30).The mean prior knowledge achievement scores for the Non-CAI group were 22.13 (SD = 3.71) and 22.77 (SD = 2.44) respectively for boys (n = 15) and girls (n = 15).

3.2.2 Gender

Table 3.1 and Table 3.2 show the frequency distribution of the sample subjects by gender. The sample of the CAI group consisted of 15 boys (50%) and 15 girls (50%). The Non-CAI group also consisted of 15 boys (50%) and 15 girls (50%). The gender proportion of the subjects from both groups was equal.

Table 3.1
CAI Group : Distribution of the Subjects According to Gender

Gender	n	Percentage
Boys	15	50 %
Girls	15	50 %
Total	30	100 %

Table 3.2
Non-CAI Group : Distribution of the Subjects According to Gender

Gender	n	Percentage
Boys	15	50 %
Girls	15	50 %
Total	30	100 %

3.3 The Teaching Sessions

A senior Geography teacher from this school was selected as the facilitator for the CAI sessions and the Non-CAI sessions. For the CAI sessions, the topic and sub-topics were to be covered in 6 teaching periods (each period = 35 minutes) or a combination of two 3-period sessions. The teacher was allowed to arrange with the school Principal for a suitable time to conduct the sessions.

The teacher was given a full briefing on how to conduct the CAI sessions by the researcher. She was also shown all the materials in the program. She was required to minimise teaching as the whole purpose of this study is to assess individualised learning. However, whenever a student faces difficulties in executing the program, she must help to solve the problems.

The same teacher was also required to teach the same topic to the students of the Non-CAI group. She could use any classroom methods such as lecturing, the use of overhead projector and etc. She taught both groups so that the achievement results could be compared.

3.4 Instrumentation

The main instruments used in this study were :

a) The teaching software (IMI)

b) The Achievement Test

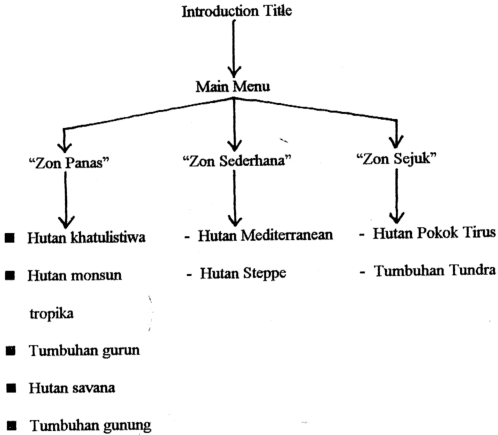c) Questionnaire on Students' perception

3.4.1 The Teaching Software

The teaching software for the CAI group was an IMI program designed with Macromedia Authorware Version 4.0 by the researcher. The chosen Geography topic was "Natural Forest of the World". It was created with the abilities to provide constructive feedbacks to students. It was also designed to be learner-controlled which allowed the learner to quit from where he was in the program at any time. He could go into the program again to the point he stopped the last time.

The main branching of the program is shown in Figure 3.3. Each forest ("hutan") was divided into 3 learning areas. The first one was on the locations of the forest. The second showed graphs on the type of climate there. The last area was on the characteristics of the forest. Notes, maps, pictures and background music were also included in the learning module. A question to motivate learning was asked in each area and students who failed to give the correct answer would have the program brought them back to the respective area they were in. This was to promote Mastery Learning.

Figure 3.3

The main Flow-chart of the IMI program

Introduction Title

Main Menu

"Zon Panas"   "Zon Sederhana"   "Zon Sejuk"

- ■ Hutan khatulistiwa
- ■ Hutan monsun
  tropika
- ■ Tumbuhan gurun
- ■ Hutan savana
- ■ Tumbuhan gunung

- Hutan Mediterranean
- Hutan Steppe

- Hutan Pokok Tirus
- Tumbuhan Tundra

       The main menu also had a choice for answering questions (Exercises). Students can test what they have learnt earlier. If they give a wrong answer, the program will bring them back to answer the question again. If the question is answered correctly, the program will allow the learner to proceed to other questions.

       The content of this teaching software was checked and verified by a content expert specialised in Geography. After checking, some difficult notes were rephrased. This was to fulfill the content validity of the instrument.

3.4.2 The Achievement Test

Two tests were constructed to assess the learning materials contained in the teaching software. The first test was the pre-experiment test or prior knowledge test. The second test was another similar test constructed to assess what the students had learnt from the software. It was known as the post-CAI test. Both tests were taken by subjects of both groups (CAI and Non-CAI group).

Both tests consist of 32 items. The first 14 items were "True or False" items to test comprehension of facts. The second type of questions was the objective questions (16 items). Some of the questions required critical thinking (higher order thinking). Lastly, 2 subjective items were constructed. The subjects had to elaborate their points (essay type).

The content validity of both test were verified by the same expert who verified the software content. The first test (Pre-experiment) was taken by all students of the three Form Four Geography classes. The Post test was taken by the subjects of the CAI group and the Non-CAI group. Both tests were attached to Appendix A and B respectively

3.4.3 The Questionnaire on Students' Perception of CAI

This was an 18-item Questionnaire to record students' perception towards CAI. This study was only focused on assessing positive attitude so no questions on negative perception were asked. The perception was assessed on a 3-point Likert Scale. The scales used were "Not sure", "Agree" and "Strongly Agree" and their respective score were 0, 1 and 2.

For example, the students were asked on whether they agree that CAI does improve their academic achievement. If they answered "Agree", they would get 1 mark. A sample of the questionnaire was attached to Appendix C.

The realiability of the Questionnaire was established with the test-retest method. The Pearson Correlation reliablity for this instrument was $r = 0.952$ ($p < 0.1$). To fulfill content validity, a teacher who was familiar with computer programming and CAI method was invited to verify the questionnaire items.

3.5 Calculation of Mean Score for Achievement

The total score for the test would be 40 with the first 30 items allocated 1 mark each. The two essay questions were allocated 5 marks each. The mean for the achievement score was calculated by averaging all the scores of the subjects. The mean achievement scores for both groups were calculated. The raw scores were also entered into the SPSS 7.5 Statistical Program to verify the calculated mean.

3.6   Assessment of Students' Perception of CAI

The highest score for the perception of CAI "Strongly Agree" would be 36, while the highest score for "Agree" would be 18. The higher the score, the higher the level of perception (perceived positively). Table 3.4 shows the level of positive perception :

Table 3.4
Level of Positive Perception Towards CAI

Perception Score	Fixed Level of Perception
27 - 36	High Positive Perception
18 - 26	Moderate Positive Perception
9 - 17	Low Positive Perception
1 - 8	Very Low Positive Perception
0	No Perception

3.7   Pilot Study

A group of ten Form Four Geography students were selected to test the questionnaire, the achievement tests and the software for the CAI treatment. When they ran the IMI program, a few spelling errors were detected and these were rectified. Some of the questions were not straight-forward enough and difficult to understand. These poor items were removed. The students did not report any inconvenience in the running of the learning software.

Both achievement tests were also being administered and two questions on diagrams were replaced because they were confusing. One difficult item was replaced. The items of the questionnaire were easy to understand. The only items removed were those which asked the same perception (repeated questions).

All the corrected versions of the instruments were verified again by the same experts who verified the earlier uncorrected versions. The purpose was to maintain high level of content validity for the instruments.

3.8   Data Collection

Data collection began when the pilot testing had been completed with all errors removed or replaced. The software was installed in sixteen sets of PC available at the school's computer laboratory. Before the CAI sessions began, the facilitator of both groups was asked to run the software to familiarise herself with the program and method.

The corrected test and the Questionnaires were printed and distributed to the facilitator. The time allowed to finish the test was one hour while the Questionnaire needed about twenty minutes to complete. All the raw data was entered into the SPSS 7.5 program for statistical analyses.