CHAPTER 5

EXPERIMENTS WITH ICALL PROGRAMS
AT TWO LEVELS

From all that has been said about reading efficiency and reading materials, we can venture to say that the primary aim of a good reading programme should be to develop unassisted reading of unfamiliar texts silently, with speed and understanding. The process of reading involves mechanical skills associated with silent and speedy reading, a behavioural aspect and mental skills associated with understanding, a cognitive aspect.

Viewed from this point, computers endowed with intelligence can be used for assisting in the development of mechanical skills and performing the mental activities of reading. It is towards this end that the preceding study in relatedness has tried to establish a relationship between those features of AI which can be applied to certain related features of English Language Teaching.

The possibilities of applying Artificial Intelligence to different levels of language learning based on the specific needs of skill based learning are immense. The scope of this research does not allow one to experiment with the methods of applying Artificial Intelligence to all levels of learning - the major ones being primary, secondary and tertiary (not to mention the other sublevels within the said levels and the further streaming of these levels according to learner competence). The study would then become too vast making it difficult for the researcher to arrive at definite conclusions.

At the same time, restricting the scope of the experiment to the application of just one aspect of Artificial Intelligence at one level of
learning may be desirable but not feasible considering the difficulty of access to learners in India. Teachers from the other level may not be convinced by marks from one level. i.e. college teachers may dismiss an experiment at school level and vice versa.

The subskills of reading required at the two levels are different; hence the experiment at two levels could offer greater insights and offer scope for trying out two different programs. To prove that Artificial Intelligence can be used for learning at more than one level, two levels were chosen as pilot study which in turn would evidently lead to the usefulness of applying Artificial Intelligence to other levels as well. The study dealt with two levels - secondary and tertiary so that this would be representative of one level at the school and one level at the college ie seventh standard and first year B.E/B.Tech respectively.

The primary level was not found suitable for the experiment as the experience of working with computers is a prerequisite for the experiment. The educational system in India is yet to provide primary school students hands on experience on computers even though many schools in urban areas have introduced computer science as a subject at the primary level.

Aspects of language learning like inference making, problem solving, honing the mechanical skills of reading etc. can be taught / learnt using Artificial Intelligence by implementing it in a graded fashion from primary level to college level.

Exploiting the study material prescribed in the syllabus for English teaching (i.e textbooks) and exploring the possibility of using Artificial Intelligence for developing certain reading skills was a subsidiary aim of the study.
The seventh standard students of the matriculation board of Tamilnadu, India have been prescribed Sherlock Holmes stories for rapid reading. It is evident that the development of problem solving skills using inferring skills is the purpose of such a syllabus. Hence the higher order reading skills of inference making was chosen as the skill to be taught using the ICALL program INVESTIGATOR at the secondary level so that the prescribed study material could be adapted into an ICALL program. Similarly, the mechanical skills of predicting and scanning were chosen as the language skills to be developed using the ICALL program PREDICTnSCAN for the I year B.E / B.Tech students because they were two of the skills to be honed as part of the skill-based approach in the syllabus prescribed. This was based on a needs-analysis conducted by the Key English Language Leaching (KELT) in 1990 at Anna University. As a result, the purposes of exploring the possibility of using certain aspects of Artificial Intelligence by exploiting the textbooks prescribed and adapting them suitably to develop ICALL programs could be achieved. This would also suggest the usefulness of alternate teaching methods.

It may be emphasised that the two aspects of language learning to be explored using Artificial Intelligence at the different levels at which the experiment were conducted are not mutually exclusive. Artificial Intelligence can be used to teach inference making to tertiary level learners also. It can also be used to teach the mechanical skills of reading to the secondary level learners in a graded fashion.

5.1 INFERENTIAL COMPREHENSION : AN INTRODUCTION

It may be pointed out that younger students are less proficient in locating and identifying information which is not stated explicitly. "While the older students read to handle inferred information in much the same way as adults do, younger students apparently fail to work out the full
implications of the material they read\textsuperscript{1}. It is thus of vital importance to nurture the skill to infer in the formative years of a child's education, because, the inability to infer can greatly impede understanding while reading in later years.

Research conducted by Paris and Upton in 1976 with students aged between five and eleven showed that processing of implied information is a developmental activity in students\textsuperscript{2}. Another similar study conducted by Paris and Lindauer with students aged seven, nine and eleven involved reading sentences in which an instrument's use was hinted at implicitly and not stated explicitly. When the students were later asked to recall the sentences, the younger students had trouble recalling implicit information\textsuperscript{3}. Both these studies proved that the teaching of inferring skills need to be an integral part of the language curriculum.

Grelliet defines inferring as "making use of syntactic, logical and cultural clues to discover the meaning of unknown elements"\textsuperscript{4}. Teaching students to make inferences must work at two levels - understanding relations within sentences and understanding relations between sentences and ideas.

\begin{enumerate}
\end{enumerate}
Understanding a text demands knowing what strategies are relevant to understanding of that type of text. "It is a concrete thing, but you have to assemble it: it comes with rudimentary directions, but you have to know how to perform basic tasks and must have certain tools at hand: most important, the directions, are virtually meaningless unless you know beforehand just what sort of object you are aiming at. In employing inference strategies, readers use their knowledge - their "knowing how" competence, rather than their "knowing that" theoretical knowledge of conventions. This precise "knowing how" is how the cause and effect are related is experimented with using INVESTIGATOR. Students used not only the information given in the text but their global understanding of the world. Applying "global" schema is an important and basic inference strategy in reading. Readers instantiate information by "situating" (Chabot, 1985) or contextualising that information in terms of certain prototypical characters' roles, genre types or narrative patterns constituted by conventions. Rabinowitz argues that these conventional strategies constitute the text so that readers reading mystery stories use mystery-story-reading strategies and all the time as they are reading they use problem finding and problem-solving heuristics which involves the following:

8. Ibid, p.163.
1. Recognizing that something in the text disturbs or bothers them, relying on their sense of "felt understanding" to infer the fact that they don't understand something.
2. Defining what it is that they don't understand - problem finding.
3. Formulating hypothesis or schema to help them understand what they don't understand.
4. Reviewing the text to find information relevant to understanding what they don't understand.
5. Testing out and revising their hypothesis against prior information in order to settle on a possible solution of explanation.

Once readers define problems in understanding, they formulate and test optional hypotheses to determine the most valid explanation. But all students may not be equally competent in understanding the problem or providing a valid explanation. ICALL can be used to provide insight into the understanding of a problem or working out the valid explanation through research procedures. Working out the explanations for different problems involving different situations has been attempted using the ICALL program INVESTIGATOR. The students merge their knowledge of social and literary conventions with their knowledge of speech-act conventions to make inferences. This kind of inferring also helps students judge characters and their actions in the text.

More importantly, honing problem solving or inferring skills using ICALL provides students with learning opportunities which they will never be provided with in the classroom setup.

In the classroom setup, the teaching of inferring skill involves two activities:
a. making learners read and
b. making learners do reading comprehension exercises

For both the above mentioned activities, the texts chosen for learners to read should be of interest to them and within their level of comprehension. The type of comprehension required will no doubt depend on the nature of the text and the purpose of reading. While learners are trained in factual and referential comprehension in the classroom, the teaching of inferential comprehension is most often neglected by language teachers. Learners face many real life situations involving problem solving activities that require reasoning abilities. Grooming learners to handle such activities through language teaching methods has its benefits, some of which are listed below.

a. learners learn to use their reasoning power
b. learners learn to differentiate between what is stated explicitly and what is implied
c. learners unconsciously involve themselves in an aspect of cognitive psychology - problem solving
d. learners learn to combine the activities stated above and apply it in the wider world of reality outside the classroom. This contributes to their personality development
e. thinking becomes a serious activity.

As an alternative to the regular classroom teaching of reading comprehension, the use of technology can be promoted in teaching the inferring skill to learners at both the secondary and tertiary level. Most of the research work in CALL has been devoted to reading. The use of computers for aiding language learning is a widely accepted norm today. What is relatively new is the use of Artificial Intelligence adding a new dimension to CALL.
One of the major characteristics of Artificial Intelligence is its innate ability to make inferences. Artificial Intelligence is the most suitable technological concept to develop the reading skill of inferring. Relationship between facts and inference can easily be represented using the Artificial Intelligence language Prolog.

In an attempt to use AI for reading teaching, an experiment was carried out on secondary level learners for which an ICALL program prepared for the sake of the study was used.

5.2 INFERRING USING THE ICALL PROGRAM INVESTIGATOR AT THE SECONDARY LEVEL

The aim of the experiment was to develop independent inferential reading of authentic texts by employing ICALL programs through rule-based knowledge representation. Because the ultimate aim of any reading pursuit should be a step towards acquiring independence in reading, independent control is of paramount importance for reading skill improvement.

A well represented knowledge in an Artificial Intelligence program can promote thinking. The objective works at two levels.

a. specific level - to develop inferential reading comprehension
b. global level - to promote intelligent thinking.

With this objective in view an ICALL program INVESTIGATOR was developed by Mr. C. Rajagopal, a scientist working at the Indira Gandhi Centre for Atomic Research, Kalpakkam, Tamil Nadu - 603 102, India. (The program INVESTIGATOR is given in Appendix 2). It took many hours of discussion for this researcher to explain the concepts involved and the manner in which the program was to be devised. The program has been written in Turbo Prolog Version 2.0.
5.2.1 The text

An abridged version of the story *The Blue Carbuncle* by Arthur Conan Doyle which is prescribed for supplementary reading by the Matriculation Board at the secondary level for seventh standard students was the text used for the study, though, only an extract from the text was chosen to be developed into an ICALL program. (See Appendix 1 for the extract from the story *The Blue Carbuncle*).

The text chosen for the study is a typical Sherlock Holmes story, in which Holmes uses deductive reasoning to solve a problem in his investigation. As the objective of the study was to apply Artificial Intelligence as an educational technology to the ELT theories of reading comprehension, a Sherlock Holmes story was chosen to exploit Artificial Intelligence's inherent traits of inference making and problem solving.

5.2.2 Knowledge Representation and Teaching Learners Thinking

The idea of using knowledge in the form of rules was an obvious choice as Holmes' deductions from clues can easily be represented as rules. Knowledge represented with ingenuity in Artificial Intelligence related computer programs can promote rational and logical thinking. "The goal of Artificial Intelligence research on problem solving is therefore, to describe how solutions are found. The more explicitly a problem can be formulated, the easier the goal is to achieve".

In the ICALL program INVESTIGATOR the clues available to Holmes and the deductions Holmes makes from them were created in the

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10. Ibid. p.97.
form of a rule based knowledge representation. This knowledge representation works on a four way interdisciplinary model

1. Knowledge is represented in the form of rules. This is an AI technique.
2. It involves problem solving. This is an aspect of cognitive psychology.
3. The idea is to develop a reading skill. This is a language learning activity.
4. All the above mentioned aspects are a combined symbiotic exercise in promoting rational and intelligent thinking. This contributes to a higher plane of personality development.

![Interdisciplinary Model](attachment:image.png)

Fig. 5.1
Interdisciplinary Model

The shaded area indicates the learning of language using ICALL.
5.2.3 The Architecture of the Knowledge Based System in INVESTIGATOR

The set of facts about the hat constitute the knowledge base. For example, Holmes could see for himself that the hat was big. But to provide more options to the learner two sets of clues were made available to the learners for each fact. The knowledge base accommodates two answers for the query regarding the size of the hat. For example, the hat could be big or small. Seventeen such clues form the knowledge base with two possible entries for every clue. The seventeen points that comprise the Knowledge Base are:

<table>
<thead>
<tr>
<th>Queries</th>
<th>The two possible answers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The size of your hat</td>
<td>... big, small</td>
</tr>
<tr>
<td>2. The state of the hat brims</td>
<td>... curled, straight</td>
</tr>
<tr>
<td>3. The state of your hat</td>
<td>... new, old</td>
</tr>
<tr>
<td>4. The colour of the silk band</td>
<td>... coloured, discoloured</td>
</tr>
<tr>
<td>5. The state of your hat’s elastic</td>
<td>... new, broken</td>
</tr>
<tr>
<td>6. The elastic has been replaced</td>
<td>... yes, no</td>
</tr>
<tr>
<td>7. Clean cut hair is present in your hat</td>
<td>... yes, no</td>
</tr>
<tr>
<td>8. Grizzled hair is present in your hat</td>
<td>... yes, no</td>
</tr>
<tr>
<td>9. Dust is present in your hat</td>
<td>... yes, no</td>
</tr>
<tr>
<td>10. Moisture is present in your hat</td>
<td>... yes, no</td>
</tr>
<tr>
<td>11. Tallow stains are present in your hat</td>
<td>... yes, no</td>
</tr>
<tr>
<td>12. The hair has adhesive</td>
<td>... yes, no</td>
</tr>
<tr>
<td>13. The hair has odour</td>
<td>... yes, no</td>
</tr>
<tr>
<td>14. The type of odour present</td>
<td>... limecream, unknown</td>
</tr>
<tr>
<td>15. The type of dust present</td>
<td>... fluffy-brown, gritty</td>
</tr>
<tr>
<td>16. The stains are covered with ink</td>
<td>... yes, no</td>
</tr>
<tr>
<td>17. Your hat has been brushed</td>
<td>... yes, no</td>
</tr>
</tbody>
</table>
This Knowledge Base is designed as a querying database. The database is created by the learner. Heuristics determines the inferences that can be made from this database of clues supplied by the learner. The set of rules governed by heuristics linking the clues with the inferences comprises the Inference Engine. The architecture of the knowledge based system of INVESTIGATOR is given in Fig. 5.2.

Fig. 5.2
Architecture of INVESTIGATOR

5.2.3.1 Holmes' facts, inferences and explanations

The list of facts available to Holmes, the inferences he made from them and the explanations he gave for them are given below in the form of a table.
Table 5.1

Holmes' Inferences

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Clue</th>
<th>Inference</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>The hat is big</td>
<td>The man is an intellectual</td>
<td>As the hat is big, the cubic capacity of the man's head is very big. A man with a big brain must have something in it.</td>
</tr>
<tr>
<td>2.</td>
<td>The hat has a band of ribbed silk and excellent lining.</td>
<td>The man is well-to-do</td>
<td>As the man could afford such an expensive hat he is well-to-do.</td>
</tr>
<tr>
<td>3.</td>
<td>The hat is worn out now. The lining is disclosed</td>
<td>The man has gone down in the world.</td>
<td>The man has had no hat since he bought it three years ago. Therefore, he has gone down in the world.</td>
</tr>
<tr>
<td>4.</td>
<td>The hat has an elastic</td>
<td>The man is foresighted.</td>
<td>The elastic is never sold upon the hat. The man has fixed it himself as a caution against the wind.</td>
</tr>
<tr>
<td>5.</td>
<td>The elastic is broken at one end and not been replaced</td>
<td>The man has less foresight now.</td>
<td>The broken elastic has not been replaced. A distinct proof of weakening nature.</td>
</tr>
<tr>
<td>6.</td>
<td>The stains on the hat have been covered by daubing with ink</td>
<td>The man has self-respect.</td>
<td>The man has taken care to cover the stains in the hat indicating his self respecting nature.</td>
</tr>
<tr>
<td>7.</td>
<td>The lining of the hat has a large number of hair ends</td>
<td>The man has had a haircut recently.</td>
<td>The man had a haircut recently as the inside of the hat has many hair ends.</td>
</tr>
<tr>
<td>8.</td>
<td>There appears to be adhesive. There is an odour of limecream</td>
<td>The man uses limecream.</td>
<td>The man uses limecream as the hat smells of limecream.</td>
</tr>
<tr>
<td>9.</td>
<td>The dust is fluffy-brown dust of the house</td>
<td>The man leads a sedentary life.</td>
<td>As the dust in the hat is the dust of the house, it means that the man mostly hangs his hat indoors. That is he mostly stays at home.</td>
</tr>
<tr>
<td>10.</td>
<td>There are marks of moisture inside the hat</td>
<td>The man is not well-trained.</td>
<td>The marks of moisture indicate that the man perspired freely. This shows that he is not well-trained.</td>
</tr>
<tr>
<td>11.</td>
<td>The hat has more than five candle stains</td>
<td>There is probably no gas in his house.</td>
<td>If the man has been in frequent contact with burning candle then in all probability there is no gas laid in his house.</td>
</tr>
</tbody>
</table>
Thus, the knowledge is framed in the form of rules that help in making inferences and explaining them. The knowledge in the program however works at three levels.

1. facts or clues  
2. inferences  
3. explanations

Rule-based systems are normally used when the domains are large and ill structured and where the problems cannot be defined clearly.

Though the rules in the story are quite simple, a small beginning in representing knowledge through rules for reading comprehension has been made. The heuristic presentation can prune the search space for a solution considerably... "as a consequence of the limited and indirect interacting between rules, rule-based architectures are well suited to solving loosely coupled problems that are decomposable into relatively independent subproblems or behaviour"11.

There are advantages in a Rule Based Representation for language teaching since representing knowledge as rules enables the learners to think.

1. The underlying principle is very simple. Any aspect of language that is to be taught can easily be represented in the inference engine and the knowledge base in the form of rules.

2. Any system meant for teaching or learning should be modifiable. Only this gives more scope and freedom for

learning. In representations where knowledge can be easily stored as separate entities as in the case of INVESTIGATOR as facts, inferences and explanations, the possibilities of altering and improving the representation for different levels of learning are immense.

3. Inclusion of explanation facility which is desirable in any system tailored for learning is easier in a rule based system than other types of knowledge representations viz. frame based or object based systems.

4. The reasoning behind every deduction made as in the explanations unit of INVESTIGATOR is actually done by a technique unique to Artificial Intelligence - trace mechanism. This tracing for explanation can be done easily if the representation is rule-based.

5.2.4 How Investigator enables the learner to think

In the process of learning from INVESTIGATOR, the learner keys in the clues. While doing so, the learner creates a database of different permutations, which means, the learner makes a conscious effort to consider all the possibilities before arriving at a conclusion. It kindles them to think, and thus learning becomes cognitive. The learner indulges in a series of reasoning processes in his mind while he carries out the instructions, in the computer program, searches and stores the information in his mind, checks the inference made by the program with his own quick power of reasoning. As it becomes a mind versus machine context, the task becomes challenging. The students in turn are highly motivated to work with more programs of the same type before they take to independent reading of problem solving and inference making texts.
5.2.5 Learners' Profile

The target learners belonged to the secondary level i.e. seventh standard of two English medium schools. The schools chosen were Vidya Mandir, Adyar, Madras - 20 and The Hindu School, Indira Nagar, Madras - 20. There were students from both the sexes and their ages varied between twelve and thirteen years. The number of students were 60 in each group. A year's experience of handling computers was desirable for the learners of the experimental group to be able to work with the ICALL program. The introduction of computers as a subject in the sixth standard gave the learners of the experimental group a certain amount of confidence when working with the computer. The learners did not have any psychological setback of being in the hunt and peck stage while using the keyboard. The program's limited natural language interface did not make any demands of programming knowledge on the learners of the experimental group.

The experimental group learners were kept informed of the aim and objectives of the experiment. They were aware that they were being subjected to learning from ICALL and that findings about their learning behavior would be contributing to the research findings. All the same, they did not appear to suffer from any anxiety of being observed. The control group learners were not informed about the nature of the experiment to avoid putting the students to unnecessary anxiety.

Research Tools

The main tools of the research were the text book for both the groups and the computer for the experimental group. The instruments of observation to observe the difference in learning behavior were the researcher's observations, questionnaires, and students' self-reports.
5.2.6 Teaching Methodology

To prove the effectiveness of INVESTIGATOR the reading comprehension exercise was administered to two groups of VII standard students with similar backgrounds

- the control group
- the experimental group

The control group consisted of the target learners who learnt the reading comprehension skills of inference and problem solving through communicative interaction with the teacher in a classroom. The experimental group of learners were also taught through the same method of communicative teaching but with a different technique. While the former teaching method used classroom discourse as a technique, the latter used computer discourse or learning from interaction with an ICALL program. The experimental group of learners used the computer program to learn the same reading comprehension skill. The objective was to find if there is any advantage in using an AI based program by comparing the results obtained at the end of the study from both the groups.

Such a comparison of two learning behaviours using the same method ie communicative teaching but with different techniques may seem to be a notorious proposition but ELT research cannot progress without such comparisons. What we should do, is to make an earnest effort to control as many variables as possible so that the results may not be biased or ad hoc. Comparison, continues to be an inevitable contributory factor to progress. Further it must be pointed out here, that this study has not undertaken a comparison of methods but rather of techniques.
5.2.6.1 Pre-Reading

The students of the control group and experimental group were given a general introduction to the characteristics of a detective story in a forty minute period. This introductory class was held separately for the control group and the experimental group.

The method adopted for the introduction to the subtler nuances of mystery/detective stories was informal and communicative. The teacher's role was more of a co-ordinator and monitor. A simulated constructed version of the conversation that had taken place between the teacher and the students is given below.

Teacher : Do you like stories?
Students : Yes
Teacher : Do your read stories?
Students : Yes
Teacher : What stories do you like?
Students : Mystery stories, Adventure stories, detective stories

It was amazing to know that the students were unanimous in their choice of stories. They considered mystery stories, adventure stories and detective stories rather synonymous. This observation is common to both the control group and the experimental group. This also proves that it is a subject of interest to the learners of that age group.

Teacher : What detective stories have you read?
Students : Holmes, Agatha Christie.
(If this conversation looks artificial it is not true. Because once again to the amusement of this researcher a majority of the students associated detective stories with Holmes).

Once the initiation into detective stories and Holmes was achieved, the rest became easy. The characteristics of a detective story were elicited from the students through an interactive conversation. All the words elicited from the students were written on the blackboard. A diagrammatic representation of the blackboard at the end of the class is given below.

![Diagram](image)

**Fig. 5.3**

A Diagrammatic representation of the blackboard
It is to be noted that T.V. serials of detective stories' on the board indicates that students spent more time watching T.V. serials of Holmes and Poirot and the Indian serial 'Tehkikat' on the television than actually picking up a book and reading it. It is surprising to note that though detective stories were admittedly of interest to them, the seduction from the skies (Star T.V., Sun T.V., Doordarshan etc) had clearly won over the will to read an interesting book. Thus, the challenge of motivating students to develop their reading comprehension skills in particular and the reading habit in general gains greater significance. The word 'inference' was not in their active vocabulary. It was introduced during the course of the discussion. The students were encouraged to gloss the meaning. The students were then told that they were going to learn to read a Sherlock Holmes story "The Blue Carbuncle". There were two students in the experimental group who claimed to have had read the story already but could not recall it clearly. The basic idea was to not do the story in detail in class. The students were expected to read the story at home and come to class.

The bitter truth was that 20% of the students did not read the story. They gave some excuse or the other for not having read it. One of the very genuine excuses being want of time as they had homework to do. It was also observed that English came low down in their list of priorities after Science, Maths, Computers etc. It may also be noted that students spend more time writing homework than reading texts in the Indian curriculum. At the end of the class, the teacher summed up all the ideas collected from the learners laying stress on the importance of logical reasoning to make inferences.

Though the pre-reading session was common to both the control group and experimental group learners, the mode of learning the reading comprehension skill of inferring varied for them.
The conversation given below is from the introductory class on detective stories for students of the experimental group. The teacher came with a lesson plan in her mind. The conversations took a predictable run inspite of the questions being open-ended.

**T:** What are detective stories? Why are they called detective stories?

**S:** There is a detective in the story

(choral) Some crime takes place. He finds out about the crime

the detective deducts something

**T:** Don't shout. One at a time. Yes, Arvind what is a detective story?

**S:** In a detective story there is a detective

**T:** Yes, that's right. Good. That is only one of the characteristics of a detective story. what does he do?

**S:** He detects about the crime

**T:** Okay sit down. But is the crime always a murder?

**S:** No, but mostly it is murder

(choral) sometimes something is stolen

**T:** How does the detective find out?

**S:** Clues, He gets clues

**T:** Yes, that is right. The detective solves the murder or theft using clues. That means usually in a detective story there is a problem. The problem may be murder, theft or anything. Then the detective solves the problem using clues. Can you think of another name for a detective?

**S:** Holmes

**S:** Poirot

**T:** No, Holmes is the name of a detective in Arthur Conan Doyle's stories (writes on the board). Investigation. A detective can also be called an investigator because he
investigates. Investigates means to find out about something. Did you understand? (17)

Now, can you name some detectives or investigators in famous stories? (18)

S : Sherlock Holmes, Poirot, Tehkikat (19)
(choral)

Questioning behaviour in classroom interaction has a direct influence on learning. Long's study clearly states that questions facilitate interaction.12 What is even more important is the question types that facilitate interaction. In the above case, though the teacher had planned the task for the lesson, the open-ended nature of the questions eg (1), (12) and (18) gave the students the opportunity to come out with their own ideas. For example, any acceptable answer for "what is a detective story" was welcome. The questions were mostly 'display' questions (ie. asking learner information he already knows thereby displaying his prior knowledge).13 The display questions led them on towards the specific knowledge about detective stories like what a detective does, in a detective story, a synonym for detective' and names of detective characters in stories they have read.

Although doing an indepth discourse analysis of classroom interaction is not the aim of this study, discourse analysis of this


conversation would be useful to compare the difference in interaction between the communicative method used in the classroom and using the computer. Discourse analysis has emerged as a field of linguistic enquiry. The conversations transcribed are not of a high quality but are sufficient data to facilitate a comparative study. The exchange structure as in most classroom interactions is a typical I-R-F structure, that is, initiation-response-feedback where the teacher initiates a conversation by putting a question, elicits a response and then provides feedback. The teacher mostly confirms in her feedback as in (7), (9), (14) and consolidates. The teacher then explains at length and therefore speaks more than the students. The dominant personality of this teacher and most other teachers influences teacher-student talk by inhibiting students from coming out with their ideas openly. The choral response from the students entails the teacher to single out one student to speak in an attempt to monitor the situation. The teachers' intention was probably to make one student's view representative of the others in the class. As a result, the others do not get a chance to participate. Teacher praise is minimal, consolidation and confirmation is more in order. The teacher's recurrent use of the expression, "yes, that's right" is a mannerism and is a very common habit that many teachers use in class. The teacher exhibited differential behaviour by letting a bright student talk.

5.2.6.2 Learning Experiences of the Control Group

The control group students were taught the story through communicative language teaching. As the students were asked to read the story before coming to class, the teacher tried to gauge their understanding by eliciting response from them to her questions.

After the exercise in motivational activity, the teacher led the conversation to the story 'The Blue Carbuncle' which the students had been asked to read before coming to class. The verbal interaction between the
teacher and the students at this stage in the class of the control group students was as follows.

T : Have you all read the story "The Blue Carbuncle"? (1)
S : Yes, Yes. No. (2)
(choral)
T : (addressing those who had not read) Why have you not read? (3)
S : We didn't have time, miss
We had lot of homework
Forgot, miss. (4) (5) (6)

T : Those who have not read the story, try to understand the story as we discuss it now. If you have any doubts you may ask me. (7)

[Coming to the part about the hat]

T : When Watson comes in, Holmes is examining something. What is it? (8)
S : A hat. (9)

T : Yes, there is a hat in Holmes' hand. What does Holmes ask Watson to do then? (10) (11)
S : He asks him to look at the hat and describe about (sic) the person who owns the hat. (12)

T : Yes, that's right. Do you think it is possible to tell about a man from his hat? (13)
S : Yes (14)
(choral)
T : How ?
S : From clues

It can give us clues about the person.
We can look at the hat size and say, miss

T : Was Watson able to do so ? Was Watson able to describe the person ? What did Watson say to Holmes ?
S : ................. ??

T : Did Watson say that it is possible to tell about a man from his hat ?
S : No. Watson said that is not possible.

T : Really ; did he say so ? Why did you think he said so ?
S : Because Watson is not intelligent like Holmes.
You have to use detective skills.

The questions put forth by the teacher this time were very specific soliciting specific responses. The teacher once again had to ask display questions to check the comprehension of what the students had been asked to read at home. The teacher also had to resort to what Chaudron calls the Socratic method of questioning whereby the "questions guide the learner toward particular bits of knowledge." The other types of questions in this interaction were comprehension checks ie (8), (11), (18), (20) which were direct comprehension checks which checked the students' understanding of specific information in the text. (13) and (15) were indirect comprehension

checks that were meant not only to evaluate the understanding of the specific aspect of being able to make inferences about a man from his hat but also about the more general background world knowledge that the students bring to a text while trying to comprehend it.

When some of the learners admitted that they had not read the story, the teacher did not reprimand them but she understood perfectly the burden of donkey load of homework that students are asked to do in India. Therefore, the challenge of motivating the students to read outside school is great.

The other question patterns were clarifications (1), (3), (22) and confirmations (10), (13). The importance of categorizing the questions lies in indicating the direction of information-flow in preceding utterances. The questions or utterances by the teacher also served to provide valuable feedback.

The response from students was generally good. It must be noticed that the teacher had ignored the students who had not read and therefore they were unable to participate in the classroom interaction. The teacher did not check to see during the course of the interaction whether they were able to comprehend the passage through passive intake of information. As most of the students came from a good academic background, they were not afraid to speak and were comfortable with this teacher. They were also competent speakers in English. Students who had read and understood the story better spoke most. Response was always forthcoming to all the questions except to (18) where students exhibited slight confusion by their silence. This is possibly because the teacher attacked the students with a barrage of questions without exactly giving them a chance to speak or waiting for their response to individual questions. The teacher immediately employed question modification by pausing and then providing a clue that led the students onto the predicted answer. The pattern of questions took a turn in
(22). Until then the question received a yes/no or other information-specific answer. The tone of clarification of the question "really, did he say so ?" made the students think and come up with a comment exhibiting their ability for deductive reasoning.

The teacher's use of confirmation for example, 'yes' as feedback (15) acted as a propositional support. The teacher did not get much of an opportunity for error correction as the response from students seemed to flow freely. The teacher provided an opportunity for another attempt by rephrasing the question in (20).

The interaction in class went the predictable way involving a questioning answering exchange till all the clues about the hat and the inference that can be made from it were made comprehensible to the satisfaction of the teacher. A chunk of the classroom teaching through communicative interaction concerning the understanding of the expression 'self-respect', the clue from the hat that led to inferring that the owner of the hat has self-respect is given below. This is to facilitate a comparative study of classroom discourse and computer discourse a little later in the thesis.

T : Yes, Holmes also says something about self-respect. What is self-respect? (1)

S : ...............! ? (2)

T : Self-respect. What is self respect ? You can guess from the word itself. Self-respect. (Gesturing towards self and then mouthing ' respect'). (3)

S : Respecting us, miss, respecting ourselves (4)
T : Yes, that's right. Good. Self respect means respecting oneself. Does that mean we are proud? (5)

S : No, it means we don't like if someone insults us.
Yes, it means that we are proud. (6)

T : Yes, what Gayathri says is right. It means we don't like it if somebody insults us. It does not mean that we are proud.

Do you understand? In the story what is the meaning of self-respect?

S : ..................? ! (8)

T : Eh...Okay. Did the hat have any marks. Stains? (9)

S : Yes, miss. (10)

(Choral)

T : But the marks were... eh... how were the stains? Could he see any marks? (11)

S : He tries to cover the stains, miss. (12)

T : With what? How does the man cover the marks? (13)

S : With ink. (14)

T : It means the man has self respect because he cares for his appearance. He wants his hat to look good. He doesn't want the marks in the hat to show. (15)

In the conversation given above too, exchange structure was a typical three part I-R-F exchange. The interaction involved the teacher asking a question, the student giving an answer, sometimes closing the three part exchange with an evaluation and subsequently initiating the next exchange and explaining wherever necessary. Negotiation of meaning of 'self respect' was the key of this interaction. Before any glossing of meaning from the context was attempted, the teacher asked a referential question (a
question asking the learner for information he does not know) thereby
testing the students’ prior knowledge regarding their understanding of the
word "self respect". But their repertoire of knowledge increased as new
meaning was negotiated and added to their prior knowledge. The teacher’s
explicit expectation was indicated in her repetitive utterance. The teacher
corrected without rejection (7), gave directions by gesturing (3). A few false
starts by the teacher typical of any discourse was seen (9), (11).

5.2.6.3 Learning experiences of the experimental group

The experimental group were also asked to read the story at home
so that the act of reading was not eliminated completely and also because
reading from the book is easier on the eye than reading from the computer
screen. During the last five minutes of the introductory class, the students
of the experimental group were told that they were to work with a computer
program that was going to understand how Holmes makes inferences from
the clues.

The students like their English teachers couldn't conceal their
surprise when told that computers could be used for teaching English. They
were given sufficient counselling to work with INVESTIGATOR on their
own once they entered the computer lab. (It may be remembered that only
part of the story was developed into the computer program). INVESTIGATOR worked in three phases.

1. creation of a database
2. inferences made by the machine
3. understanding of the inferences using INVESTIGATOR’s
   explanation facility

**Facts** are bits of information about the hat that are true
INVESTIGATOR asked the learners to key in facts about their hat instead
of facts about the hat in the story to make learning more interactive. Immediately a query-response interaction was initiated. For every query the two probable answers were given against it within brackets in the "Enter your choice" window. The learner had to enter one of the two words. This was stored as an answer in the "Your answers" window. It was not necessary for the students to key in the answer to all the questions. The student could also key in the data in any order. How the screen looked at this stage is given in figure 5.4.

Please give me facts about your hat
1. The size of your hat
2. The state of the hat-brims
3. The state of your hat
4. The color of the silk band
5. The state of your hat's elastic
7. Clean cut hair is present in your hat
9. Dust is present in your hat
10. Moisture is present in your hat
11. Tallow stains are present in your hat
12. The hair has adhesive
16. The stains are covered with ink
17. Your hat is brushed

Your Answers

Enter Your Choice there
Your Choice is (0: INFER; -1: TRACE; -2: QUIT)

Fig. 5.4
A view of the screen at the beginning of the program

The learner had to give the number of the fact against "your choice is:" to feed the answer for that fact.

Inference is the process of obtaining logical judgement from a given premise or observed data. Once the learner had keyed in the facts, he or she had to type 0' against "your choice is:" to let INVESTIGATOR make inferences from the facts keyed in.
Trace is the ability to trace the inference backwards to the clue by way of explanation. After the learner had read the inference made by INVESTIGATOR based on the clues he had keyed in, the learner came back to the Enter your choice' window (by pressing enter) and typed -1' to trace the inferences.

This was the most important part of the program. The trace' mechanism of Artificial Intelligence traced the inferences back to the facts and explained the reasoning process to arrive at the inference. This was the part that directly enhanced comprehension. The interconnection between facts, inference and trace is shown in the diagram below.

![Diagram](image)

**Fig. 5.5**
**Facts, Inference, Trace: Interconnection**

It would be easier to understand the trace mechanism of INVESTIGATOR with an example. Let us assume that the facts keyed in by the learner were as follows.

1. The size of your hat : big
2. The state of the hat-brims : curled
7. clean cut hair is present in your hat : yes
8. Grizzled hair is present in your hat : yes
16. The stains are covered with ink : yes
17. Your hat is brushed : no

The inference screen for these clues keyed in by the learner would appear as in Fig.5.6.
My Inferences

I infer that you own a hat
I infer that your intellect is high
I infer that you had a hair cut recently
I infer that you have grizzled hair
I infer that you have self respect
I infer that your wife is far from loving
No (more) inference(s) can be made for this (these fact(s).
Press any key to continue

Fig. 5.6

A view of the screen showing the inferences

The trace screen would appear as follows

The trace of my Inferences

I infer that your intellect is high <Because>
You told me that your hat is big < and>

I infer that you had a haircut recently <Because>
You told me that clear cut hair is presented in your hat <and>

In infer that you have grizzled hair <Because>
You agreed that grizzled hair is present in your hat <and>

I infer that you have self-respect <Because>
You agreed that the stains are covered with ink <and>

I infer that your wife is far from loving <Because>
You told me that your hat is not brushed

Fig. 5.7

A view of the screen tracing the inferences to the clues
By giving the learner the option of keying in any set of clues in any order and in various permutations, the learner gets the feeling that he is in control of the learning process. This increases his willingness to learn manifold. The learner is able to work out for himself the inferences that can be made for different sets of clues. The learning experience of each learner is different as each of them creates his own database. Discussing the inferences made based on the clues provided by them among their friends outside their classroom can help share and multiply their thinking. Representing knowledge through a database and query gets the learners thinking.

"Much of learning a subject is collecting such knowledge. Whether this is an interesting puzzle or a frustrating ordeal depends partly on recognizing the equal importance of the What and How much question... understanding a domain's facts and procedures is not the same as rote memorization."\(^{15}\)

Working with options certainly gave the experimental group learners an edge over the control group learners. The idea of providing learners with clues so that he/she may learn to use them to arrive at new information is confirmed by Moyle.

"From the beginning of reading, the child should be provided with material which are meaningful so that he

may acquire the habit of using all the clues available to extract and consider the content expressed".16

There is a remarkable difference between the learning styles of students of yesteryears and the students of today, in the sense that students today, adapt easily to new learning environments. They have the advantage of not having to unlearn to suit new academic styles. This was found to be true in the case of the students of the experimental group adapting to the CALL type of learning.

"Today's students have a different learning style: They are mosaic learners, able to channel-surf among a dizzying array of bright images and facts. They are untroubled by the fact that each one of them pieces the mosaic together in a fundamentally individual fashion, undoing the common vocabulary of our culture. For such students, the info-mart approach to learning may be a perfect fit, and the marketing of much of today's 'educational' software reflects this"17.

We can exploit the learners' strategies, their knowledge of computers, their curiosity and their interest in working with computers to sustain their interest in reading mystery stories.

5.2.7 Intelligent features of Investigator

i. INVESTIGATOR can be considered to be an Intelligent Tutoring System as it can be used as an intelligent drill routine with many options and no fixed responses.

ii. It is not necessary that the students be familiar with the programming language Prolog in which INVESTIGATOR has been written as the program has a natural language user interface in a limited sense of the term. The learners are required to key in English words. The inferences and explanations are given in English sentences that are easy to understand.

iii. As the student has to key in one of the two words given within brackets as 'facts' the probability of error is minimised.

iv. Unlike Holmes who had only one set of facts to work with, the students can work with all the facts in various permutations. This definitely improves their understanding of Holmes' reasoning power which is the objective of this study.

v. INVESTIGATOR banks on the Artificial Intelligence features of deductions and trace which are built into an AI system. The ability of the program to move backwards while tracing the inferences enhances learning. This concept can be used for teaching other aspects other than deductions as well.

vi. In contrast to a conventional CALL program where the behaviour of the learner is fixed, INVESTIGATOR in the true tradition of 'intelligent' behaviour gives enough freedom to the learner.
vii. A dictionary can be merged with INVESTIGATOR with an interface in natural language to facilitate the learner's reference of meaning for difficult words.

5.2.8 A Comparative study of classroom/computer room discourse

After giving an account of the learning from interaction in the classroom and interactive learning using the ICALL program INVESTIGATOR, a comparative study of the two types of learning are in order. The comparison is made by the researcher's observations of both the learning processes. The following factors can be singled out as the basic tenets for comparison of the two techniques of learning through interaction.

1. Teacher/computer input

While comparing the amount of teacher and computer input while learning the inferences made by Holmes, it was obvious that the teacher talked more and hence provided more input. The teacher was therefore a more dominant participant in the interaction which was not a positive sign for learner understanding. The computer input on the other hand was almost equivalent to the learner input as every initiation from the computer waited for a response from the learner which was learner input. Teacher input was sometimes in long and complex sentences. Computer input was not even in the form of full sentences. The ideas were expressed simply in computer input and solicited an "otherwise-or" response from the learner.

The mode of input in both the cases was the same. Initiating the exchange was done by putting questions to the learners. The other form of input was the providing of feedback. (Feedback has been dealt with separately later). While superficially the initiating structure of the teacher and the computer appeared to be similar, the questions put forth by the
teacher as input dealt with only the clues that Holmes got from the hat. The computer input dealt with both the 'yes' and 'no' possibilities each clue that Holmes provided. Computer input was therefore doubled compared to teacher input thereby making comprehension more profound and complete in learning from INVESTIGATOR. Computer input worked apriori also provided the learner with the opportunity of trying out various combinations of clues to make and understand inferences. Greater input thus provides greater learning opportunities. Attitudinal differences in input were also observable. Teacher talk exhibited implicit or explicit expectations while this was absent in computer input.

It can be agreed that the teacher can also provide two possibilities for every clue and therefore widen the repertoire of learner knowledge and skill for inference making. But time is a pressing issue in the classroom situation. The teacher does not have the time to go outside the boundary of the text and enhance comprehension. Motivation to do so may also be lacking in the teacher.

A point about comprehensible input is to study how much of it is available to be used by the learner ie how much of it can actually become intake. While SL learners are exposed to a lot of information, they can intake only a portion of it\textsuperscript{18}. Whether ICALL can serve a useful purpose in increasing the intake is to be studied.

The quantity and quality of comprehensible input are also important factors to be considered.

\begin{flushleft}
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Teacher/computer interaction

Summing up the views of Allwright (1984) and Breen (1985), Chaudron states that interaction is significant because

1. Only through interaction can the learner decompose the target language structures and derive meaning from classroom events

2. Interaction gives learners the opportunities to incorporate target language structures into their own speech and

3. The meaningfulness for learners of classroom events of any kind, whether thought of as interactive or not will depend on the extent to which communication has been jointly constructed between the teacher and learners19.

But there are distinctive difference between learner interaction with the teacher and learner interaction with the computer. The interactive features of classroom behaviour include questioning and answering, turn taking, negotiation of meaning and feedback. Among these, questioning and answering, turn taking and feedback are common to learning from ICALL too. Negotiation of meaning is more easily achieved in classroom interaction due to human involvement and human understanding. Duplicating this using the computer is difficult.

Any typical classroom interaction involves an initiation-response-feedback structure as suggested by Sinclair & Coulthard. Many variations have been suggested to this three part structure but the model proposed by Sinclair and Coulthard remains the edifice over which other variations of

structures have been built. On the surface level, teacher and computer interaction seem to have the same I-R-F structure but how they actually contribute to the interaction is vastly different in each case. Initiation has been dealt with as teacher/computer input above.

Teacher talk is an integral part of teacher communication in the classroom. The personality of the teacher has a telling effect on learner understanding. A teacher who dominates the act of discourse by talking too much or explaining at length without giving the students a chance to speak greatly inhibits learner participation. It is thus no more an interaction but a passive absorption of the teacher’s information or precise adherence to the performance of classroom activities. Learning to read thus becomes a listening chore. Studies by Bellack et al (1966) and Dunkin and Biddle, (1974) demonstrate that teachers dominate classroom speech. This is substantiated by Legaretta’s study in 1977 which showed that students contribute 11% to 30% of total talk inclusive of choral and individual speech while teacher’s contribution is 89% to 70%. Teacher’s explanations were also the most dominant functions of utterances in elementary bilingual education programmes. In the conversations that have been given as part of the study too, the teacher dominates the interaction. Also, it must


M.J. Dunkin and Bruce J. Biddle. The study of teaching (New York :Holts Rinehart and Wiston, 1974).


be observed that a language class for reading comprehension gets converted to a listening and speaking class. Learning from an ICALL program for reading concentrates more on reading per se and does not digress from its objective. All through the class, the learner looks at the computer and reads. He speaks and listens only when he talks to his neighbour or seeks clarification from the teacher who acts as a monitor in the computer room. Even when the students work in pairs, they negotiate and discuss between themselves by speaking and listening but concentrate on the task of reading at hand. Thus there is the simultaneous interaction with the computer and between peers which is less inhibiting than student interaction with the teacher. A bright learner might thus be bored with the teacher's explanations and a weak learner may be frustrated if he is not able to follow what the teacher is saying.

The teacher addresses all the students at the same time hence interaction between teacher and learner is general. Learning from ICALL is one-to-one interaction. As the interaction is one-to-one, learner participation in the interaction is 100%. Learning is more individualized. The difference in the pace of learning between the low achiever and high achiever can also be bridged by learning from interaction with the computer. It is believed that teachers in heterogenous classroom exhibit differential behaviour ie negative behaviour towards low achievers and minority ethnic groups. Teachers speak less to these students, their attitude towards them is less positive and even criticize them more.23 This is indubitably an educational disadvantage for low achievers who have to sit in the same classroom as the others. Low achievers might show greater readiness for learning to read after considerable amount of exposure to learning from ICALL as the computer is impartial in its treatment.

The teacher's use of false starts, hesitations, self-repetitions are typical of any other interaction outside the classroom as well. There are ploys of speech modifications that the teacher employs too. It is assumed that this aids learners' comprehension. But this assumption may not be true because there is evidence of "adjustments in teacher speech resulting from the teacher's general familiarity with the learners or the pedagogical purposes,"24. In the preparation of ICALL programs, complete meaningful sentences can be used to initiate and respond to learners by predicting learners' responses. False starts, hesitations and self-repetitions which may mislead the learners are thus absent in ICALL programs for reading comprehension.

The teacher talks with feeling in class, praises, jokes and gestures. Even if the ICALL programs are developed in such a way that they provide positive reinforcements by displaying words like 'good' and 'congratulation' on the screen, the emotional involvement of the human teacher is certainly lacking and irreplaceable.

Learning opportunities in interactive learning are also to be studied. Allwright and Bailey cite two kinds of learning opportunities - practice opportunities ie opportunities to do something with whatever one is trying to learn and input opportunities ie opportunities to encounter what one is trying to learn.25 While input opportunities are present in the both the learning situations, more scope for practice opportunities is present in ICALL. The learner can practice the task of inferring by trying out many combinations. Practising in the class is limited because there is no time for giving practice opportunities to all learners. Even among the practice

opportunities, Allwright and Bailey suggest two types - opportunities to practice with bits of language and opportunities to practice with language learning techniques and claim that the second type of practice opportunity is a much neglected one which is where ICALL can come in handy.

**Learner input/output**

Learners who generate input by initiating interactions are believed to benefit more from it than the learners who are at the receiving end of the input or are led to believe that they are making the same input in a vicarious manner. Research by Seliger in 1972 has proved that learners who engage more in interaction with others inside and outside the classroom get more focused input and thereby develop faster.²⁶

Student behaviour encompasses learner input in classroom/computer interaction. Students draw attention by raising their hands, speaking out of turn, interrupting the teacher, gesturing through a nod etc. This is indicative of learner confidence exhibited by only a small to medium percentage of students in class. Students who are shy or feel inhibited may never speak in the class and may never interact. Such students might gain in confidence by interacting freely with the machine.

As it has been felt that the amount of learner input is directly proportional to language development, computer input is a boon to those input-shy students who can be allowed to wield a free hand while inputting information while carrying out the instructions in an ICALL program.

Learner output would be determined by the learner's ability to input, comprehend others' input, respond to it actively or passively and finally develop his reading skill. On that score, learner output in the classroom is dependent on learner understanding of the reading passage. The efficiency of the learners' listening and speaking skills would determine his reading comprehension efficiency. Learner output in the computer room is a measure of learner performance after exposure to continuous learning from interaction with ICALL programs. It was observed that students of the experimental group who had admittedly not read the story before coming to class were able to interact confidently with INVESTIGATOR inspite of it. At the end of the ICALL class they were able to comprehend the inference that could be made from the clues provided in the program. It can be argued that the purpose of making the learner read was thus defeated. But what should be seen as a positive trend in ICALL is how interesting can we make the program so that the learner goes back and reads the text. However the students of the control group who had not read the story before coming to class were unable to participate in the classroom interaction with the teacher. Much action research is necessary in the area of comparing learner input/output in the classroom and computer situation before anything definitive can be said on this account. The quality and quantity of interaction using ICALL programs is of paramount importance. For such an interaction, comprehensible input is responsible for progress in language acquisition. Because output is a result of acquired competence i.e "when performers speak, they encourage input (people speak to them). This is conversation".27 Similarly what kind of computer input will trigger a good output resulting in conversation with the computer provides scope for further research.

Seliger differentiated between low input generators and high input generators. He called high input generators as those who by initiating and sustaining conversations through taking turns, caused other people to use languages with them, to provide them with language samples and their strategies of communication led to high levels of input. The low input generators on the other hand participated minimally, spoke only when called upon and were generally passive in classroom interaction. They did not use language actively. Seliger found that high input generators did in fact outperform the low input generators in achievement. What is to be seen is whether low input generators can get more opportunities for interaction and graduate to the level of high input generators using ICALL.

Feedback

Chaudron states that the function of feedback is not only to provide reinforcement but to provide information which learners can use actively in modifying their behaviours. Feedback provided by the teacher in the classroom is general on most occasions. Feedback provided by the computer as in INVESTIGATOR is always personalised. In the classroom, learners' readiness determines the learners' ability to learn from feedback to a certain extent. In learning from the computer, feedback is given automatically and is not so much dependent on learner readiness.

Feedback from the teacher is inconsistent and dependent on various psychological factors like teacher's mood and teacher's attitude towards the learners. Constant importuning may irritate the teacher which can inhibit

the learners’ questioning behaviour. The computer on the other hand never tires of providing the same feedback a thousand times over and over again with consistency and accuracy.

There is also the misconception in the classroom situation that feedback is always error correction. Chaudron cites inconsistency, ambiguity and ineffectiveness of teachers’ corrections as problems with teacher feedback.30

About the need to release students from the anxiety of equating corrections with what Macfarlane calls “failures”31 computer feedback can act as a remedial technique. As students interact one-to-one with the computer they need have no fear that others in the class or their teacher would come to know about the mistakes they have made.

Allwright categorises feedback into "facts of error indicated, blame indicated, location indicated, model provided, error type indicated, remedy indicated, improvement indicated, praise indicated and opportunity for new attempt given."32 It will be useful to consider all these factors while designing an ICALL program for reading. It will not be possible or necessary to incorporate all the types of feedback in a single program but maximum

categorization of feedback provided would be desirable to enhance learning from interaction with the computer.

Speaking about feedback with specific reference to inferences made by Holmes from the story under study, the teacher links the clues with inferences while providing feedback. INVESTIGATOR goes one step ahead and provides richer feedback by tracing the effect back to the cause in the inference making process.

Time can also be a limiting factor while providing feedback in the classroom. Working under time pressure heavily influences teacher response. Limitless time on the computer and the capacity of the machine to work without the stress and strain of human fatigue is a definite advantage for the computer.

**Learner Strategies**

Reliable identification of learner strategies to compare and contrast the two learning processes is extremely difficult. The cognitive operations that learners bring along with them to the class and apply while in the classroom or in the computer room is unobservable and can only be surmised by the researcher's observations of the two happenings.
O'Malley et al., have organised strategies into three groups.\(^{33}\)

1. metacognitive : Involving knowledge about or regulation of planning ie planning, monitoring and evaluating

2. cognitive : Operations of analysis, transformation, synthesis

3. socio affective : operations of social interactions with others (i.e. co-operation, questioning)

Among the many strategies listed under each of the three heads by O'Malley et al a few of them pertaining to the study have been chosen for analysis and have been given in bold print.

**Metacognitive strategies**

Whether the students used *advance organisers*, *directed attention* or *selective attention* is best known to them. Self management is a conspicuously observable strategy which both the control group and experimental group learners seemed to employ. While the learners of the control group read the text before hand and came prepared to be questioned and tested, the experimental group learners came mentally prepared for the new and first time experience of learning a reading skill from the ICALL program INVESTIGATOR. Self-management was a strategy both the groups

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of learners were determined to employ. The students of the control group may have done functional planning or advance preparation of what they were going to speak when questioned. The students of the experimental group did not have the opportunity to do any functional planning as it was a new experience they were going to be exposed to only after entering the computer lab. Self evaluation is the strategy the learners of the control group applied in order to judge their understanding and performance. This is not unique to the particular session under study, it is characteristic of classroom learning irrespective of the subject or language being learnt. The experimental group learners evaluated themselves as part of their evaluation of the program INVESTIGATOR.

Cognitive Strategies

The control group did not use repetition during the course of interaction in the classroom by practicing or rehearsing before coming to the class. They were merely asked to read the given text before coming to class. The experimental group learner repeated the activity of carrying out the instructions in the program of their own free will. This naturally improved their understanding of the linking of the clues with the inference. Surprisingly, some of the students admitted to repeating in order to check their own inferencing process with the computers. Both the control group and the experimental group learners used resource from the reading material prescribed. Both of them also consciously applied and understood the rules of deduction that Holmes employed. The experimental group's use of rules was even more complex as they tried to find out the inferences by trying out different combinations of rules. This toying with recombination which is another cognitive strategy was not provided to the control group learners and hence they did not use it. The strategy of relating new information to prior knowledge or elaboration was adhered to by both the group of learners. Same is the case with transfer of prior knowledge to
new learning task and the employment of the most important cognitive strategy pertinent to the study namely, inferencing which was the aim of this experiment.

The socio-affective strategies of co-operation and questioning for clarification is applicable only to the control group learners. They did not employ co-operation among peers as they had to merely listen to the teacher and respond. Their questioning for clarification was minimal.

The important questions that prop up at the end of the analysis are - Is making all learners interact with ICALL programs forced participation?. Learner participation also depends on group size. Is ICALL a definite advantage?.

Learners differ in their idea of participation. Some like to listen and think it is an important part of participation. Some think speaking is participation. Teachers certainly think that more speaking is more participation. Therefore, learner strategies and teacher strategies may meet with conflicting views.

5.2.9 Evaluation of INVESTIGATOR

A common test was administered to the control group and the experimental group to find if ICALL can be more effective than classroom learning. (The test is given in Appendix 3). This serves to overcome the allegation of Zettersten that there is no attempt to "know to what extent a particular group of students using language exercises with a microcomputer
have acquired greater language proficiency than a comparable group not having used computers"34.

This is exactly what this experiment set out to do - judge the effectiveness of INVESTIGATOR by comparing the performance of the control group and the experimental group. To achieve this goal, a common test was administered to the control group and the experimental group of learners.

The principal aim of this test was to evaluate the effectiveness of INVESTIGATOR and to measure the extent of student achievement in understanding the fact-inference relationship35. But to use any test as a barometer for any evaluation it must have validity, reliability, practicality and instructional value. The definitions of these terms are given below36.

Validity is related to how well the test does what it is supposed to do, namely, to inform us about the examinee's progress towards some goal in a curriculum or course of study, or to differentiate levels of ability among various examinees on some task'.

Reliability is a matter of how consistently it (the test) produces similar results on different occasions under similar circumstances'.


Practicality of a test must be determined in relation to the cost in terms of materials, time and effort that it requires.

The instructional value of a test pertains to how easily it can be fitted into an educational programme, whether the latter involves teaching a foreign language, teaching language arts to native speakers, or verbally imparting subject matter in a monolingual or multilingual school setting.

After defining the terms, it is necessary to illustrate that the test was valid, reliable, practical and had instructional value. The test under consideration was valid because the test set out to evaluate the understanding of the inferences made by Holmes based on the clues available to him. Fifteen of the twenty questions (five questions were devoted to vocabulary testing) tested the testees' comprehension of the inferences made by Holmes. The marks scored by the learner helped differentiate the differences in the ability of understanding of the learners.

Before the test was actually administered to the control group and the experimental group, a dry run of the test was conducted by choosing four students from each group at random. The results of this sample test and the actual test showed that a difference in the average performance of the sample testees and the actual testees was negligible. As the lesson 'The Blue Carbuncle' was taken from the supplementary reader of the Matriculation Board, five students were chosen from a school belonging to the Matriculation Board, St. Michaels Academy, Adyar, Madras - 20. These students did not belong to the control group or the experimental group but the lesson had been taught to them as it was part of their syllabus. The same test was administered to them too. The results of this test and the sample test on the control group was almost identical. Thus, the test was reliable.
The test material was prepared by the researcher under the guidance of her supervisor after many laboured hours of drafting and redrafting. The test was typed using Wordstar and then photocopies of the paper were distributed to the students. Preparation of the test material did not demand any more effort than the normal effort needed for the preparation of test materials. There was hence no serious obstacle to the practicality of the test.

The instructional value of the test was of tremendous importance because the results of the test would consolidate or weaken the stand of implementing Intelligent CALL in the language curriculum.

The test was of a diagnostic nature. Though the test tested learners' understanding of inference making at the secondary level, the actual objective was to test the effectiveness of learning from ICALL. The underlying principle was to diagnose the usefulness of AI as a learning tool.

A comparison of the test marks of the control group and the experimental group was not expected to reveal egregious differences in marks. The reason for this was that one cannot expect a marked difference in learning after working with just one ICALL program. Even a marginal exhibition of better performance by the experimental group was expected to provide sufficient impetus to pursue research in ICALL to achieve definitive results.

The question types used in the test were multiple choice, yes/no and match the following. Multiple choice tests "have rather obvious advantages in terms of administering and scoring convenience\(^{37}\). The same is true of yes/no and match the following questions too. It helps in differentiating

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37. Ibid. p.256.
learners into those who know and those who do not know without any ambiguity. The employment of multiple choice as a testing item is often criticised on the grounds that the examinees merely choose without thinking but Harris cites evidence to show that ability to choose the best of a number of given alternatives is actually quite highly related to compose correct responses. The test being a list of objective type questions did not require more than one minute for each question. The questions in the test numbered twenty. Hence the maximum time allotted for answering all the questions was twenty minutes. All the students were able to complete the test within the allotted time.

The instructions given to the testees before the test included informing them that the test would test their reading comprehension, especially their understanding of inferences made by Sherlock Holmes. The testees were also informed of the types of test questions and that they were to write down only the question number and answers in the answer sheet provided to them. All the students were supplied with copies of the question paper. The teacher acted as an invigilator and at the end of the allotted time, collected the answer sheets from all the students. The test was administered to both the control group a week after classroom teaching and to the experimental group a week after they had worked with the ICALL program.

Though interacting with one ICALL program was not sufficient to establish the supremacy of learning inference making from learning through INVESTIGATOR over classroom teaching, it was expected that the learners into those who know and those who do not know without any ambiguity. The employment of multiple choice as a testing item is often criticised on the grounds that the examinees merely choose without thinking but Harris cites evidence to show that ability to choose the best of a number of given alternatives is actually quite highly related to compose correct responses. The test being a list of objective type questions did not require more than one minute for each question. The questions in the test numbered twenty. Hence the maximum time allotted for answering all the questions was twenty minutes. All the students were able to complete the test within the allotted time.

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Though interacting with one ICALL program was not sufficient to establish the supremacy of learning inference making from learning through INVESTIGATOR over classroom teaching, it was expected that the

experimental group would score better than the control group because of the advantages of Artificial Intelligence. But, how much better was difficult to quantify.

Quantitative and qualitative ways of collecting and analysing data were deliberately combined to enable the evaluation of the ICALL program INVESTIGATOR as a potential alternate source of learning reading. Quantitative data about learner understanding was obtained from the test administered to both the groups. Qualitative data was obtained from the experimental group using questionnaires and student's self reports of their learning experience.

The performance of the control group and experimental group warranted comparison. The test as illustrated in Appendix 2 consisted of twenty questions of which five were concerned with testing vocabulary. It was found to be essential for leading the students to inference making. The remaining fifteen questions were directly related to their understanding and ability for inference making.

**Statistical Analysis of the Control Group / Experimental Group mean**

The most suitable test for comparing the control group and experimental group scores was found to be the t-test as described by J.D.Brown (1988).\(^{39}\)

The group design was such that the experimental group of learners and the control group of learners yielded scores that are independent of each other.

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other. This was ensured by choosing the control group and experimental group from two different schools thereby confirming that the students were different in each group.

There were two operationalising variables:

1. One independent variable ie whether the students were in the control group or the experimental group.
2. Learners' comprehension of inference was the dependent variable used for comparing the performance of the two groups.

The variables were operationalised to the researcher's satisfaction. As the students of both the groups belonged to different schools and were separated by 90 kilometers between them there was no way that one group could have sneaked the questions to the other group and influenced them in any way.

The research hypothesis for the t-test was: the mean for the experimental group is significantly different from that of the control group.

Regarding the sampling of data,

1. The number of levels = 2 ie there were two groups the control group and the experimental group.
2. No person fell into both groups at the same time. Both the samples were exactly the same size ie 60.

In order to apply the t-test, there is no restriction of the sample size, there should be one interval scale dependent variable and one two level nominal scale independent variable. The alpha decision to be set in advance was set at $\alpha < 0.1$ to enable greater surety in decision making.
The performance scores of the two groups and the calculations to find the mean and standard deviation of the control group and experimental group is given in Appendix 10.

The standard deviation is another way of showing the spread of scores. It measures the degree to which the group of scores deviates from the mean; in other words it shows how all the scores are spread out.\(^\text{40}\)

Though the t-test and the z-test are similar it was decided to use the t test and not the z test because the z test requires large samples while the t test does not. The t test can be applied regardless of the size of the two samples. But the basic t test can be applied only if the two groups involved are independent of each other.

In order to calculate the critical value of t, the degrees of freedom for the test of independent means is to be calculated. The formula for calculating the difference of freedom is as follows:

\( \text{df} = (N_E - 1) + (N_C - 1) \)

where \( \text{df} \) = degree of freedom

\( N_E \) = no. of learners in the experimental group

\( N_C \) = No. of learners in the control group.

\[ \text{df} = (60 - 1) + (60 - 1) \]

\[ = 118 \]

It is important to calculate the degrees of freedom to find the critical value for \( t \) as it is part of the adjustment to be made for conditions of this study and helps in determining to which \( t \) distribution the researcher refers.

To recall, the alpha level has already been set at \( \alpha < 0.1 \) for a directional decision. The df was found to be 118. On referring to the table of critical values for \( t \) (see Appendix 11). The \( t_{\text{crit}} \) was found to be 2.358 or may be rounded off to 2.4 (To find the critical value of \( t \), find the row at the top of the table for one-tailed tests in Appendix 11. Then find the column for \( \alpha < 0.1 \). Then move down the column until you reach the row that corresponds to a df of 120).

2.4 is the correct critical value under the conditions of the study.

**Interpretation of results**

The standard deviation in the case of the control group was found to be 3.37 and that of the experimental group was found to be 2.61. The control group has shown a higher spread of scores which means there is considerable difference among the learner understanding. It indicates that learning from classroom teaching was not very satisfactory. The experimental group has shown a narrow spread of scores with a high
average score. Therefore, students have understood the particular programme of work and are capable of carrying out the task of learning reading from ICALL.

Other Observations

The general opinion is that language teachers have to concentrate on grammar and correctness of different aspects of the four language skills-listening, speaking, reading and writing. If they can allot the work of learning other skills subsidiary to the major language skills like inference making and problem solving to the computer then they will be able to devote more time and energy to other aspects of language teaching. Moreover by developing the skills of inference making and problem solving from the secondary level, the students are bound to be efficient and intelligent readers by the time they reach the tertiary level. This also makes the task of college teachers easier.

Also, in response to the questionnaire given in Appendix 4 the students came up with interesting observations important to the study. Some students said that they were excited by the whole experience of using CALL material for the first time. One of them even said that "learning had become fun". Some of the remarks of the students have been quoted below

- "The program was nice but could have been more complicated".
- "It must be more exciting".
- "It is easier to work with INVESTIGATOR than to study the text for a test".
- "It keeps your mind occupied".
- "It was educative, entertaining, easy and interesting".
- "The program was boring".
- "Why did you not use graphics?".
• "It was a waste of time".
• "I liked the program because mystery stories are my favourite".
• "The program was interesting and then I read the book".
• "This program was more like entertainment. All the questions were choice questions (sic). At least according to me it is more like a game than learning".
• "The program made excellent inference through which we can trace it".

Most of the students claimed that the story was not very difficult to understand. Of the 60 students of the experimental group, 40 students found the program interesting and easy to work with, 15 students found it boring but easy, 3 students found the program interesting but difficult and 2 students thought that the program was boring and difficult.

30 students claimed INVESTIGATOR had improved their understanding. INVESTIGATOR confused the understanding of 3 and had not affected 20 students in any way. 7 students were unable to say what effect the program had on them.

When asked to compare their traditional classroom learning experience with their experience of learning from a computer program, 27 students thought learning from a computer was easier, 11 students preferred classroom teaching, 8 students claimed they could read and understand the story without a teacher or a computer. 4 students said the story was difficult to comprehend and neither the teacher nor the computer could have improved their understanding. The last observation is rather amusing and reflects a defeatist attitude of the children.

When asked to compare the actual act of reading the text and learning reading from the computer, 38 students felt that learning from the
computer was easier than picking up a book and reading it. 10 students admitted that learning reading from the computer was more difficult than reading the text. 12 students were unable to decide which was better.

5.2.10 Scope for further research

INVESTIGATOR is a software developed on just an extract of one of Sherlock Holmes stories. It is possible to create an Expert System with a pattern replication for say ten different Holmes stories. The underlying principle is the logical reasoning common to inference making in all detective stories. The Expert System can act as the common thread of deductional thinking linking the different stories together.

The Matriculation Board in Madras has prescribed in its syllabus, six Holmes stories as the Supplementary Reader for the whole academic year comprising Holmes stories alone. The idea must have been to develop independent reading of detective stories and a good understanding of the characteristics of detective stories and most importantly to develop a problem solving attitude.

An attempt can be made to put all the stories into one common Expert System. The learner can choose the story he wants and try to comprehend the deductions and their reasoning in the problem or problems solved.

Given below is the suggested methodology to implement the Expert System Read and Solve A Problem (RESAP). This need not be restricted to Holmes stories alone. Similar systems can be created for Agatha Christie stories, Perry Mason stories etc.
1. **Present the story**
   
a. Locate the file  
b. Open the file  
c. Read in the story. Display the story on the screen Use PgUP and PgDN keys to enable the reader to scroll through the story

2. **Ask the reader questions about the story.** The questions can be of two types.  
   
a. Factual question  
b. Inferential questions

3. **Based on the results of the questions**
   
a. If the answer is wrong re-present the relevant part of the story and repeat the question. Depending on the number of times the question is incorrectly answered reduce the marks given till the correct answer is finally given. The mode of leading to the correct answer should be in the form of intelligent graded learning, not in the form letting the learner arrive at the correct answer by elimination. This can be done by providing an intelligent help text.
   
b. If the answer is correct give maximum marks and go to the next question.
4. Give total marks and award grade.

The Database for this program can be divided into two parts

1. story file
2. question file

The story file can contain n lines of 80 characters divided into pages of twenty lines to make the text readable on screen. The question file can comprise the following

1. questions
2. lines of story file to present if a question is answered incorrectly
3. \( x' \) fields each of which holds the marks to be awarded

Reading comprehension involves reading with understanding and with speed. The second aspect i.e. rapid reading through predicting and scanning is taken up for study in the next section.

5.3 THE MECHANICAL SKILLS OF READING : AN INTRODUCTION

Reading comprehension plays a very important role in the testing of English language by various agencies especially at the tertiary level. Students wanting to pursue their studies abroad are faced with the challenge of facing GRE (Graduate Record Examination), TOEFL (Testing of English as a Foreign Language), GMAT (Graduate Management Aptitude Test) and other tests of similar nature as a test of their English language proficiency at the tertiary level. A study of the exam pattern reveals that the learners at the tertiary level should be competent and proficient as far as reading comprehension is concerned. The learners need to be familiar with certain tactics involved in reading comprehension questions. But at no
stage of education in the Indian curriculum does the language syllabus concentrate on the mechanical skills of reading.

We read mainly to derive meaning from the words written. However there are certain techniques that are to be followed to read meaningfully.

It is therefore imperative that the mechanics of reading skills be included as a major part of language learning activity at the tertiary level. In the absence of carefully graded textbooks and suitable study materials these mechanics have not been properly introduced at the tertiary level. Learners at this stage should be taught these skills as it is of vital importance in their day to day life right from reading of newspapers in the morning to scanning for specific material in the library.

"Reading is a language related process that requires taking in, all at once, patterns of structure and meaning well above the level of the word".41

Reading is associated with the twin processes of decoding and attaching meaning. The mechanic of decoding demands the association of sight and sound in order to recognise the written symbols. To achieve proficiency in the mechanical skills of reading, fluent reading along with the following abilities is recommended42.


a. sight - recognition - this involves visual discrimination of words and familiarity with the visual shapes of words.

b. phonics - the ability to relate spellings (combination of written symbols) to sounds. This requires the student to be able to 'guess' the pronunciation of a new word on the basis of his prior experience of similar words.

c. the skills of word-analysis and structural analysis - readers should have an adequate knowledge of morphology and syntax to guess the meanings of new words that they encounter.

d. reading by sense groups - a good reader reads by sense groups and not individual words without much visual or mental efforts. This comes with experience and fluency in reading.

The two major mechanical skills of reading are skimming and scanning. While skimming, the reader quickly goes through a text to get the gist of it. While scanning, the reader quickly runs his eyes through the text to find a particular piece of information.

Teaching of the mechanics of reading should enable the reader to avoid the following faults in reading habits which are widely prevalent even in adult readers.

a. running a finger over the written matter while reading
b. moving the head while reading instead of using eye movement.
c. mouthing the words aloud or using lip movement.
d. reading only one word per eye fixation.
e. regressing eye movement along a line i.e. moving the eye backwards along the line.
Proficiency in the mechanics of reading is of vital importance to the
development of the reading skill. It is only when the mechanical skills and
mental skills work in association with each other does the activity of reading
become meaningful.

In the rest of the section just two of the aspects of the mechanics
of reading - predicting (a subskill of skimming) and scanning have been
chosen for an experimental study exploring the possibility of exploiting
ICALL as an alternative technique to learning the mechanics of reading in
the classroom under the guidance of the language teacher.

The ICALL program has been developed for the purpose of the
study. The description of this reading process will be used as a basis for
observations about the alternative strategy of learning reading from ICALL
and for an extended discussion of individual differences in reading skills in
the classroom and the computer lab.

Margaret Meek observes, "All good readers learn to predict both
words and events. Knowing how sentences, words and episodes are strung
together makes us confident that we shall understand them". Thus
predicting and understanding are closely related.

Prediction is the ability to predict on the basis of something that
has been read, what is likely to follow in a piece of text. To be able to make
such a prediction effectively, the reader must be able to follow the linguistic
clues as well as the logical organisation of the ideas in the given text. For
example, a news heading Akram Bowls India Out in the newspaper

43. Margaret Meek. Learning to read (London: The Bodley Head, 1982),
p.47.
column requires the reader to know that the news refers to a cricket match between Pakistan and India. The verb bowls alludes to Akram being a bowler and in being responsible for bowling the opposite team out.

**Scanning** is glancing rapidly through a text either to search for a specific piece of information or to get an initial impression of whether the text is suitable for a given purpose. For example, when a reader scans through the index of a book on evolution to see whether the author has given a definition of evolution, the reader runs his eyes quickly over the page to find evolution in the index and definition of under it with the page number.

**Skimming** is glancing rapidly through a text to determine its gist. For example when a researcher is going through articles in a journal, he skims the text to find whether a particular article is relevant to his own work. We unconsciously predict while skimming. Generally we skim and not scan the newspaper as our objective is to keep ourselves informed about the world around us without going into great detail. Once a topic of interest catches our eye then we read that news story in detail.

### 5.4 PREDICTING AND SCANNING USING THE ICALL PROGRAM PREDICTnSCAN AT THE TERTIARY LEVEL

Computers can be used for developing reading techniques because they are accurate in time control. The concept of reading set to a given time can be practiced using the computer. An experiment was conducted using an Intelligent CALL program PREDICTnSCAN at the tertiary level at Anna University. The experiment involved testing the program on the first year B.Tech (Chemical) students. The objective of this experiment was to exploit the search technique of Artificial Intelligence to
enable the learners to develop two mechanical skills of reading viz. prediction and scanning.

The ICALL program PREDICTnSCAN worked on the principle of Intelligent Tutoring System serving as a drill practice. An ITS can be used to teach a skill through drill and practice routines. Hainline talks about the usefulness of computers in rote learning which is applicable to the usefulness of ITS too in this regard: where rote learning is thought to be desirable, it can mitigate the disadvantages of this method, and it can produce graded and structural practice in freer situations. The computer's value in drill and practice should not be ignored, ... a number of people dislike drill and practice on philosophical grounds but its pragmatic value is undoubtable. The objection is sometimes also made that its use in this area is a waste of its capabilities, but it is surely more important to do well a job that needs doing rather than show off the more flamboyant tricks of CAL in a manner that may be more distracting than helpful"44.

The target learners were at the tertiary level studying in the first year of college. The learners were first year B.Tech Chemical students in the age group of 17 and 18 belonging to both the sexes. The number of target learners were 53. Of these 53 learners there were some who had studied in English medium in the eleventh and twelfth standard and there were some who had studied in the Tamil medium upto the tenth standard and shifted over to the English medium in the eleventh and twelfth standard. Most of the learners however, had completed their schooling in the English medium.

The learners were heterogenous in their reading competence levels. Their reading competence in English showed mixed abilities varying from

low level competence to high level competence. Socially they ranged from the rural lower middle class who do not speak English with confidence to the urban upper class who seem to be more comfortable communicating in English than in their own mother tongue.

In order to evaluate the effectiveness of the program, the tools used were of two kinds. The first type - the tool used for conducting the experiment was 486 computers in the computer laboratory. A questionnaire was the second type of tool used to get feedback on the learners' experience and performance at the end of the experiment.

5.4.1 The experiment: An overview

An Intelligent CALL program PREDICTnSCAN was developed after many hours of discussion between the researcher and a scientist, Mr. C.Rajagopal working in the area of Artificial Intelligence at the Indira Gandhi Centre for Atomic Research. As the objective of the study was to experiment with the same group of target learners with two similar lessons involving the same skills, two lessons namely Improving Road Safety and The Story of Indian Airlines were chosen from the textbook English for Engineers (Vol. 1) prescribed for the first year B.E and B.Tech students at Anna University. Both the lessons involved teaching of the reading skills prediction and scanning. The program was developed by Mr.Rajagopal according to the research requirements of the study. The major feature of the program is the intelligent search which matches the students' response with the answers. The search is a definite advantage over traditional teaching methods as it provides the learner instant feedback, helps in self-tutoring and in eliminating the laborious procedure of correction by the teacher. Constant interaction with PREDICTnSCAN by prototyping different texts for similar questions concerning prediction and scanning can serve as a graded Intelligent Tutor.
The methodology adopted for testing the program PREDICTNSCAN involved the comparison of the experience of learning in a conventional class with the experience of learning from an ICALL program. The method of comparison of the two experiences of learning involved the following stages.

1. The same group of learners experienced learning in the conventional class and later in the computer lab.

2. The target learners were given a questionnaire to assess their differing experience of learning. They answered to the questions in the questionnaire by recalling the cognitive processes they underwent and then put it down in words.

3. Ten variables were chosen as the barometer for assessing the difference in the two learning experiences based on the learners' answers to the questions in the questionnaire.

4. The learning experiences of the group were compared in the form of a table for each variable chosen. This was done in two ways - (a) by the researcher's observations and (b) by the retelling of his/her experience by the learner from memory in writing.

The above mentioned methodology is supported by the following:

1. The idea of collecting data in the form of retelling of their experience through verbal or written form is supported by Carrel et al.\textsuperscript{45}

\textsuperscript{45} Carrel, et al., Interactive Approaches to second language reading (CUP, 1981) p.216.
2. The method of statistical analyses through interview findings leading to evidence of learning behaviours is discussed by Wesche (1979)\(^46\).

3. The methodology of subjecting students to a certain learning experience and then collecting information by focusing their attention on what went on in their heads as they worked is cognitive process in preference to what they did actually physically while working with and in the target language is also recommended by Hosenfield (1976)\(^47\).

4. Collecting information on student variables through a questionnaire is not very unusual. Wenden suggests three examples of getting information on students' learning processes. They are observation, introspective self-report, retrospective self-report\(^48\). I have used both my own observations and the students' introspective self reports to study the effectiveness of the ICALL programs based on the ten variables chosen.

In the classroom, the maximum time given for completing the exercise was 30 minutes. In the computer lab the time needed for individual tasks was preset in the program. In the classroom, as the teacher was monitoring the situation, the teacher used her watch to see the time and urge the students to complete the given task within the stipulated time.


limit. The students also looked into their wrist watches from time to time to egg themselves on towards the completion of the task at hand.

5.4.2 The task in the Class

The lesson *Improving Road Safety* (see Appendix 5) was modified suitably to create a pattern of uniformity in the classroom and ICALL tasks. The modifications made were to the structure of the exercises that were given at the end of the lessons to test the predicting and scanning skill. (By structure of the exercise is meant question types and number of questions). This was done to maintain uniformity in the structure of the two exercise that the students had to do, one each after the conventional class and the computer lab class. It was believed that a proper assessment of the difference in the learner performance in the classroom and the computer lab can be made only if the exercise given to the students in both the cases are uniform in their structure. (See Appendix 6 for the test questions relating to prediction and scanning of the text, IMPROVING ROAD SAFETY). The exercise was divided into two parts - prediction and scanning. There were four questions under prediction and three under scanning.

The prediction tasks involved

1. predicting what the passage was about given the title of the passage
2. predicting ten problems of road safety and the possible solutions to them
3. predicting ten words that might appear in the text of the passage
4. given one sentence from the passage, predicting whether a list of selected sentences from the passage appear before or after the given sentence

The scanning tasks involved

1. scanning the text and locating the paragraphs which relate to a list of features of road safety

2. scanning the text and listing ten problems of road safety that appear in the passage

3. scanning the text and listing ten words that appear in the text

In the classroom, the students worked individually and answered the questions in separate sheets and handed it over to the teacher. The teacher then corrected the papers manually. It is important to note that the students could involve themselves and concentrate on a skill based reading exercise without the imposing presence of a teacher. Since the teacher's presence was not a compelling need, the employment of a computer as a teaching tool for the next part of the experiment was not a grave threat to the teacher's role.

5.4.3 The task in the Computer Laboratory

The lesson Computerisation in India: the story of Indian Airlines (see Appendix 7) was directly converted into the ICALL program PREDICTnSCAN. Unlike the other lesson Improving Road Safety it did not require any modification.
**PREDICTnSCAN** was also divided into two parts viz prediction and scanning.

The prediction tasks involved

1. predicting what the passage was about from the title of the passage
2. predicting ten operations necessary to the organisation of computerisation of the Indian Airlines
3. predicting ten words that are likely to appear in the text of the passage
4. given one sentence from the passage, predicting whether a list of selected sentences from the passage appear before or after the sentence given

The scanning tasks involved

1. scanning the text and locating the paragraphs which relate to a list of aspects of computerisation of the Indian Airlines
2. scanning the text and listing ten operations necessary to the organisation of computerisation of the Indian Airlines as given in the passage
3. scanning the text and listing ten words that appear in the text.

After the students completed the task according to the instructions given in the program, **PREDICTnSCAN** immediately displayed a
comparative list of operations predicted before reading the text and operations listed after scanning the text adjacent to each other on the computer screen. Then, a list of words predicted by the learners was given against a list of words scanned by the learner. PREDICTnSCAN gave the correct answers to question 4 of prediction and question 1 of scan. The program gave the total marks scored by the learners at the end. (Sepp Appendix 8 for the printout of the ICALL program PREDICTnSCAN).

5.4.4 Evaluation of the effectiveness of the ICALL program PREDICTnSCAN

To evaluate the effectiveness of the ICALL program PREDICTnSCAN, ten parameters were chosen to facilitate a comparative study between classroom learning and learning from the ICALL program. The ten parameters that formed the bases of evaluation were

1. the time taken to complete the task
2. learner autonomy
3. individualized pace of learning
4. one-to-one interaction
5. learner involvement
6. concentration
7. scope for self instruction using the ICALL program
8. methodology
9. testing
10. learner strategies

Each of them has been examined in detail below. The definition of each parameter is followed by a tabular comparison of learners experiences in classroom learning and learning from ICALL. The numerical data given
below each table was arrived at from the answers given by the learners in response to the questionnaire in Appendix 9.

The number of target learners = 53.

1. The time taken to complete the task

The maximum time allotted for completing the task was the same in the classroom and in the computer lab. The time was measured as accurately as humanly possible by the teacher while administering the test in the classroom. In the process, the teacher measured only the total time given for completing the entire task and not the time taken for the completion of individual tasks. In the ICALL program, the time required for individual task and for reading each paragraph was preset. Thus a more vigilant eye was kept on the learners.

Table 5.2

Time Taken in the classroom and in the Computer Room

<table>
<thead>
<tr>
<th>Learner Experiences</th>
<th>Classroom</th>
<th>Computer Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>The teacher instructed the learners about the time to be taken for the entire task. The teacher constantly urged the students to perform the task within the given time by reminding the students how much time was left.</td>
<td></td>
<td>The time needed to complete each task was preset in the computer.</td>
</tr>
<tr>
<td>The teacher and students were constantly looking at their watches.</td>
<td></td>
<td>Students performed the task without worrying about the time limit as they knew the computer would take care of it.</td>
</tr>
<tr>
<td>Some students could not complete the task within the time limit.</td>
<td></td>
<td>All the students completed the task within the time limit.</td>
</tr>
</tbody>
</table>
Number of students who could not complete the task within the given time in class = 8.
Number of students who could not complete the task while learning from the program = 0.

In the classroom, the students concentrated on amplementing the whole test within the time limit. They could not distribute the time needed for individual tasks judiciously. Where the students learnt from PREDICTnSCAN, as the time individual task was preset they progressed from one task to the next with ease. The program helped them to distribute their time judiciously to complete the task. That is why, while 8 students couldnot complete the task in the classroom.

2. Learner autonomy

Autonomy in language learning is a desirable goal. The main characteristic of autonomy as an approach to learning is that students take some significant responsibility for their own learning over and above responding to instruction.49

The practical rationale behind promoting learner autonomy is that a teacher may not be always available in the classroom. In such situations there is a need for learners to learn or their own without the possible individual attention from the teachers. Learners also become more proficient in their language learning efforts if they learn not to wait for the teacher to

49 D. Bond, Developing Student Autonomy in Learning 2nd ed (New York: Kogan page, 1988).
provide them with resource. The advantages of developing autonomy in their learning styles are characterized by the following:

1. Autonomous learners are able to identify what's been taught but most learners don't know what's going on in their classes.

2. Autonomous learners are able to formulate their own learning objectives, not necessarily in competition with the teacher - but more often in collaboration with the teacher or as something which is in addition to what the teacher is doing.

3. They can and do select and implement appropriate learning strategies often consciously.

4. They are able to identify strategies that are not working for them and use others ... they have a rich repertoire of strategies and have the confidence to ditch those that are not effective and try something else.

5. All learners involve themselves in self-assessment to some degree but effective autonomous learners are consciously involved with it and recognize its importance.

ICALL can be a useful tool for promoting learner autonomy as the students learning from ICALL work on their own without expecting help from the teacher. ICALL learners may develop their own strategies during

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the course of their interaction with computers. They are bound to make self-assessments of their learning process as they will compare learning from CALL with learning from classroom instruction.

### Table 5.3

**Table of comparison of learner autonomy**

<table>
<thead>
<tr>
<th>Learner Experiences</th>
<th>Classroom</th>
<th>Computer Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning was teacher controlled</td>
<td>Students worked on their own.</td>
<td>Students worked on their own.</td>
</tr>
<tr>
<td>The teacher constantly urged the students to move on to the next task and kept reminding the students to complete the task within the given time.</td>
<td>There was no intrusion of the teacher.</td>
<td>There was no intrusion of the teacher.</td>
</tr>
<tr>
<td></td>
<td>Students work at their own speed and moved from one task to the next task at will.</td>
<td>Students work at their own speed and moved from one task to the next task at will.</td>
</tr>
</tbody>
</table>

Number of students who felt there was greater learner autonomy in the classroom = 14

Number of students who felt there was greater learner autonomy while learning from ICALL = 29

3. **Individualised Pace of Learning**

Learning within the framework of the system but at one's own pace is individualised pace of learning. In the context of CALL, the concept of individualised pace of learning is based on the principle of programmed instruction using branching where a bright student can move on to the next lesson without having to wait for the slow learner to catch up with him. At the same time a slow learner can take more time to practice and learn a
particular skill without being psychologically affected by the better performance of his peers. It has been found that once students begin to work on the computers, they set their own pace of learning and follow their own course so that instructor is merely a learning monitor.  

Table 5.4

Table of comparison of Individualised pace of Learning

<table>
<thead>
<tr>
<th>Learner Experiences</th>
<th>Classroom</th>
<th>Computer Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>The teacher fixed the time for each task. The students moved from one task to the next at uniform speed.</td>
<td>Though the maximum time needed for each task was preset in the program if a student finished a particular task before time he/she could move on to the next task.</td>
<td>The time taken for individual tasks varied. For eg. some students took more time to predict, while some students took more time to scan.</td>
</tr>
<tr>
<td>The students could not adjust the reading speed between the tasks.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Number of students who felt learning was at an individualised pace in the classroom = 7
Number of students who felt learning was at an individualised pace while learning from ICALL = 46

4. One-to-one Interaction

One-to-one interaction is the reciprocal action between two individuals. In the classroom, it is the interaction between the teacher and a student. In the computer lab, it is the interaction between a student and the computer.

What is meant by one-to-one interaction in the classroom is the interaction of pupil with teacher and vice versa. Obviously, it is not possible for every pupil to get individual attention from the teacher all the time in contrast to the one-to-one interaction in the computer lab. (Though it is possible for a teacher to focus attention on one learner for a while, especially if he or she is not a good teacher) i.e., interaction between the computer and the pupil. The purpose of using one-to-one interaction as a variable to study the contrasting experiences of learning was to highlight the advantage of the computer in achieving one-to-one interaction over learning in the classroom.

Table 5.5

Table of comparison of one-to-one interaction

<table>
<thead>
<tr>
<th>Learner Experiences</th>
<th>Classroom</th>
<th>Computer Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>One teacher interacted with sixty students while giving the instructions to perform the task.</td>
<td>Each student interacted one-to-one with the computer.</td>
<td>The instructions given by the computer to each student was one-to-one.</td>
</tr>
<tr>
<td>The teacher moved around in the class keeping a hovering eye on all the students. The teacher helped any student who raised a doubt by going to him and clearing the doubt individually.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
The students who felt inhibited to ask the teacher to repeat the questions because they did not understand it or hear it because they were sitting at the back did not interact with the teacher. Students who wanted to read the instruction again especially those who hesitated to ask the teacher could interact better with the program by reading the instructions on the screen again.

5. Learner involvement

Learner involvement is "connected with the development of volitional activity, ie with the ability to set oneself an aim and attain it, persisting in such an endeavour"53.

Learner involvement may be linked to learner autonomy. When learners act more autonomously they exhibit a greater enthusiasm for learning.54 learners expressed the opinion that they experienced greater learner autonomy in learning from ICALL, it may be summed up that they were also more involved in their task of learning while learning from ICALL.


Table 5.6

Table of Comparison of learner involvement

<table>
<thead>
<tr>
<th>Learner Experiences</th>
<th>Classroom</th>
<th>Computer Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learners involved themselves by working on their own to complete the task.</td>
<td>Learners involved themselves by interacting with the computer program.</td>
<td></td>
</tr>
</tbody>
</table>

Number of students who felt there was greater learner involvement in the classroom = 19
Number of students who felt there was greater learner involvement while learning from ICALL = 34

6. Concentration

Concentration is a psychological activity involving steadfast attention to a task. Concentration depends upon learner interest and learner involvement.

Concentration may also be equated with the ability to pay attention. Concentration is one of the unobservable factors in classroom participation. vanLier has suggested that the learner’s attention is the key component which converts input into intake.\(^{55}\) As there is lesser distraction in the computer lab the learners may be able to concentrate better. But this is only a speculation and cannot be proved.

Table 5.7
Table of Comparison of Concentration while learning

<table>
<thead>
<tr>
<th>Learner Experiences</th>
<th>Classroom</th>
<th>Computer Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students concentrated to the best of their ability as they answered the test.</td>
<td></td>
<td>Students could concentrate well because each of them had one system to work with. They looked intently at their computer screens while working</td>
</tr>
<tr>
<td>The teacher intrusion and noise from outside deterred the learners' concentration.</td>
<td></td>
<td>There was no intruding presence of the teacher.</td>
</tr>
<tr>
<td>Some students looked out of the room seeing the passers by on the corridor.</td>
<td></td>
<td>Students were less distracted.</td>
</tr>
</tbody>
</table>

Number of students who felt they could concentrate better in the classroom = 9
Number of students who felt they could concentrate better while learning from ICALL = 40
Number of students who felt they could concentrate better both in the classroom and in the computer lab = 3
Number of students who felt they could not concentrate either in the classroom or computer lab = 1

7. **Scope for self instruction using PREDICTnSCAN**

By scope for self instruction is meant the ability of the learner to learn by interacting, with the ICALL program PREDICTnSCAN without the assistance of the teacher.
Learning through self access is an established method in ELT today. Current theories of learning suggest that self instruction may lead to self assessment which is characteristic of the active, responsible learner, one who cultivates a sense of his or her progress, achievement and perhaps levels of competence. Self instruction demands that the learner take responsibility for his learning without the assistance of the teacher. Computers are a good medium for promoting self instruction provided effective software that can make for the teacher's absence is available.

After working with the program on their own, most of the students felt that it was possible to learn the reading skills viz. prediction and scanning through self instruction using the ICALL program over say, a semester after which they claimed they would be able to gain sufficient confidence to read authentic texts unassisted at desirable speeds.

Number of students who felt there is scope for self instruction using ICALL  
= 34
Number of students who felt that it is not possible to learn by self instruction using ICALL = 19

8. Difference in the learning process

The contrasting learning processes involved in classroom learning and learning from ICALL is tabulated below.

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Table 5.8

Table of Comparison of the Learning process

<table>
<thead>
<tr>
<th>Learner Experiences</th>
<th>Classroom</th>
<th>Computer Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>The emphasis is on teaching and learning</td>
<td>The emphasis is solely on learning</td>
<td></td>
</tr>
<tr>
<td>The learning process is teacher controlled and instruction oriented</td>
<td>The learning process is self instructional</td>
<td></td>
</tr>
<tr>
<td>Teaching in the class requires a lot of effort from the teacher if the learner has to improve his reading skill by repeating similar tasks through drill and practice.</td>
<td>No effort is required from the teacher. The same program can be used for different texts by prototyping. Lot of effort goes into programming, though.</td>
<td></td>
</tr>
<tr>
<td>The teacher may become tired.</td>
<td></td>
<td>The computer is accurate, tireless and impartial.</td>
</tr>
<tr>
<td>The teacher may be partial while correcting the papers.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Number of students who felt that the classroom was more favourable for learning prediction and scanning = 17

Number of students who felt that ICALL was more favourable for learning prediction and scanning = 36

9. **Method of evaluation**

The method of evaluation besides checking for the correctness of the answer predominantly involved search. Search in Artificial Intelligence terms is arriving at the desired solution by searching among the available paths to arrive at the nearest solution or reducing uncertainty to the maximum extent.
Table 5.9

**Table of Comparison of evaluation of learner performance**

<table>
<thead>
<tr>
<th>Learner Experiences</th>
<th>Computer Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Classroom</strong></td>
<td><strong>Computer Lab</strong></td>
</tr>
<tr>
<td>After the students completed the task by writing the answers on the answer sheets, the teacher took the paper home for correction.</td>
<td>The students keyed in the answers directly onto the computer screen using the keyboard.</td>
</tr>
<tr>
<td>While checking whether the words predicted by the students appear in the passage the teacher had to search for the words manually by eye reading the passage. This took a very long time. Moreover, it was a very cumbersome process.</td>
<td>The program's intelligent search searched the text to correct the answers.</td>
</tr>
<tr>
<td>Sometimes, the teacher also used her memory power to find whether the words predicted by the learners appeared in the text.</td>
<td>The ICALL program performed the search in a matter of seconds using the AI technique.</td>
</tr>
<tr>
<td>The learning process is teacher controlled and instruction oriented. Correcting the papers requires a lot of effort from the teacher if the learner has to improve his reading skill by repeating similar tasks through drill and practice. The teacher may become tired. The teacher may be partial while correcting the papers.</td>
<td>The memory of the computer is highly efficient compared to the humans. The learning process is self instructional. No effort is required from the teacher. The same program can be used for different texts by pattern matching. The computer is accurate, tireless and impartial.</td>
</tr>
</tbody>
</table>
10. Learner Strategies / Learner Style

Strategy is the "set of abstract cognitive functions which are used to acquire knowledge, which are biologically determined, independent and constant"\(^{57}\). Learners use different strategies for learning conditions thereby creating a very thin line of difference between style and strategy. Style is defined as "relatively stable individual preferences".

Wenden divides learning strategies into cognitive strategies and self-management strategies.\(^{58}\) The function of the cognitive strategies are four-fold in nature.

1. Select input
2. Comprehend input
3. Store input
4. Retrieve input

The self management strategies involve planning monitoring and evaluating. Among the cognitive strategies, the difficulty of comprehending input is common to both types of learning and depends very much on the learners' background knowledge and nature of the material. Presentation of the material can also be a key factor. Comprehension using computers may be an advantage if knowledge is represented in such away that it is easy, challenging and interesting for the learners. The employment of self management strategies is probably greater while learning from ICALL as


the learner has to monitor and evaluate his performance himself. In the classroom situation he may depend on the teacher to do the same.

**Table 5.10**

**Table of Comparison of learner style / strategy**

<table>
<thead>
<tr>
<th>Learner Experiences</th>
<th>Classroom</th>
<th>Computer Lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Learners' strategy in a classroom depends on the teacher.</td>
<td>Learner depends on the accuracy and efficiency of the computer.</td>
<td>Their is no emotional involvement between the computer and the learner.</td>
</tr>
<tr>
<td>Learner appreciates emotional involvement of the teacher.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5.4.5 "Intelligent" features of the program

All the prediction and scanning exercises required the matching of words keyed in by the learner with the expected answers for pattern matching the words keyed in with the words present in the passage of the text. **PREDICTnSCAN** employed intelligent search, an Artificial Intelligence technique to search for the words and match them with the answers.

Finding the route or a solution from an initial state to a desired state is a search. While doing so the intermediate states are searched in order to find the desired solution. As opposed to brute-force search, intelligent search lays down certain rules for proceeding with the next step in the search. Typical rules could be (i) among the available paths, which one takes nearer to the solution or (ii) which one reduces uncertainty to the maximum extent. The search can be of two types.
1. a depth first search
2. a breadth first search

The depth first search may be equated with the usual way of doing backward chaining. Depth first search proceeds broadly as follows. It looks for the left-most (or first) node beneath the goal node and checks if it is terminal. If not, it establishes a list of sub-goals and starts again as the node reached as goal. Once there are no lower level nodes then, providing the current node is not terminal. Hence it goes back to the last sub-goal on the outstanding list and takes the next route of descent to the right. If the tree has an and/or structure then success in the search indicates going back to the last AND node, which failure in the search indicates a return to the last outstanding OR node.

Breadth-first search expands all the nodes immediately below the initial node. Then, working from left to right it expands all these nodes until a solution is reached.

The search technique used in PREDICTnSCAN is a built-in depth first intelligent search. The search is highly efficient, accurate and very quick compared to humans. By displaying the answers immediately because of the search the students get instant feedback on their performance.

The ITS PREDICTnSCAN has a knowledge base. For example to the prediction/scanning questions, 'what is the lesson about?' and 'what are the operations necessary to the organisation?' a list of words have already been put into the knowledge base of the program. Students' answers which are found to be relevant and correct but are not listed in the knowledge base, can be included so that the knowledge base can be constantly updated. This will add to the knowledge and the exhaustiveness of the knowledge base and considerably improve the efficiency of the program. Facility for
improvement is an important aspect that characterises the intelligence of any computer program. The student can thus teach himself and the program by adding to the list of words creating a kind of open ended dictionary in the process. These features of the program can be presented more elegantly through a menu driven intelligent help text as part of further research to improve the program.

5.4.6 Advantages of PREDICTnSCAN

An important aspect of AI which deserves consideration at this stage is the remarkable ability of AI in adjusting the speed of reading, i.e., it enables the reader to read the chosen passage at the varying speed with which he can elicit information. Reading speed depends on the reading proficiency of the reader (slow reading or fast reading) and the level of difficulty involved in the passage.

There are certain definite advantages in the use of computers in making timed reading more effective. In a classroom situation, timed reading is usually done using the watch, but this impedes the reader's concentration. There is no way to measure the development of his/her reading performance. The salient features of the computer program in this connection are the accuracy of time and the undiverted attention of the learner towards the reading tasks unmindful of the urgency to cope with time. It also enables the reader to increase his reading speed in the course of his interactions with similar computer programs. PREDICTnSCAN provides learning opportunities which cannot be provided classrooms for want of time.

Above all, the reading speed can be varied according to the varied reading proficiencies of the learner. (This feature is not present in the program but can be included).
Lastly, the motivating aspect involved in reading. In the experiment conducted in this regard almost all the participants have endorsed the view that learning through a computer program motivates them highly.

Observations made

The observations made during the experimental study were as follows.

1. All the students were using a CALL program for the first time.

   They did not have much hands on experience on the computer. Despite this they were able to work with the program with confidence.

2. Learners showed great enthusiasm to work with PREDICTnSCAN.

3. Slow learners were admittedly relaxed while working with the program.

4. Many students felt that though self instruction through programs similar to PREDICTnSCAN, will enable them to improve their reading skills they felt that the presence of the teacher in the role of monitor in the computer laboratory was desirable.

5. The participants observed that reading the print medium was easier than reading from the computer screen especially for a long duration. In addition to glaring, the letter of the computer screen have an air of unreality as felt by some of the learners.
The easy readability provided by the bold and fine print of the book is not available on the computer screen.

5.4.7 Scope for improving PREDICTnSCAN

The following suggestions are made to improve PREDICTnSCAN

1. The knowledge base consisting of the correct entries was not exhaustive enough, certain answers that were keyed in by the learners and were acceptable were not given marks as they were not included in the knowledge base. This error has to be corrected by improving the exhaustiveness of the knowledge base.

2. Only the maximum time necessary for each individual task should be set so that a student can move on to the next task if he has completed the previous one before time.

3. Students should be given the provision of going back and reading the text before answering the questions related to scanning.

4. The answers to question no.4 can be displayed immediately in the program if the student opts for it.

5.4.8 Scope for further study

The English for Engineers text book of Anna University is found to be ideal for teaching the mechanical skills of reading. The book consists of passages to improve the reading skills - skimming, scanning and predicting. The passages in the text have been carefully graded. The book is the outcome of an ELT project, namely KELT (Key English Language Teaching) carried out by the English teaching staff in the University in collaboration
with the British/Indian ELT specialists. During the first phase of the project, a needs analysis was conducted which revealed that the skills of skimming and scanning are neglected in the learning curriculum, a new textbook was designed to impart these skills to learners. Hence an ICALL programme introduced in the I year B.E. / B.Tech as part of the English Syllabus will be both useful and desirable. This ICALL programme should consist of a series of programs for example about ten passages dealing with the same reading skill say predicting, ten passages dealing with scanning etc. Students should be allowed to work with these programs once a week for a semester so that at the end of the semester we can have definite results about the effectiveness or otherwise of computer assisted learning of mechanical skills of reading by comparing the learner's entry behaviour at the beginning of the semester and the terminal behaviour at the end of the semester.

This chapter was a report on the experiments with two ICALL programs INVESTIGATOR and PREDICTnSCAN conducted at the secondary and tertiary levels respectively. Apart from reporting, a detailed analysis was made based on the learners' response to the questionnaire administered to them. This analysis showed that ICALL had certain definite advantages and has a definite place in the ELT curriculum. The next chapter discusses the place of ICALL in the ELT curriculum.