CHAPTER 7

CONCLUSION: THE FUTURE OF ICALL

7.1 SUMMING UP

It has been seen in the preceding chapters that Artificial Intelligence has a vital role to play in the teaching of reading. AI's potential for interaction has revolutionised language learning in general and reading research in particular. Experiments conducted in the field of CALL suggesting various ways in which different aspects of language can be taught using computers have resulted in a transition from CALL to ICALL. During this transition, the aim of ICALL is to overcome the limited interactability of CALL programs and to make learning from CALL more effective, by providing it with intelligence. Production of AI oriented CALL programs demands combined efforts from AI programmers and language teaching experts. This collaborative work resulted in converting ordinary CALL (a dumb catalyst and a passive responder) to ICALL (an interactive and intelligent communicator).

In order to discuss the applicability of AI to language learning it becomes necessary to have a comprehensive view of the theories and principles of language teaching with an emphasis on the ELT concepts of reading efficiency.

It may be seen that ELT experts have been formulating reading theories for a period of hundred years or more but it was only in the 1960s
that concrete attempts had been made to concretise and formulate theories about the development of the reading process and various models of reading associated with it.

Infact, the principles governing the reading theories make one thing clear. Reading is a mental process constantly subjecting the reader's mind to the content of the written passage requiring him to adjust his thinking. It is not necessary that this process occur sequentially every time.

Different models of reading view reading differently. Gradually, instead of viewing reading as a skill per se, reading came to be viewed in the context of writing. A study of the mental processes of reading showed that the reader visually perceives letters separately before perceiving them as words. Whether reading is dependent on phonological input or whether it is dependent on visual input suggested by the linear model was an area of debate till the parallel model considering the possibility of simultaneous visual and phonological processing of texts, while distributing meaning to it, came to be accepted. The linear model of reading was thus rejected in favour of a more interactive model. The theory of improving reading efficiency came with experience and the mental process involved with it can be described in various ways. Reading being an intelligent interrogation of the text, calls for interaction between the reader and the text and between the reader and the author.

Reading is primarily a skilled behaviour. A psychological approach to understanding this skill can help in classifying reading into subskills. The focus of classroom teaching should be on developing these subskills so that it can contribute to a more holistic acquisition of the reading skill. Brumfit's classification of reading skills into mechanical skills, intellectual skills and nonstudy skills encompasses all the activities of reading.
The reading skill depends more on the mental abilities of the reader than on the outcome of any particular theory or a principle of teaching. Reading is essentially a skill to be developed by the reader. The act of reading is characterised by three important aspects of contemporary reading theory. They are anticipation, automisation and analysis of feedback. These aspects, it can be seen, can be achieved in a computer-based learning reading programme governed by Artificial Intelligence.

Two important proponents of the reading theory Smith and Goodman suggest that the process of reading takes place through prediction, confirmation and rejection. For this, the reader's use of linguistic and non-linguistic information is essential. Reading demands the ability to decode and derive meaning. What the reader brings to the text as prior knowledge is partly responsible for the reading efficiency that he exhibits. The presentation of knowledge as schema and its relevance in the AI based reading scenario has been highlighted.

Readers apply various strategies to comprehend the text. Studies have shown appreciable difference between the strategies of good and poor readers. Some of the strategies that teachers used in classrooms to improve learners' reading performance like the SQ3R strategy, advance organisers, pretests, group discussions etc can bridge the gap between the learning behaviours of good and poor readers.

The aim of the acquisition of reading skills is to read independently with understanding. Understanding involves a global, local, referential and evaluative comprehension besides an ability to reorganise information, make inferences, and predict what comes next.
As the weightage for deriving meaning gained ground and many models about how reading actually happens came to be propounded, newer methods for teaching reading gained currency. With the advent of educational technology, the use of taperecorders and later computers made their entry as tools for language teaching. The method of using technological aids such as teaching machines and taperecorders recommended the development of individualised reading skill at its own pace in a graded fashion. Though the teaching machines including audio visual equipments were designed to aid the teacher, they were primarily learner centered providing scope for learner freedom and learner autonomy. The focus of the thesis is on the usefulness of developing reading skills using Artificial Intelligence based CALL programs.

It is clear that the aspects of reading as enunciated by modern research on reading are closely related to the characteristics of AI. The focus of the thesis rests upon those aspects of AI technology exploitable for language learning. AI, involving cognitive psychology and computer technology uses the application of processes that are analogous to the human reasoning process. The advent of Intelligent Tutoring Systems or ITS for language learning adds a new dimension to ICALL and acts as an alternative source of motivation and helps learners perform better. This is an epoch making development causing revolutionary changes in education. In addition, AI’s ability to understand and generate natural language can be successfully exploited to make language learning from ICALL very efficient.

The study of the ways and means of exploiting the characteristic features of AI technology reveals to us certain striking similarities between the strategies of ELT pedagogy and AI technology. One of the methods that is common to both of them is programmed instruction which includes the
drill and practice technique. The application of AI factors endowing the tutor with intelligence has led to the development of ITS. Another point of relatedness is the application of logic to both pedagogy and technology. Logic which serves as a representation of knowledge on which AI systems are built are found to be exploitable for language learning. Another point of comparison is the common emphasis on teaching through interaction. To sum up, knowledge based systems can perform the functions of intelligent help, assessor, advisor and tutor - the functions expected of a teacher in the classroom.

Barring these conceptual relations, many AI characteristics are ideally suited for language learning. The use of declarative languages, providing viable options, handling natural language queries, learning from examples and precedents and above all the use of creativity are some of the AI characteristics which can be related to the salient features of ELT pedagogy.

There are some common areas of interest in ELT and AI like problem solving, inference making and blackboard architecture. While establishing the relationship between the two, certain measures regarding the applicability of AI to language learning have been illustrated.

In an attempt to study the exploitability of AI's inherent ability to make inferences and the importance of inference making as a higher reading skill, an experiment with an ICALL program INVESTIGATOR has been described in detail.

The experiment with INVESTIGATOR at the secondary level has shown that it is possible to develop problem solving skills using AI as an alternative and effective approach. But a lot of planning and studying of
students' attitudes, a psychological understanding of the mental process of problem solving and inference making and a more exhaustive rule system are required to achieve optimum results. It is being reiterated that the experiment is only a pilot study. It is only a beginning in an attempt to create a parallel learning process to the traditional classroom teaching concentrating on the development of inference making, a neglected but relevant skill for which the teacher cannot allot time in the class.

The second experiment at the tertiary level merely translates the prescribed text to a program. The important AI technique employed to evaluate learner's performance is the intelligent search. The search being efficient and accurate, it provides an opportunity for self evaluation. Reading is an independent activity and the skill as a whole has to be developed through practice by the reader. The teacher can only help the learner in providing strategies. Ultimately, it is the reader who has to be able to read efficiently on his own. Thus the use of ITS to foster independent learning activities is suggested.

ICALL as an emerging discipline cannot be discussed in isolation from CALL which forms a part of ELT. The pros and cons of including ICALL in the ELT curriculum have been weighed.

7.2 FINDINGS OF THE STUDY

The clear and obvious relationship between AI technology and ELT pedagogy has been established in Chapter IV. The salient features of AI have a marked relationship with a few tactics' necessary for promoting reading efficiency. ICALL programs can thus be designed exploiting these AI techniques to improve one or more of the reading skills.
The hypothesis taken up for investigation has necessitated this study to prove - both theoretically and experimentally that ICALL programs can be used to assist language learning just as classroom teaching does. As the study was restricted to the development of reading proficiency which ranks uppermost among other language skills, attention has been bestowed upon those reading skills for which the features of AI can be used.

Problem solving and search, inference making, predicting, pattern matching, syntactic and semantic parsing, tutoring through drill and practice, and systems based on knowledge representation are features which not only differentiate ICALL from conventional CALL but are also features that are unique to AI that are exploitable for teaching reading.

The efficiency of AI in facilitating the development of certain reading skills at the secondary and tertiary level has been demonstrated by way of conducting two experiments - one involving inference making, a mental skill and the other dealing with drill and practice - a mechanical skill.

The ability to make inferences, in other words to understand all that is not explicitly stated and the implied meaning of the author based on the hints found in the text is an essential skill for learners at the secondary and tertiary level. This skill helps learners improve their reading comprehension in general, which is sadly enough not given adequate attention in the language classroom. Language teachers are chiefly preoccupied with the teaching of the traditional aspects of reading such as grammar and vocabulary, devoting thereby little or no time for the teaching of this skill. Inference making by itself is an independent mental activity of an individual. In a classroom, individualized attention with a focus on the
development of this skill is practically impossible given the large number of students in classes in India.

The assistance of AI is immense in facilitating the development of this skill in learners because, it helps overcome some of the problems briefly stated above. AI's inherent ability for inference making is a definite advantage because it cancels out the need for developing a system for making inferences using non AI languages like C for instance. This must be exploited for developing sophisticated ICALL programs to develop the reading comprehension skill of inferring. The first experiment INVESTIGATOR designed for secondary level learners illustrates that ICALL is suitable for making learners understand inference making with specific reference to detective stories.

Higher level exams meant for tertiary level learners such as GMAT, TOEFL, etc test reading skills such as predicting, skimming and scanning which are rarely given importance in the language classroom. Barring a few educational institutions in the country where the communicative methodology of teaching is in implementation, most of the college courses (i.e. the undergraduate General English Course) do not focus on the development of these skills. The ability to read and comprehend rapidly, it is assumed, is inherently developed in the learner by the time he/she completes the two year or one year English course as the case may be.

The second program PREDICTnSCAN designed for tertiary level learners, focuses on self-instruction through drill and rightly so because, at the tertiary level learners need to be given more freedom and must be made to take on responsibility for their learning. The intelligent search technique used in the program can therefore be utilised not only for the teaching of rapid reading techniques but can also be adapted for developing other
reference skills. The search technique is also an advantage for self evaluation.

An important clarification that needs to be made at this juncture is related to the use of the term Artificial Intelligence in language teaching and the furore it created in language teaching circles when AI made its advent in the seventies. Those who are opposed to the use of ICALL overlook the dual function that ICALL can play—that of complementing and supplementing the language teaching methods and materials. ICALL programs serve as an ideal complement to the classroom methods of developing readings skills. They also as a supplement to materials used for teaching. The idea that AI could ultimately replace the human teacher was unacceptable to many simply because machines cannot be called 'intelligent' until they are able to generate new knowledge as well as adapt themselves to the changing situations in the classroom, rather than carry out perfectly what they are programmed to do.

Further, the term Artificial Intelligence, most teachers feel, is in contrast to the natural intelligence of a human being because, AI implies that human intelligence in its entirety could be simulated using AI.

But only certain aspects of human intelligence can be simulated using computers. To make a computer exhibit various attributes of intelligence different systems of AI have to be used. Therefore, rather than using the term Artificial Intelligence which is a misnomer so far as language teaching is concerned, either the expression Aspects of Intelligence or Attributes of Intelligence should be used because they convey aptly the concept of intelligence endowed with the computer and confirm the fact that only aspects or parts of human intelligence can be simulated. Human intelligence can never be imitated by a machine in entirety.
It is no exaggeration to state that reading from ICALL has revolutionized the concept of reading. Unlike reading from books which is sequential, reading from ICALL makes the interactive mode of reading more successful. The interactions between the reader and the writer is enhanced by knowledge based systems.

7.3 SCOPE FOR FURTHER STUDY

Since the present study has intended to formulate a theoretical base relating ELT pedagogy with AI technology, experiments conducted in this regard, serve mainly as pilot studies. For instance, how best PREDICTnSCAN can be further developed to act as an ITS is an important area of investigation.

This will act as a fillip to the students of Engineering and Technology to improve their reading efficiency as the materials selected for reading are carefully chosen and graded as part of the Overseas Development Authorities English Language Teaching Project carried out at the Humanities department of Anna University. The materials available as English for Engineers (the English Textbook prescribed for I year B.E./B.Tech.) was born out of a research project conducted by a team of ELT experts. Hence the reading materials can be directly built into an ITS.

ICALL programs for developing higher order reading skills like inferring, critical appreciation, evaluating etc can be built using efficient Expert Systems. The inclusion of graphics can greatly enrich and enhance language learning.

Further, whether programs should concentrate only on one reading skill or whether it is possible to develop Knowledge Based Expert Systems...
that can be used to learn related skills can be taken up for future research. The most important advantage of ICALL over conventional CALL is its natural language user interface. Unlike CALL programs which demand programming knowledge on the part of the learner, ICALL can use a natural language interface in English between the machine and user. Earlier if learners had to learn from CALL they had to be students of computer science and language. This put an additional burden on the learners of language creating a psychological apprehension in learners who were not bright students in computer science. The use of AI has changed this scene for the better, thanks to the increasing research activities in natural language processing using computers. Consequently, ICALL offers a lot of scope for effective language learning without demanding any knowledge of programming on the user's part.

The concept of ICALL's ability to provide intelligence which is not possible in ordinary CALL has rich potential for further exploration. Intelligence here means

1. The computer knows the subject it is handling
2. It can provide freedom to the learner by not fixing the responses as in CALL
3. It can give explanations at any stage of the program easily
4. It can anticipate and predict even in case of incompleteness and uncertainty
5. It can make decisions
6. It can analyse errors more intelligently
7. It can search for information
8. It can be creative.
It can be seen that each aspect of intelligence yields itself to further investigation.

The ITS is a sophisticated version of the age old drill and practice routine. But its capability for interaction is superior to CALL's which merely stated whether the answer was correct or incorrect. In CALL there is only one-way learning, the learner learns from the computer. In ICALL, learning can be two-way i.e. the learner can learn from the computer and the learner can learn by teaching the computer. An ITS that enables the learner to add information to its knowledge can make the learning process an invigorating experience.

The use of AI for language learning is not without its limitations. A major difficulty in AI research which is true of ICALL as well is that it concentrates so much on specific problems that any attempt to attain more universal solutions is almost impossible. ICALL research may build narrow knowledge domains making generalisations and learning difficult. Moreover the methodology adopted to teach a specific problem may not be related to a global or common intelligence required to solve a class of such problems of which the specific task is just one member. For example, if a problem for problem solving involving inference is designed for a particular reading aspect, it cannot be duplicated for another similar problem solving activity. This limitation has to be overcome by making reading teaching using ICALL more versatile. The need of the hour is for the computer programmer and ELT expert to work together harmoniously.

7.4 ICALL IN INDIA

In India, where millions are illiterate, where schools have no basic amenities like classrooms and blackboard, does CALL have a place at all?
There is no denying the fact that illiteracy is rampant and the masses are going without basic education. But this should not encourage the educationists to take a complacent stand regarding CALL. There is another side to the Indian education scene. Computers are introduced in schools right from the fourth standard which means the argument that computers are expensive and are not economical for the language classroom does not hold water. Computers are already available in the school. An astute administration that provides for judicious time-sharing is a simple solution for the implementation of CALL.

Why do we need CALL in the first place? It is very easy to argue against CALL, dismissing its importance altogether. It is extremely important to take cognisance of the theory that education has to be in phase with technology. If research shows that the computer is an invaluable tool for language teaching, an open minded acceptance and implementation of CALL will be in the right spirit. Computers must be an inherent part of the educational system in India.

The major problems that may be encountered if ICALL is taken up for research in India is enumerated below

1. AI has not yet caught up in a big way in the software sector or the educational sector in India. Only institutions devoted to AI research are making major pathways in AI like the Centre for Artificial Intelligence at Coimbatore and the computers science departments of universities. But the awareness about AI is less than the awareness about computers in general.
2. Access to computers is limited in the educational arena in India even though India is among the top software exporters in the world.

3. Collaborative work between language teachers and computer programmers might face difficulties in being realized. The Govt of India will have to set up a CALL committee and hire computer programmers by paying them handsome salaries. Otherwise CALL research may never take off in India.

4. Convincing the language teaching fraternity of the significance of CALL is an important issue. This researcher found the attitudes of language teachers in about half a dozen randomly selected schools in Madras very encouraging without exception. This can be attributed to the growing awareness of computers. Instilling confidence in the language teachers to handle CALL classes should be given priority before the inclusion of CALL in the language curriculum.

5. The most serious of all problems would be building an infrastructure for good evaluatory programs for CALL. As there are few experts in India who are familiar with computer programming and the principles of language teaching, we can take additional help from CALL experts outside India.

The Ministry of Education in India is faced with more serious problems of illiteracy, high drop out rates, lack of infrastructural facilities and the like to sit up and take notice of a relatively less priority issue in education like CALL. Though this is understandable, it is the proposal of this study that we make an earnest beginning in including CALL in our
curriculum. With giant strides being made in CALL-related education in developed countries, we cannot afford to be left behind. It is prophesied that the new economic liberalisation policies of India will promote greater availability of funds for education at the school and college levels.

A possible direction forward would be the introduction of a library of CALL software in the language department. Students can be allowed to borrow from it during their free hours or even be permitted to take it home if they have access to a computer. The teacher can direct the student before handing over the CALL package. If the student faces any problem, he can clarify his doubts in school the next day. This will make learning more experimental and less regimental.

It is to be pointed out that India is twenty five years behind the US and the UK in the use of computers for language learning. It is time we made a constructive beginning in the use of computers in the language curriculum. Computer developments have transformed the mode of education and the use of multimedia has an important role to play in our country where the concepts of open universities and distant education are fast catching up.

Multimedia is any combination of text, graphic art, sound, animation and video delivered by computer or other electronic means. The use of CD ROMS in multimedia is the most cost-effective distribution medium for storage and retrieval. Multimedia will provide radical changes in the next century as students can go beyond the physical confinements of the classroom, enriching their learning experience. Whether it will replace the teacher, only time will tell but there is no doubt that the teacher will become more of a guide and mentor in the multimedia context. "Interactive multimedia systems promise to revolutionize education. In the future, it will
be possible for people to learn anything, anytime, anywhere\textsuperscript{1}. The use of multimedia through networks will destroy distances. The use of graphics, sound and video is bound to convert education into edutainment.

Another important development in the area of AI is hypertext. Hypertext is a potential solution to problems that involve voluminous densely cross-referenced databases that must be searched by many different people attempting to retrieve highly divergent types of information. The use of AI in hypermedia is all set to revolutionize the concept of reading. Reading can no more be associated with sound-sense-meaning association of words to text. Reading is going to be more exciting and multifaceted. It will involve search, reading the same information in different ways, option of linking one information to another and will throw up opportunities to learn by making errors.

Hypermedia fiction presents the opportunity for accessing information that incorporates multiple views and dimensions. The reader can be allowed to decide how the story develops. For example, while using interactive fiction programs readers by becoming actively engaged can carefully judge, interpret and even create. This augurs well for a new breed of developmental theory shifting the concern of reading to "how to create in the young an appreciation of the fact that many worlds are possible, that meaning and reality are created and not discovered, that negotiation is the art of constructing new meanings by which individuals can regulate their relations with each other\textsuperscript{2}. This will make the concept of linear reading from a book (ie. moving sequentially from one page to the next) appear

\begin{thebibliography}{9}
\end{thebibliography}
primitive in comparison with the interactive reading using AI. The use of AI will be able to make the interactive model of reading possible as an alternative to classroom training.

Thus, much remains to be done and it is heartening to note that of late computer studies are becoming very popular among Indian youth. The importance of computers and the multiple ways and means of using computer developments are being mastered by our graduates as seen from the fact that they gain easy entry in the computer related avenues of employment.

Since learning the English language is basic to understanding and pursuing studies in other disciplines, studies in ICALL to develop study skills in English is both a logical extension to classroom teaching and in tune with the present era of advancements in educational technology.