COMPUTER ASSISTED LANGUAGE LEARNING (CALL)/COMPUTER ASSISTED INSTRUCTION FOR ENGLISH LANGUAGE TEACHING (CAI)

Computer Assisted Language Learning (CALL) is an approach to language teaching and learning in which computer technology is used as an aid to the presentation, reinforcement and assessment of teaching-learning material, usualyincludimng a substantial interactive element (Bryam,2004).

Warschauer(1996) divided the development of CALL into three stages, each corresponding to a certain level of technology and specific pedagogical practices. These are –

i. Behavioristic CALL
ii. Communicative CALL
iii. Integrative CALL (Multimedia and Internet)

- **Behavioristic CALL** :

Behavioristic CALL is formulated by the dominant behavioristic theories of learning preferred by Skinner and the technological frontiers of computers from the 1960s to early 1980s. CALL programs presented a stimulus to which the learner provided a response. Initially both could be done only through text and the computer could analyze errors and provide feedback. More sophisticated programs were developed later that reacted to the mistakes made by the students by branching out to HELP screens and Remedial activities. Though such programs and their underlying pedagogy still exist today, a rejection of a greater part of the behavioristic approaches to language learning and an advancement in sophistication of computer technology have opened up new possibilities for CALL.

- **Communicative CALL** :

Communicative CALL is based on the communicative approach that gained prominence in the late 1970's and the 1980's. In the communicative approach the focus is on using the language rather than analysis of the language, teaching grammar implicitly. The first CALL software provided skill practice, though not in a drill format. For instance, paced reading, text reconstruction and language gains were provided though the computer remained the tutor. The computers provided context for English language use to the students, like asking for directions to a place. However this approach has been criticized for using the computer in an ad hoc and disconnected manner for marginal rather than central aims of English language teaching.

- **Integrative CALL** :

It is also called Explorative CALL. Started in the 1990's the Integrative/Explorative integrated the teaching of language skills into tasks or projects. It also integrated multimedia technology (providing text, graphics, sound and animation) and computer-smediated communication. Computer, instead of being used for drill and tutorial purposes, now became a medium for extending education beyond the classroom and reorganizing instructions.

Blin (2004) presented the following table as a summary to understand the various stages of CALL in relation to the learner autonomy.

CALL stages and the potential for learner autonomy

Stage (Warschauer& Healy, 1998)	CALL applications and technology	Potential for learner autonomy (Benson, 2001)
Behaviouristic CALL	Drills, vocabulary and grammar	Control over pace of learning; Control over mode (e.g. instruction, practice or testing).
Communicative CALL	Text reconstruction, games, simulations (problem-solving, cognitive engagement, spoken communication with peers)	Control over path taken
	Word-processors, desktop publishing packages, concordancers and databases	Control over text creation and interpretation
	(Computer tool used to facilitate linguistic processes involved in achieving nonlinguistic goals or to achieve linguistic goals that could not otherwise easily be achieved)	Control over process of learning; Development of metacognitive skills and metalinguistic awareness (i.e. cognitive and metacognitive autonomy)
Integrative CALL	Multimedia, hypermedia and interactive technologies promoting integration of skills (CD-ROMs)	Control over the selection of materials and over strategies of interpretation
	(Rich linguistic and nonlinguistic input, new language presented through a variety of media, branching options)	
	Internet: email, online discussion, web authoring	Control over access
	Large collaborative projects (opportunities for collaborative learning)	Control over learning content; Control over interaction

Warschauer's three stages of CALL

Stage	**1970s – 1980s: Structural CALL**	**1980s – 1990s: Communicative CALL**	**21st Century: Integrative CALL**
Technology	Mainframe	PCs	Multimedia and Internet
English-teaching paradigm	Grammar-translation and audio-lingual	Communicate language teaching	Content-Based, English for Specific Purposes (ESP)/ English for Academic Purposes (EAP)
View of language	Structural (a formal structural system)	Cognitive (a mentally constructed system)	Socio-cognitive (developed in social interaction)
Principal use of computers	Drill and practice	Communicative exercises	Authentic discourse
Principal objective	Accuracy	Accuracy & Fluency	Accuracy, Fluency & Agency

(Warschauer, 2000)

CALL programs can be used in many ways for teaching English language through literature in the class. Some of the popular theories are discussed below.

Davies and Higgins (1985)identified the following uses of the CALL programs:

- Gap-filling exercises and Cloze Tests
- Multiple-choice exercises
- Free-format exercises
- Tutorial programs
- Re-ordering: Word Sequencing
- Simulations and Games

Jones and Fortescue (1987) discussed application of CALL programs in promoting –

- Grammar
- Vocabulary
- Reading skillshite
- Authoring programs
- Writing
- Oral skills
- Listening skills

Hardisty and Windeatt(1989)classified the CALL programs into three basic types depending on the application of computer technology to language learning in different context and situations. These are –

- School programs: exercises involving gap-filling, multiple-choice, sequencing, matching, total text reconstruction.
- Office programs: word-processing, database, DTP, communications, spreadsheets.
- Home programs: adventures and simulations.

With the advent of blogs, social networking sites, podcasting, virtual worlds, interactive whiteboards and smartboards, CALL types were further modified. Davies, Walker, Rendall& Hewer (2011) classified computer assisted language learning in the following manner:

i. Dumb CALL (1970s to 1980s): According to Davies, Walker, Rendall& Hewer (2011) the term dumb is used because at this time computers did not offer sound or video. These computers did not even have the colour display, which today even mobile phones can boast off. These computers displayed their text in monochromes.
ii. Multimedia CALL (1990s to present day): Since 1990s computers were provided with Sound Cards which allowed the computer to play & record audio. The quality of video and display improved considerably and computers were designed with CD-ROMs that store more data than earlier secondary storage devices like the Floppy Discs.
iii. Web CALL (1993 to present day): With the advent of Web 2.0 CALL underwent a major paradigm shift with blogs, podcasts, social networking sites and innovative uses of internet for language learning.

Presentation of Information in the CALL Software

CALL software aims to help the learner learn a language and presentation of information to the learner is thus structured, systematic and has specific features. The information provided to the learner by the CALL software are basically of four types, namely,

i. Textual information
ii. Graphical information
iii. Multimedia information
iv. Help options

Consistency in the presentation of the information to the learner is important. Whatever technique the CALL developers choose to present information must be consistent throughout the program to make the learner comfortable in the CALL learning environment. Grabinher in *Educational Technology Research and Development* (1993) and Heines in *Screen Design Strategies for Computer Assisted Instruction* (1984) used the term *functional areas* for a programme as a strategy to ensure consistent screen design.

1. Textual Information : Text is the most common format that is used to present information in the CALL program. Textual information in the CALL programme has certain fundamental features. They are:

i. The font of the text is clear and legible
ii. The line spacing and space between paragraphs are adequate to aid on-screen reading of texts
iii. The font of the text gels with the background
iv. Main points and important aspects are highlighted
v. Animations used to present textual information do not make the text cumbersome as the learner might lose interest if the task of reading becomes difficult
vi. A very large chunk of information is not presented since in such cases the act of scrolling becomes a mandate and learners generally tend to get tired and give out important information in the process.
vii. Appropriate chunking of information on the basis of size, concept and the level of the learner, is significant
viii. Reder& Anderson (1980) demonstrated that readers learn the main points of a textbook better from summaries of the main points than from the text itself. So the txtual information provided by CALL is systematic and precise.
ix. The language in the textual information is age appropriate to facilitate learning and usually possess absolute clarity in concept
x. The content explicitly shows the transitions from one idea to another to maintain continuity and relevance

2. Graphical Information

Two major aspects with regard to graphical information in a CALL software are –

i. The purpose
ii. The type that is being used

Allessi&Trollip in *Computer Based Instruction: Methods and Development* (2001) identified three primary usage of graphics during the presentation of a CALL programme. These are

i. Graphics in CALL programme used as the primary information
ii. Graphics in CALL used as an organizer
iii. Graphics in CALL used as cues

The graphical information used for CALL can be of various types, namely,

- Simple line drawings
- Schematics
- Diagrams
- Photographs
- Animated images
- Three dimensional images
- Artistic drawings
- Maps
- Timelines
- Flowcharts

Important features of use of graphics in the CALL software are as follows:

i. The graphical content is selected and used in a way consistent with the age and culture of the learner
ii. The graphical information is integrated into the content and augments the learning process of students
iii. The graphics are selected in such a way that they do not distract the language learner
iv. The graphics are incorporated after rigourous editing so that the learner is not confused with excessive details
v. Animations are integrated in a way that assists the learner
vi. In most cases the CALL programmes provide controls that helped the ;earner to stop animations at his/her wishes

3. Multimedia Information

Multimedia learning is based on the 'Theory of Multimedia Learning' (Mayer & Moreno, 1998; Mayer, 2001). Multimedia refers to the presentation of materials using both words and pictures. The multimedia messages integrated into CALL programmes are basically classified in terms of the following:

i. **Delivery media** – involves two or more delivery devices. For example, computer screen and amplifier speakers, projectors and the teacher's voice.
ii. **Presentation mode** – involves both verbal and pictorial representations. For example, on-screen text and animation with sounds, printed texts and illustrations
iii. **Sensitive modalities** – involves auditory and visual modes. For example, narration and animation, lecture and slides

The process of multimedia learning with the help of CALL may be viewed as information acquisition, in which the multimedia messages serve as information delivery vehicles, or as knowledge construction, in which multimedia messages serve as aids in effective comprehension.

Cognitive Theory of Multimedia Learning

Multimedia messages in CALL are designed in light of how the human mind works in order to lead to meaningful learning. A cognitive theory of multimedia learning assumes that the human information processing system includes the dual channels for visual/pictorial and auditory/verbal processing, though each channel has limited capacity for carrying out a coordinated set of cognitive processes during learning. Based on these steps of multimedia integration into the CALL programmes have evolved. The major steps involve

i. selecting relevant words from a text for presentation
ii. highlighting relevant images
iii. organizing selected words into a coherent verbal representation that accompanies the visual representation
iv. organizing the selected images into a coherent visual representation
v. a planned integration of the visual and verbal representations with the learner's prior knowledge

Principles of Multimedia Learning Used in CALL

The cardinal principles of multimedia learning used in CALL are as follows:

i. Multimedia principle – students learn better from words and pictures than from words alone
ii. Spatial contiguity principle - students learn better when corresponding words and pictures are presented near than far from each other on the page or screen
iii. Temporal contiguity principle - students learn better when corresponding words and pictures are presented simultaneously than successively
iv. Coherence principle - students learn better when extraneous materials is excluded rather than included, since such materials compete for cognitive resources in the working memory and diverts attention that can disrupt the process of organizing important data
v. Modality principle - students learn better from animation and narration than from animation and on-screen text, i.e. students learn better when words in a multimedia message are presented as spoken texts rather than as printed text. CALL integrates audio clips accordingly.

vi. Redundancy principle - students learn better from animations and narrations than from animation, narration and text. This principle is consistent with the capacity-limitation hypothesis, in which, visual working memory becomes overloaded with the concurrent presentation of animation and on-screen text. CALL programs are created accordingly.

vii. Individual differences principle – Design effects are stronger for low knowledge learners than for high knowledge learners, and for high spatial learners than for low spatial learners.

CALL programs are designed and multimedia is integrated into them on the basis of the principles discussed above. Program icons and navigation patterns are maintained at an optimum level and multimedia contents are kept short and well integrated in the total CALL program. Besides, irrespective of whether it is an audio or video clip, well planned controls are provided to move forward, backward, replay, start or pause the clip at will and according to the individual learner's needs. Audio clips are also well pitched.

Cognitive Processes Involved in Learning Language with the Aid of Multimedia in CALL

For effective integration and use of multimedia for CALL it is essential to allow learner autonomy.CALL provides a wide variety of tools and tracks from which learner can select relevant information on the basis of their own needs, objectives and learning styles (Vanparys&Baten, 1999). The tasks designed in CALL focuses on the learner and the main task is broken into smaller simpler tasks based on various cognitive processes of the learner as identified by J.L. Plass in 'Design and Evaluation of the User Interface of Foreign Language Multimedia Software: A Cognitive Approach' (1998). An example of use of CALL for teaching English Grammar to students of classIX, in accordance with the cognitive processes is given below:

Cognitive Process	Description	Explanation
Interpreting the Performance Goal	Performance goals are short term objectives that help a learner answers the question: "What do I wish to learn this CALL software?" Performance goals help CALL developers identify the various content concepts that they wish to incorporate so as to help the learner learn the language.	In the CALL Grammarsoftware, the performance goals could be learning about models; learning how to convert active sentences to passive sentences; learning the correct usage of preposition at; differentiating between the first person and third person pronoun usage.

Encoding or retrieving task-relevant declarative information	Once the performance goals are set by the CALL developers, the learning activities are designed. It is up to the user of the CALL software to decide how to attain the objectives that software aims to fulfill. The CALL tasks are structured in a manner that the user has learner control.	Continuing from the previous part, if the learner wishes to learn about Active and Passive sentences, she can either go directly]to the concept of Active or Passive sentences, or she can view the software from the beginning, or she can revise the concept of verbs, types of sentences, types of tense and then move ahead to learn about Active and Passive voice. This freedom needs to be structured into the CALL environment.
Compiling and executing procedural knowledge	Procedural knowledge is the knowledge exercised in the accomplishment of a task; it is about 'knowing how' to perform certain activities (Bruning, et al, 1999)	Once the language learner has decided how she would begin to use the CALL Grammar programme, she begins learning the various ways to accomplish tasks – like, where to read for more information on concepts, how to move forward, how to change between concepts, how to solve the various exercises that come within the Grammar programme. Very unconsciously the language learner is learning the various ways by which she can accomplish tasks within the CALL for Grammar programme.
Cognitive Process	Description	Explanation
Monitoring performance	A very important aspect of learning is to monitor or see for oneself what all has been learnt. In normal classroom situations we do this in many ways: we have tests, we have discussions, we have homework, we have examinations.	In case of the CALL for Grammar programme, the monitoring performance can be done either by self – or by the programme itself. Self monitoring is done on the basis of the feedback received while perusing the CALL material, while there are sophisticated CALL programme that can monitor aspects, like, scores in tests, the learning curve, the movement across concepts.
Identifying sources of error in performance	In formal learning environments, sources of errors are identified by the teacher while discussing or while examining the answers of the students. A language learner can also identify the source of error in	In the CALL Grammar environment, identification of the sources of error in performance is built in the courseware, where when the language learner attempts a question incorrectly,

	performance when she compares her language to that of her peers.	the computer is able to guide the learner.
Correcting errors in performance	In the classroom environment, remedial education in the form of learning material or extra time from the teacher would help correct errors in performance. Errors in performance can also be corrected when the language learner refers to the library, dictionary or any reliable resource.	In the CALL Grammar, errors in the performance can be corrected by providing enrichment material, or prompts that would help the language learner identify the mistakes and make the necessary amendments.

Help Options

Learners with varying levels of computer usage competency are exposed to CALL programmes and thus easy access to help options throughput the programme is important. Allessi&Trollip in *Computer Based Instruction: Methods and Development* (2001) distinguish between two types of help:

- **Procedural help** – it refers to the help regarding the operating system, changing volume and moving backward or forward. This should be available by clicking a help button.
- **Informational help** – this means the help with the content. This includes providing more examples, detailed descriptions, sample problems, solutions to problems etc. Glossaries, index and references are also a kind of informational help. Suitable icons may be used for the purpose and these icons should be consistent throughout the CALL software.

Factors for Success of CALL

A list of factors considered important for successful computer aided language learning have been proposed by Leiblum in *Computers and Education* (1979):

i. The use of CALL should be directed towards the solution of a real instructional problem.
ii. CALL should provide a unique solution to the problem and should score among the highest media forms selected through the media selection model (MSM).
iii. It must have the support of the institution or organization.
iv. The user audience should be clearly defined and their needs clearly identified.
v. It is preferable that the usage be spread over an extended period rather than a temporary ‘one-shot’ affair. This guards against disaster caused by system malfunction.

vi. It is preferable that the use of CALL programmes be made mandatory and not optional.

vii. The initiator and supporting faculty should express interest in evaluation procedures and maintain student performance records for success of CALL.

CALL in a Multimedia Language Lab

> Due to impact and influence of information technology on society and education, computer- assisted language learning is becoming the trend in foreign language teaching. Interactive computer network allows students to test the result of learning without the risk of being punished for any mistake. Learning does not have to be a pressure. Computer- assisted language learning can reduce the anxiety of students and turns out to be a positive side of learning.(Gates, 1977)

Language learning and teaching has experienced a major paradigm shift in today's world. Communicative language teaching and learning has gained prominence with the functional approach considered the best way to address the learner's diverse needs. To combine the CLT approach with a framework of CALL, computer simulation in the language laboratory seems to be the most effective strategy. Huang in "The Preliminary Study of The Indirect Use of Computer Simulation in EFL Teaching", a paper presented at the First International Conference of CALL, Taiwan, 1997 categorized computer simulations into two types, depending on their primary purpose i.e., the nature of computer-human interaction and the amount of control:

	Primary purpose	**Computer-human interaction**	**User control**
Instruction-oriented	Teaching& learning	Unbalanced	Limited
Fun-oriented	Motivational& entertaining	Balanced	Multiple

The instruction oriented computer simulation aims at teaching or helping the students learn a language. Naturally the primary function of such CALL software would be giving well planned, structured and organized instruction while the responsibility of learning rests with the learners. However the instruction-oriented CALL continuously monitors the learning of the students and checks whether they have successfully achieved the goal. The computer-human interaction in this case is not balanced as the users receive instructions passively and then respond, waiting for subsequent instruction from the computer. Thus the computer becomes dominant in te interaction and the user's choice is limited. All the available choices being predetermined and well planned, the user responses are also somewhat predictable. In such usage of CALL in the language laboratory the users are expected to accomplish a pre-set goal in learning and the computer simulation continuously guides the users in a certain direction.

On the other hand the primary purpose of fun-oriented simulations is to be both motivational and entertaining. Mechanical instruction in any particular subject is not the primary concern and this type of CALL usage in the language lab tends to motivate users to get interested in the simulation itself. The user has considerable degree of freedom and is given multiple choices for taking control. Each move of the user usually leads to another multiplicity of choices and even prompting of an unexpected response from the computer. Thus both the user and the computer share equal opportunities to receive instructions from and response to each other.

In a modern language laboratory both these categories of computer simulations are regarded as two ends of a continuum and both instruction-oriented and fun-oriented features are integrated in the CALL programmes of the lab. A typical language laboratory presents a great impact on the student teacher communication. Earlier this communication used to be blocked to some extent because of the layout of the lab that created considerable physical distance between the student and the teacher and tended to direct the communication process towards a one-way teacher to student communication. In a modern CALL enabled language laboratory the scenario has changed to a great extent and the communication between the students and the computer has become increasingly interactive. As opposed to a traditional classroom where the teacher had to urge his or her students to use their faculty of imagination and place themselves in exclusive situations, the CALL enabled laboratory offers the opportunity to visualize the situation. The software can create a virtual world that is very similar to the real world and the teacher, in this changed scenario, assumes the role of a coach or facilitator. The teacher orchestrates the flow of communication and serves the primary

function of a coordinator who coordinates the flow of communication between the teacher and the student as well as between the students and the computer. The communicative task in the CALL enabled language lab is rendered joyful and more effective through interactive games and activities. The fact that students can set the pace of their learning increases their motivational level. However both the teachers and the students need to be trained adequately and oriented properly with the necessary computer knowledge required for managing a conversation under the communicative framework in a CALL enabled multimedia lab as Allessi&Trollip (1985) warn us –

> Less threat and anxiety were as an advantage of simulations, but the opposite can also be true, because simulations call for intensive interaction among participants, and the results of decisions and suggestions a student may make are immediately apparent to participants. Simulations can be more threatening and more anxiety provoking than traditional lecture methods (p.185)