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Distance English Language Learning in Algeria: An Investigation of Students' Attitudes and Effectiveness of the Method. Case Study: 1st Year Mechanical Engineering Students at the University of Science and Technology, Oran

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Dedication

This dissertation is dedicated to the memory of my father Mr. IZIDI Abdellah.

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Abstract

This study aims at investigating students' attitudes as well as the effectiveness of distance English language learning in developing the academic achievements of mechanical engineering students in the four language skills: listening, speaking, reading, and writing. To this end, a comparative experimental design was chosen. Thirty volunteering students were assigned into three groups of ten students each. The groups received the same intensive ESP course presented through three different methods: (1) Traditional method; (2) Distance learning method (asynchronous delivered via email); and (3) Language lab method. Computerised self-designed pre-test and post-test were used to measure students' achievement before and after the intervention. In addition to the pre- and post-tests, a paper-based questionnaire aiming to measure students' attitudes, opinions, and preferences was administered at the end of the experience. The data collected were subject to a deep statistical analysis using SPSS version 20. The results of One-way ANOVA and Scheffé post-hoc post-test mean analysis showed statistical significant differences at 0.05 level in favour of the distance learning group in all four LSRW skills. In addition, the analysis of the questionnaire responses demonstrated that the mechanical engineering students have positive attitudes towards the distance learning ESP course implemented, but have negative attitudes towards both their prior distance learning experience and the traditional method they had been taught with. A further analysis of the questionnaire revealed that the mechanical engineering students prefer to be taught English with the distance learning method rather than the traditional method but they highly favour the language lab method over the other methods of instructions applied.

Keywords: Asynchronous, CALL, Covid-19 pandemic. Distance Learning, effectiveness, ESP, four skills, Language Laboratory, multimedia, ICT, students' attitudes.

Résumé

La présente étude a pour objectif d'investiguer les attitudes des étudiants ainsi que l'efficacité de l'apprentissage à distance de la langue anglaise pour le cas des étudiants de génie mécanique. Les compétences linguistiques étudié englobent l'écoute, le parlé, la lecture et l'écriture. A cet effet, une approche expérimentale comparative a été adoptée. Trente étudiants volontaires ont été répartis sur trois groupes de dix étudiants. Les groupes ont reçu les mêmes cours ESP d'une manière intensive. Les cours ont été présentés par trois méthodes différentes à savoir: (1) la méthode traditionnelle, (2) la méthode d'apprentissage à distance (asynchrone livré par e-mail) et (3) la méthode d'apprentissage utilisant un laboratoire de langue. Un pré-test et un post-test informatisés ont été conçus pour mesurer le rendement des étudiants avant et après l'étude. À la fin de l'expérience, un questionnaire visant à mesurer les attitudes, les opinions ainsi que les préférences des étudiants a été proposé. Les données recueillies ont fait l'objet d'une analyse statistique approfondie moyennant le logiciel SPSS version 20. Les résultats de l'analyse de la variance simple (ANOVA One-way) et de Scheffé post-hoc du post-test montrent une différence significative à un seuil de 0.05 en faveur du groupe enseigner avec la méthode d'apprentissage à distance au niveau des quatres compétences linguistiques. L'analyse des réponses au questionnaire a montré que les étudiants de génie mécanique ont des attitudes positives envers la session l'apprentissage à distance de l'anglais pour des fins spécifiques mis en œuvre. Cependant, les étudiants ont exprimé des attitudes négatives à l'égard de leur expérience antérieure d'apprentissage à distance ainsi qu'envers la méthode traditionnelle avec laquelle ils avaient été enseignés. Une analyse plus approfondie du questionnaire a révélé que les étudiants de génie mécanique préfèrent être enseignés l'anglais avec la méthode d'apprentissage à distance plutôt que la méthode traditionnelle, mais ils privilégient fortement la méthode du laboratoire de langue par rapport aux autres méthodes d'enseignement.

Mots clés : Anglais à des Fins Spécifiques, asynchrone, attitudes des étudiants, Enseignement Assisté par Ordinateur (EAO), laboratoire de langue, efficacité,

l'apprentissage à distance, multimédia, Nouvelles Technologies d'Information et de Communication (NTIC), Pandémie de Covid-19, quatre compétences linguistiques.

ملخّص البحث

تهدف هذه الدّراسة إلى التّحقّق من توجهات الطّلبة من جهة وكذا مدى فاعليّة طريقة تعلّم اللّغة الإنجليزيّة عن بعد في تطوير التّحصيل الأكاديمي لطلبة الهندسة الميكانيكيّة وذلك على مستوى المهارات اللّغوية الأربع : الاستماع، المحادثة، القراءة و الكتابة. و من أجل تحقيق هذا الغرض ، استخدم التّصميم التّجريبي المقارن. ثلاثون طالبا متطوّعا تمّ توزيعهم على ثلاث مجموعات متساوية. تلقّت المجموعات الثّلاث نفس الدّورة التّعليمية المكثّفة في مجال اللّغة الإنجليزيّة للأغراض الخاصّة لكن كلّ مجموعة درّست بطريقة تعليميّة مختلفة: (1) الطّريقة التّقليديّة (2) طريقة التّعليم عن بعد (تسليم الدّروس الغير متزامن عبر البريد الإلكتروني) (3) طريقة المخبر اللّغوي. تمّ استخدام اختبارين محوسبين قبلي و بعدي، ذاتيّا التّصميم وذلك من أجل اختبار التّحصيل اللّغوي للطّلبة قبل وعقب الدّورة التّعليمية. بالإضافة إلى الإختبارين المحوسبين ، وعند انتهاء الدّورة التّعليميّة, قدّمت استمارة ورقية تهدف إلى قياس توجّهات، آراء و تفضيلات الطّلبة. تمّ إخضاع البيانات المتحصّل عليها إلى تحليل إحصائي معمّق باستخدام برنامج SPSS النّسخة 20. أظهرت نتائج تحليل المتوسّط الإحصائي بالنّسبة للاختبار البعدي وذلك من خلال نتائج معامل شيفيه و تحليل التّباين البسيط فروق دالّة إحصائيّا عند مستوى الدّلالة (0.05) لصالح المجموعة التّجريبيّة التي تلقّت الدّورة التّعليمية عن بعد وذلك على مستوى جميع المهارات اللّغوية الأربع. بالإضافة إلى ذلك، فقد أظهر تحليل بيانات الاستبيان أنّ لدى طلبة الهندسة الميكانيكيّة اتّجاهات إيجابيّة نحو دورة تعلّم اللّغة الإنجليزيّة للأغراض الخاصّة التي قدّمت عن بعد ولكن هؤلاء الطّلبة أظهروا مواقف سلبيّة تجاه كلّ من تجربتهم السابقة في التّعلّم عن بعد وكذا الطّريقة التّقليديّة التي دُرّسو بها. فضلا على ذلك، أظهر تحليل إضافي للاستبيان أنّ طلّاب الهندسة الميكانيكيّة يفضّلون أن يتمّ تدريسهم اللّغة الإنجليزيّة بطريقة التّعليم عن بعد بدلاً من الطّريقة التّقليديّة لكنّهم يفضّلون وبدرجة أكبر طريقة المخبر اللّغوي على باقي طرق التّعليم الأخرى المطبّقة.

الكلمات المفتاحيّة: إتّجاهات الطّلبة، التّعليم عن بعد، الفاعليّة، اللّغة الإنجليزيّة للأغراض الخاصّة، المهارات اللّغويّة الأربع، الوسائط المتعدّدة، تكنولوجيا المعلومات والاتصالات، جائحة كوفيد-19، طريقة تعليم اللّغة بمساعدة الحاسب الآلي، غير متزامن.

Lists of Abbreviations and Acronyms

3D :	Three-Dimensional
4G :	Fourth Generation
5G :	Fifth Generation
AA:	Audio Active
AAC:	Audio Active Comparative
ADSL:	Asymmetric Digital Subscriber Line
AI:	Artificial Intelligence
AIV	Automated Identity Verification
AP:	Audio Passive
CAI:	Computer-Assisted Language Instruction
CALL:	Computer-Assisted Language Learning
CLT:	Communicative Language Teaching
CMC:	Computer-Mediated Communication
CPU	Central Processing Unit
DVC:	Digital Video Conferencing
EAP:	English for Academic Purposes
EBE:	English for Business and Economics
EFL:	English as Foreign Language
EGP:	English for General Purposes
e-learning:	Electronic learning
ELT:	English Language Teaching
e-mail:	Electronic mail
EOP:	English for Occupational Purposes
ESL:	English as Second Language
ESP:	English for Specific Purposes
ESS:	English for Social Studies
EST:	English for Science and Technology
HDD	Hard Disc Drive
ICT:	Information and Communications Technology
IM :	Instant Messaging
LAN:	Local Area Network
Language Lab:	Language Laboratory
LMD:	Licence Master Doctorat
LMS	Language Management System
LSP:	Language for Specific Purposes
LSRW:	Listening, Speaking, Reading and Writing
MALL:	Mobile-Assisted Language Learning

ML	Machine Learning
OS	Operating System
PLATO:	Programmed Logic for Automatic Teaching Operations
RAM	Random Access Memory
SMS:	Short Message Service
SPSS:	Statistical Package for Social Sciences
TEAM:	Technology Enhanced Accent Modification
USB:	Universal Serial Bus
VoIP :	Voice over Internet Protocol)
VR:	Virtual Reality
WHO	World Health Organization
WWW:	World Wide Web

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General Introduction

General Introduction

Computers and the internet are considered among the greatest technological inventions of the twentieth century. Their impacts can be seen in every aspect of human's life, from social interaction to business transaction, from health care to entertainment. In fact, no civilised man can deny the importance of such ingenious inventions in facilitating people's modern life and shortening the distances between them through electronic telecommunications.

As any other domain, higher education has also been affected by computer technologies and the internet. In fact, the use of these innovations to support teaching and learning has recently become much easier and feasible which has led to their massive exploitation especially by the new and young generation. As a result, many universities and colleges in the developed countries started to adopt distance and online learning as part of their program to increase access to higher education. Indeed, the demand for the new mode of instruction has rapidly increased from learners worldwide and from all walks of life.

In the developing countries, however, many teachers are still afraid of applying computer technologies in their classrooms and prefer to rely solely on the traditional 'chalk and talk' methodology which has over the years proved its failure in achieving the desired outcomes. Accordingly, the situation in Algeria is far from being different. Although the Ministry of Higher Education and Scientific Research has showed a great interest in modern teaching methodologies by equipping several universities across the country with advanced language laboratories, the great majority of these facilities are either closed or not operating at all. This situation has led one to wonder what would possibly be the impact of these heavy-duty investments on the Algerian English language learners.

By the end of December 2019, the world has witnessed the emergence of a deadly and highly-contagious respiratory virus called Covid-19. The virus was first discovered in Wuhan – China then spread so rapidly throughout the world that in less than three months, precisely in March, 11th 2020, it was declared as a global pandemic by the

WHO (World Health Organization). In order to prevent the spread of the pandemic and reduce the number of casualties, individuals were ordered to stay home, all gatherings of more than ten people were prohibited to ensure social distancing. As a result, most colleges and universities in both developed and developing countries were forced to close their doors. The shift from traditional face-to-face classroom instruction to distance learning thus became inevitable since it was the only way for teachers to stay connected remotely with their students and ensure the continuity of the rest of the program. As a matter of fact, it seems that this transition was relatively smooth for developed countries (such as the Netherlands, Denmark, United States, Germany, United Kingdom, and Norway) that had already successfully implemented distance and online learning in their institutions prior to the Covid-19 pandemic. On the contrary, developing countries, like Algeria, that had failed to develop strategic plans for the crisis were not supposed to smoothly manage the shift towards distance learning as they had witnessed a lack of integration of modern technologies in their higher education system.

The objective of the present study is to examine students' attitudes as well as the effectiveness of distance learning on mechanical engineering freshmen's academic achievement in the four language skills: listening, speaking, reading, and writing.

To the researcher's best knowledge, at the national level, very few experimental studies have been conducted on the use of computer technologies in foreign language learning and no comparative experimental work has ever been done to examine the effectiveness of distance learning in improving students' four language skills. Indeed, this was one of the underlying motivations behind conducting the present research.

To achieve the purpose of this study, the researcher has chosen to employ a comparative experimental methodology as a starting point of the analysis because he believed that this model is the most appropriate one for evaluating effectiveness from an objective and scientific standpoint. Subsequently, a comparison was made between the achievements of three groups who had received the same intensive ESP course but presented through three different methods: (1) Traditional method; (2) Distance Learning method and (3) Language laboratory method. The experiment was performed in the

digital language laboratory facility at the Department of Mechanical Engineering USTO-MB Oran. The laboratory was acquired in 2012, but since then it has never been operational. It was the researcher's challenging duty to revive the facility first and then make use of it as a tool to assess the potential effectiveness of the three teaching methods applied.

The present study is guided by the three subsequent research questions:

1. What is the most effective method for improving the achievement scores of the Algerian mechanical engineering students?
2. Which language skills are mostly affected by the implemented teaching methods?
3. What are the attitudes of first year mechanical engineering students towards distance learning?

As tentative answers to the above research questions, we propose the following hypotheses:

1. Distance learning is an effective method in improving the Algerian mechanical engineering students' achievement scores.
2. Distance learning affects the development of EFL learners' four skills: listening, speaking, reading, and writing.
3. The Algerian mechanical engineering students have positive attitudes towards distance learning.

Aiming at examining the EFL students' attitudes as well as the effectiveness of distance learning in an ESP context, this research is an attempt to provide valuable data for the research community. The research paper is made up of a general introduction, four chapters, a general conclusions, appendices, and annexes. The first chapter provides a review of the existing and most recent academic researches related to effectiveness of CALL (Computer-Assisted Language Learning) and distance learning at both the national and international levels.

The second chapter is 'Theoretical Considerations'. A large part of it is dedicated to the different theoretical aspects pertaining to language learning in general. It presents

definitions of key concepts and basic language learning theories. The rest of the chapter deals with ESP, authentic material and attitudes.

The third chapter discusses some of the literature review relevant to the main areas of the present study. It proposes a rapid look at the nature, history, evolution and theories of distance education with special reference to computer technology. We predict that a better understanding of computer technology and distance learning will provide a cleared terrain for the reader.

The last chapter entitled 'Data Analysis and Interpretations' is completely devoted to the presentation of the experimental case study conducted in the Mechanical Engineering Department at the University of Science and Technology, Oran USTO-MB. It starts with the presentation of the current situation of English at the targeted department, and then it is followed by a description of the research methodology and the data collection procedures, after that it moves to the analysis of the data gathered and the presentation of the results. The chapter ends with the discussion of possible explanations for the results obtained in addition to some recommendations for future research perspectives.

Chapter One

Literature Review

Chapter One: Literature Review

1.1 Introduction

This chapter attempts to shed some light on the most closely-related research to the present study. It mainly focuses on previous studies on the effectiveness of CALL and distance learning. Such literature review is necessary to lay foundations and position one's work within the scholars' community. The chapter is composed of two major parts. The first part highlights previous international studies while the second one is limited to the previous studies conducted at the national level only.

1.2 Previous International Studies

Researches on the effectiveness of CALL and distance learning have been ongoing for decades but it was not until the early 1990s when multimedia was first introduced that studies began to provide quantitative evidence for the real potential impact of the new technologies on language teaching and learning.

A common and objective method of assessing CALL and distance learning effectiveness is through an experimental design in which subjects are randomly assigned to two or more groups. The experimental group receives a treatment with CALL or the distance learning method while the control group is taught using the conventional method, and serves as a comparison point. The subjects are usually evaluated before and after the experience and the results are subsequently analysed using statistical means.

In the following part, a selected number of recent experimental CALL and distance learning studies on effectiveness and which are related to the scope of the present study will be presented.

1.2.1 Previous International Studies on the CALL Effectiveness

Reinking and Rickman (1990) evaluated the connection between computer-mediated text and intermediate-grade students' reading comprehension and vocabulary learning. The subjects of the study consisted of sixty sixth-grade students attending a suburban public school in an upper-middle class community. They were divided into four groups. The first two groups read passages printed on pages accompanied by a standard

dictionary. The other two groups read the same passages on a computer screen that provided assistance with the meanings of the target words. At the end of the experiment, a vocabulary and a reading comprehension test was administered .The ANOVA statistical analysis of results showed statistical significant different in favour of the experimental groups. In other words, students who read the passages with computer assistance scored significantly higher on a vocabulary and reading comprehension test. The author concluded that computer-mediated text use increases comprehension and expand options for acquiring information.

Faid's (2007) study, which was conducted at the Egyptian university of Beni Suef, investigated the effectiveness of a self-designed and developed CALL application based on multimedia on fourth-year commerce students' writing skills. Eighty students were randomly assigned into experimental and control groups. The subjects were tested before and after the experimental period. The results of the test showed statistically significant difference between the mean scores of the experimental and control groups in the post writing test in favour of the experimental group. The study concluded that the multimedia software designed by the researcher proved to be effective in improving students writing skills.

Lakshmi and Sunder Reddy's (2015) study aimed at assessing the effect of CALL activities on English learners' academic listening skills. In this study, twenty ninth-grade students were randomly selected as a sample. The selected students were assigned to treatment and control group of ten students each. The experiment lasted six weeks during which the treatment group received training on some listening skills using a free software called *'ABA English'* while the control group received the same training using the conventional method. Students' listening skills were assessed before and after the experiment using a pre- and post-computerised test. At the end of the experiment, the results of both groups were compared. The study concluded that the CALL software proved to be effective in developing students' listening skills as well as increasing their confidence and motivation.

The study of Kayaoğlu et al. (2011) attempted to explore whether any difference exists between learning English vocabulary via animation and via traditional paper-based method. The study was conducted at Karadeniz Technical University - Turkey, with thirty-nine students at pre-intermediate level class. The subjects were randomly assigned to experimental and control group (n = 17 and n = 22, respectively). The control group was first allowed twenty minutes to complete a vocabulary test. Then, a text on water cycle was distributed to be read in ten minutes. At the end of the session, the same vocabulary test was administered for twenty minutes (It is worth mentioning that the teachers had no intervention in the teaching process). The experimental group had gone through the same procedure. The only difference was that students were supplemented with an animation on the water cycle topic. Results obtained from the pre-test and a post-test were statistically analysed in SPSS 16 (Statistical Package for Social Sciences). The researchers concluded that although there was no statistically significant difference between the post-tests of each group, there was an increase in students' scores in favour of the experimental group. The researchers added that relative positive attitudes toward learning with multimedia were observed.

Kim's (2012) research examined the effectiveness of incorporating CALL in instructing pronunciation to adult ESL (English as Second Language) learners. Two Korean male graduate students in science/engineering at a U.S. University participated in the study. They received twelve individual tutoring sessions using TEAM (Technology Enhanced Accent Modification) software in the span of approximately two months. Data from a direct observation, an oral interview, and a questionnaire measuring learning preferences were collected and analysed along with pre-test and post-test audio speech samples. The results of the data analysis revealed that both students made an overall improvement in their L2 pronunciation skills by using TEAM. It was concluded that TEAM, with its visual feedback capability, was proved to be effective in improving ESL students' pronunciation skills.

Rusanganwa's (2013) study investigated the effectiveness of CALL on technical English vocabulary retention. The study was conducted in Rwanda where textbooks and multiple computers are not available. The sample consisted of thirty-two undergraduate

students of physics divided into experimental and control group (n = 13 and n = 19, respectively). Students attended four weeks of a technical vocabulary course taught by two different ESP (English for Specific Purposes) trained science teachers. The experimental group was taught using multimedia presentations displayed on a single computer screen while the control group received the same lessons' content presented on a blackboard. At the end of the treatment, post-test scores of the two groups were statistically compared. The findings showed that the effect of multimedia on the recall of the concepts taught is large.

Ghaemi and Hosseini's (2014) study probed the effect of CALL on EFL learners at Qeshm International Incubator - Iran. In this empirical research a pre-test/post-test experiment/control group design was utilised and ninety intermediate students with an age span of twenty to thirty years old were selected as participants. The course material was available into two forms: a paper-based copy for the control group, and a CALL format that included video and sound clips, pictures, and interactive softwares for the experimental group. SPSS 12 statistical analysis results showed a significant difference in learning achievement between the experimental and control group. The results also showed that students who had higher computer skills and who spent more time using computers in language learning obtained more benefit from CALL. Moreover, CALL users had a positive attitude toward the CALL method and had a higher intention to use it in a future programme.

Tsai's (2012) study attempted to evaluate an ESP courseware instruction for semiconductor technology. The content of the courseware was designed to develop five skills (listening, speaking, reading, writing, and translation) for learning English. The courseware was integrated with three–dimensional multimedia representations to promote learning interest, student engagement, and efficiency. This learner-centered instruction was compared with the traditional teacher-centered method. In order to evaluate the instructions, the researcher had employed a pre-test, a post-test, and two questionnaires related to students' learning satisfaction and attitudes. The analysis of the data revealed that students with higher achievement on the post-test showed better participation and motivation, made greater use of multimedia and had better

understanding of English content. In addition, students reported that they were satisfied with the practices of learning professional knowledge and English skills provided by the courseware. Students had also reported that the courseware integrated with multimedia promoted learning effectiveness.

Nutta's (1998) comparative study examined whether or not computer-based grammar instruction is as effective as teacher-directed grammar instruction for post-secondary students at multiple levels of proficiency. A total of fifty-three students from the University of Florida were randomly assigned to computer-based or teacher-directed sections. All students received the same intensive ESL programme. The statistical analysis of the pre-test, immediate post-test, and delayed post-test results showed that computers-based groups scored significantly higher on open-ended tests than the teacher-directed groups. Moreover, no statistical significant differences were found between the computer-based and teacher-directed students' score on fill-in the blank or multiple choice tests. The results indicated that computer-based instruction can be an effective method of teaching grammar for ESL learners.

The experimental study of Mohamadkhani et al. (2013) investigated the effectiveness of using audio files on improving listening comprehension of high school students in Khorramabad - Iran. A total of thirty four students were randomly selected and assigned to experimental and control groups of seventeen each. Both groups were taught in the same style. The results of the statistical comparison of the post-test listening scores showed that using audio files had a significant positive effect on improving students' listening comprehension.

Torlakovic and Deugo's (2004) study investigated the effectiveness of CALL grammar instruction by comparing two groups of ESL students. Over a period of two weeks, the control group had a teacher-driven instruction while the treatment group was exposed to a CALL software. Both groups received the same material in terms of content and feedback. The groups were tested before and after the experimentation using a pre-test, an immediate post-test, and a delayed post-test. The results of the statistical analysis revealed that the treatment group showed a significant improvement on the intuition and

production tasks in comparaison to the control group who showed no significant gains. It was concluded that CALL instruction is more effective than teacher-driven instruction in teaching grammar for ESL learners.

Cook (1985) research attempted to determine whether there were any significant differences between the growth of writing performance of students who received computer assisted writing instruction and those who were instructed traditionally using a pen-and-paper method. Two seventh-grade classes were compared for writing growth. During an entire semester, the experimental group wrote their assignments on word processors while the control group used a pen and paper. Both groups were tested before and after the experiment. The results of the statistical analysis revealed no significant difference between the growth of the writing performance of both the experimental and control groups. However, the researcher concluded that the majority of the students who wrote with word processors experienced considerable writing growth and their growth in writing was greater than those who practiced with pen-and-paper method.

Al-Mansour and Al-Shorman's (2012) research aimed at investigating the effect of computer-assisted language instruction on Saudi students' English learning achievements. The sample of the study consisted of sixty students randomly selected from King Saud University and assigned to experimental and control groups. Data were collected within an eight-week period via a pre-test and post-test design for equivalent groups. The findings of the statistical analysis revealed a statistically significant difference between the achievement of the experimental group and that of the control group on the post-test in favor of the experimental group. The results of the study indicated that using computer-assisted English language instruction alongside the traditional method has a positive effect on EFL students' achievement.

Tsau (2012) experimental study examined the effect of an *'Automatic Speech Analysis Syste*m' on EFL learners' oral reading fluency from the perspectives of *'words read correctly per minute'*, '*multidimensional fluency scale'* and accuracy rate. Three classes of English-majored college students in central Taiwan were chosen to participate in the training. Students of the first class enhanced their oral reading fluency with and

audio player and the second class used a system-paced *'Automatic Speech Analysis System'* while the third class applied a learner-paced *'Automatic Speech Analysis System'*. Pre-test and post-test were conducted before and after the training. The results of the statistical analysis showed that the training either with an audio player or with an *'Automatic Speech Analysis System'* enhanced students' *'words read correctly per minute'* more than their '*multidimensional fluency scale'* scores. The results also showed that students of low oral reading fluency benefited more by practicing with the *'Automatic Speech Analysis System'*.

Tamjid and Moghadam's (2012) quantitative study explored the effects of employing a vocabulary learning software on Iranian intermediate EFL learners' vocabulary acquisition. Fifty- two intermediate EFL learners were chosen to participate in the study. The researcher had administered a Preliminary English Test (PET) to ensure the initial homogeneity of the students. After excluding participants with extreme scores, the remaining forty-six students were assigned to experimental and control groups. The experimental group received a treatment which included the use of a vocabulary learning software named *Narsis*, based on the book entitled *504 Absolutely Essential Words*, over a one-month-period of time while the control group was taught the same vocabulary during the same period of time using the *504 Absolutely Essential Words* course-book. Both groups were tested before and after the experiment. The results of the statistical analysis showed that the vocabulary taught was mastered better by the participants receiving the treatment in the experimental group. The researchers concluded that CALL produced better results in vocabulary learning than ordinary traditional book-based vocabulary teaching method.

Kaewchawee's (2013) study aimed at investigating the effectiveness of multimedia-based instruction in developing sixth grade students' English language performances. Fifty students from Tessaban 1 Buriratdarunwittaya School in Thailand were chosen to be part of this study. The methodology underlying the study was quantitative based on a single group pre-test-post-test design measuring four skills: listening, speaking, vocabulary and grammar. Over a period of eight weeks, the participants received an English course through various Multimedia-Based Instruction

activities. The statistical comparison between the results of the pre-test and post-test scores revealed a significant difference in the overall students' mean scores. In addition, the results of the post-test mean scores were higher than that of the pre-test. Moreover, when comparing the mean scores between each skill, the results showed that the mean scores of all post-test skills were higher than those of the pre-test. Furthermore, the researcher reported students' positive attitudes and enjoyment of learning English through multimedia-based instruction.

Al-Hammadi's (2011) research examined the effectiveness of multimedia software for developing listening skills among EFL Saudi learners. The sample of the research consisted of sixty students from third year Saudi secondary school. The participants were randomly assigned to experimental and control groups of thirty students each. To achieve the purpose of the study, the researcher used three instruments: (1) a list of listening skills needed by the targeted learners, and which were collected from the previous studies; (2) a computerised pre-test and post test for listening skills and ; (3) a multimedia software designed and programmed by the researcher for developing students listening skills. The experimental group was instructed using the proposed software for four weeks, while the control group received no treatment. The results of the statistical analysis revealed a significant difference between the post-test mean scores in favour of the experimental group in all listening skills; namely, listening for the gist, listening for specific information, listening to guess the meaning of unfamiliar words from context, and listening to use the context to make predictions. Al-Hammadi (2011) concluded that the designed software proved to be effective for developing specific listening skills for the third year Saudi secondary school students.

The study of Ali et al. (2011) evaluated the effectiveness of three learning methods, namely Contextual Clues, Dictionary Strategy, and CALL in developing ESL students' vocabulary. In order to achieve this purpose, a total of one hundred and twenty-three first-years university students were selected based on a Purposive Sampling[1]. The

[1] Purposive Sampling, also known as judgmental, selective, or subjective sampling, is a form of sampling in which researchers rely on their own judgment when choosing members of the population to participate in their surveys.

researchers chose a quasi-experimental design[2], specifically the non-equivalent control group design which lacked randomisation. The data were collected both quantitatively and qualitatively. The quantitative data were collected by administering four vocabulary achievement tests (a pre-test, an immediate recall test 1, an immediate recall test 2, and delayed recall post-test) whereas the qualitative data included the collection of responses from semi-structured interviews. The results of the statistical analysis revealed that there were significant differences in the immediate recall tests in favour of the Dictionary Strategy and Contextual Clues methods but no significant differences were found in the delayed recall post-test. Significant differences were also found when the score of the pre-test and the delayed recall post-test of the three methods of vocabulary learning were compared.

The research of Naba'h et al. (2009) investigated the effectiveness of a CALL instructional software programme on the English achievement of Jordanian secondary students. The sample of the study was composed of total of two hundred and twelve secondary students from four public schools in Jordan, and who were randomly assigned to experimental and control groups. The instruments of the study consisted of an instructional software programme for teaching the passive voice and an achievement test. The findings of the statistical analysis showed significant differences between students' achievement mean scores in grammar attributed to the instructional teaching method. The difference was in favour of the experimental group. The researchers concluded that CALL is an effective method of teaching grammar for Jordanian secondary students and recommended TEFL teachers to use CALL lessons in their instruction.

The comparative study of Neri et al. (2008) explored the potential effectiveness of a CALL pronunciation training system in developing young EFL learners' English pronunciation skills. Two groups of eleven years old students were chosen to be part of this study. The first group received a teacher-fronted instruction whereas the second group learned the same content by means of a computer-assisted pronunciation software system including an automatic speech recognition feature. Students were tested before and after the experience and their pronunciation performances were digitally recorded.

[2] Quasi-experimental design study is simply a type of experimental research that lacks randomisation.

The statistical comparison between the obtained results revealed that pronunciation quality of isolated words had improved significantly for both groups. It was concluded that the computer-assisted pronunciation training system with automatic speech recognition feature could lead to short-term improvement in pronunciation skills that are comparable to those attained by means of a more traditional, teacher-led pronunciation training.

Bhatti (2013) studied the role of reading in secondary schools and how it may be improved through computers. He conducted a year-long study to examine which of two methods of teaching reading skills, an instructor-led class or a CALL class would be more effective. The experimental research included two randomly selected groups of ninth-grade students at the secondary school of District Khairpur Mir's, Sindh - Pakistan. Both groups received twenty-four reading lessons either through CALL or through an instructor-led method. Students' reading skills were measured using pre- and post-tests. The results of the statistical analysis revealed that CALL was 35% more effective than the traditional instructor-led class. In addition, the researcher noticed that using computers in reading instruction with a variety of pictures and sounds generated a lot of interest among the students. Bhatti concluded that CALL has positive results in improving students' reading skills and he suggested teachers to prepare PowerPoint presentations to generate more interest among students at the secondary school level.

Ahmad's (2002) empirical study attempted first to diagnose the causes of students' low level in the listening comprehension at the secondary school level. He attributed this situation to: (1) neglecting listening comprehension skill in teaching, (2) using traditional methods of teaching, and (3) neglecting English activities in the English courses at all grade levels. Based on the main findings of his diagnostic study, the researcher designed a programme using the video as an advance organizer[3] in order to develop listening comprehension of secondary school students. To achieve this study, two groups from a secondary school in Syria were randomly selected. The experimental group was instructed using the video as an advance organiser whereas the control group

[3] An advance organizer is a relevant introductory material presented at the begining of the lesson in any format of text, graphics, or hypermedia used help students bridge the gap between between what they already know and what they are about to know (Ausubel, 1968).

was instructed using the traditional method. The results of the statistical analysis indicated the superiority of the experimental group in terms of the listening comprehension achievement compared to the control group. The researcher concluded that the CALL programme based on video as an advance organiser is more effective in improving students' listening comprehension at the secondary school level.

The study of Ahmadian et al. (2015) compared a paper-based and CALL contextualised vocabulary learning. To this end, fifty-two Iranian EFL learners were randomly assigned into experimental and control group of twenty-six learners each. The control group received a paper-based contextualisation of vocabulary items while the experimental group received the computer-based contextualisation of vocabulary items using the PowerPoint software. One pre-test and post-test, alongside with an immediate and a delayed post-test were given to the learners. The results of the tests were calculated using SPSS software. The results showed that computer-based contextualisation had more effects on students' vocabulary learning than paper-based contextualisation of the words.

The study of Ali (2004) investigated the effectiveness of a teacher-based instruction and CALL in improving undergraduate Arab learners' English reading ability in the three aspects of speed, comprehension and vocabulary knowledge. The Experimental Pre-test Post-test Design was implemented in both experiments carried out in this study. Two samples of one hundred and one hundred and fifty students for Experiments I and Experiment II, respectively, were randomly chosen from two higher education institutions in the Arab world. Each sample was divided into two groups depending on learners' pre-instruction preferences for teacher-based or CALL methods. The experiment lasted sixteen weeks. The results of the quantitative and qualitative data analysis revealed that CALL was significantly more effective in improving the learners' reading ability in the three targeted aspect than the teacher-based method. The researchers attributed this improvement to the following reasons: learners were more motivated to read and they enjoyed reading; CALL made learners' reading progress visible to them through immediate feedback; it fostered learners' autonomy and their

desire to be in control of the program and it offered the learners a large number of different reading activities to work on.

The study of Kırkgöz (2011) investigated the design and implementation of a speaking course in which face-to-face instruction was blended with the use of video technology. Twenty-eight first-year students of English from a Turkish University were chosen to participate in this study. The study consisted of three hours of task-based classroom instruction, complemented with one hour of additional class time, which was devoted to viewing and evaluating students' video recorded speaking tasks. A mixed research method was used to collect data from multiple sources: recordings of a pre-and post-course speaking task, analysis of the video-recordings of students' speaking tasks, informal interviews with the students, and a written end-of-year course evaluation survey. Analysis of quantitative and qualitative data showed that students made a noticeable improvement in their oral communication skills, and they were positive in their perceptions of integrating technology in the lessons. The study concluded that the use of a camera, as a technological tool, had a positive impact on students' viewing and critically evaluating their speaking tasks.

Verdugo and Belmonte's (2007) study examined the effects of digital stories on six-year-old students' understanding of spoken English. The researchers used a quasi-experimental research study lunched in six state schools in Madrid - Spain. A total of two hundred and twenty children were chosen to participate in this research project. In order to collect the data, a pre-post test design was used to evaluate the effect of internet-based technology on students listening comprehension. The results of the tests were carried out with the assistance of SPSS software. The results of the statistical analysis revealed that the experimental group outperformed the control group in the listening comprehension final test. The researcher concluded that using digital stories is effective in improving children's listening comprehension skills.

Basoz and Cubukcu's (2014) study investigated the effectiveness of computer assisted instruction on students' vocabulary achievement. The subjects of this quasi-experimental study consisted of fifty-two freshmen studying in the ELT Department of

Balıkesir University - Turkey. Before the intervention, the participants were randomly assigned to either a Computer Assisted Instruction (CAI) group or a Communicative Language Teaching (CLT) group and both were tested using a pre-test. The CAI group studied twenty target words using *Moodle* in a computer laboratory whereas the CLT group was instructed the same words by their teacher in a communicative classroom atmosphere. Both groups were immediately tested after the intervention using a post-test. A delayed post-test was administered to the freshmen five weeks after the intervention in order to test their retention. The results of the statistical analysis revealed that both CAI and CLT groups had some kind of vocabulary gain as a result of the treatments. However, there was no significant difference between the groups in vocabulary gains.

Prvinchandar and Ayub's (2014) study compared the effectiveness of two types of computer software in improving Malaysian pupils' writing skills. Sixty students who participated in a seven-week training course were divided into two groups: an experimental group using the StyleWriter software and the control group using the Microsoft Word programme. A pre-test was administered before conducting the experiment. Upon completion of the course, students were tested using both a computer-based as well as a pen-and-paper post assessment test. In each test, four components of writing skills were assessed, namely: grammar, vocabulary, spelling, sentence structure, and the overall performance. The results of the statistical analysis indicated that the students who were exposed to StyleWriter software had significantly better scores in all the writing components compared to the control group who used Microsoft Word in both pen-and-paper and computer-based essay writing assessments. The researchers concluded that the StyleWriter software was effective in improving students' writing skills even when computer assistance was no longer available.

Peng's (2001) study investigated the effects of learners' control on computer-assisted English language learning in a hypertext versus a linear text learning environments. Two hundred and twenty-five students from four freshman English classes at Feng Chia University - Taiwan, participated in this study. The students of each class were randomly assigned to one of the two treatment groups: linear approach group or hypertext approach group. The instruments used in the study included two versions of

English learning tutorial programmes, a pre-test, a post-test, and an attitude questionnaire. The results of the statistical analysis showed that the students of the hypertext approach did not have a significantly poorer learning performance than the students of the linear approach. The results suggested that the high degree of learners' control in the hypertext approach leads to better learning attitude, and motivation, and even lower sense of disorientation. The researcher concluded that, in computer-assisted English language learning, a hypertext learning environment with a high degree of learners' control can be as good as, or even better than a conventional linear learning environment.

Kiliçkaya's (2005) experimental research aimed at exploring the effect of CALL on the undergraduate students' success on the TOEFL exam. Thirty-four sophomore[4] students from the EFL Department at the Middle East Technical University - Turkey, were randomly assigned to experimental and control groups of seventeen students each. The experimental group was taught using CAI in a language laboratory while the control group was taught using the traditional method of instruction in a traditional classroom setting. The training lasted eight weeks and the same instructor met the groups three hours a week. During the first week, a pre-test was given to both groups and at the end of the treatment a post-test was administered. In addition to the tests, participants of the experimental group were interviewed with regard to CALL. Pre and post-test achievement scores were statistically analyzed using SPSS software and the interviews were subjected to content analysis. The results of statistical analysis showed no significant difference between the control and experimental groups in the overall scores. However, statistical significant differences were found in the scores of the reading and listening sections. The results of the interviews showed that the participants in the experimental group valued CALL and they suggested that it should be incorporated into the regular classes, where especially listening skill is focused on.

AbuSeileek's (2007) study attempted to assess the effectiveness of computer-based pronunciation instruction in enabling EFL learners attending advanced English language classes to perceive and produce correct stress patterns. The study was

[4] a student studying in the second year of a course at a US college or high school

conducted in the Department of English Language and Literature, College of Arts, King Saud University - Saudi Arabia. The researcher chose a pre-test post-test research design in order to find the effect of the teaching method (computerized or traditional instruction) on the development of students' pronunciation ability. The sample of the research consisted of fifty male Saudi EFL learners who were randomly assigned to one of the following groups: the treatment group who was taught according to the computerized instruction using the *Mouton Interactive Introduction to Phonetics and Phonology software*, and the control group who received the traditional method of instruction. The course mainly focused on using the communicative approach in learning stress patterns which is based on providing meaningful, interactive, and authentic activities. The results of the statistical analysis revealed that computer-assisted pronunciation instruction was effective in improving EFL learners' ability to produce and perceive correctly different stress patterns in words, phrases, and sentences. In addition to the statistical results, the researcher reported students' positive attitudes toward computer-assisted pronunciation instruction and activities.

Qteefan's (2012) experimental study aimed at investigating the effectiveness of educational computer games on the fifth graders' English language achievement in Gaza Western Governorates. The sample of the study consisted of one hundred forty participants (seventy male students from Beach Elementary Boys "A" school, and seventy female students from Beach Preparatory Girls "G" school in Gaza). The educational computer games strategy was used in teaching the experimental groups, while the traditional method was used with the control ones. An achievement test of five scopes with fifty-five items was designed by the researcher as a pre and post test. The results of SPSS statistical analysis indicated that there were statistically significant differences in students' English language achievement due to the method in favour of the educational computer method. The results also showed that there were significant differences in the students' total achievement including all the language skills in favour of the experimental groups of both genders. Based on the results obtained, the researcher concluded that the educational computer games strategy had superiority over the traditional method in teaching English language.

The study of Dalal and Rani (2013) aimed at evaluating the effectiveness of CAI in improving the pupils' language creativity in English. In this study, a CAI programme and materials on various topics of English were developed by the researcher herself. Language Creativity Test, developed by Dr. S. P. Malhotra and Suchita Kumari, was used to collect the Language creativity scores in the pre-test and post test stages. The sample of the study consisted of sixty students from the Aryan Public School - India, who were randomly selected and then evenly divided into experimental and control groups. The study design was composed of three stages. First, all students of all groups were tested using a Language Creativity Test. Then, students received a five week treatment. The experimental group was taught English using CAI whereas the control group was taught using the conventional method of teaching. Immediately after the treatment, the post-test on Language Creativity was administered. The results of the statistical analysis revealed that there was no significant difference between the control group and experimental group in the pretest. However, in the posttest the experimental CAI group performed better than the control group. The researchers concluded that the CAI method is much more effective in enhancing the Language creativity of the students than the traditional method of teaching. They also noticed a better students' motivation and active partticipation in the learning process due to uniqueness of the CAI package.

Ahangari's (2013) research explored the effectiveness of two modes of CALL: cooperative and individual modes, on Iranian high school students' reading comprehension and their foreign language learning anxiety. The sample of the study consisted of two intact groups, each containing twenty-four students, which were randomly assigned into experimental and control groups. The control group was taught in an individual CALL mode while the experimental group was instructed in a cooperative CALL mode. Both groups took reading comprehension pre-test and post-test. Participants were also asked to answer a Foreign Language Classroom Anxiety Scale questionnaire both at the beginning and at the end of the treatment. The collected data were analyzed using SPSS 16.0. The results of the analysis revealed that the experimental group outperformed the control group in terms of reading comprehension. In addition to that, the researcher noticed that the foreign language anxiety level of the experimental group has significantly improved after the treatment.

The empirical study of Tonekaboni et al. (2015) examined the effectiveness of computer networks in empowering second-language learners' vocabulary. A total of sixty-six English translation majors, who were learning English for specific purposes as part of their studies at Islamic Azad University - Iran, were purposefully chosen to be part of this research. After administering the Michigan English Language Proficiency Test, as a homogeneity test, only forty-four students who ranked as low intermediate were selected and randomly assigned to experimental and control groups of twenty-two participants each. The experimental group was taught the passive voice via an English learning programme in a language laboratory while the control group was taught the same vocabularies using the traditional method. At the end of the treatment, the participants were asked to answer a modified version of Schmitt's Vocabulary Learning Strategies questionnaire. The data gathered were subject to statistical analysis using SPSS 18.0. The results indicated that computer networks can be considered as an effective tool for vocabulary empowerment.

The study of Jafarian et al. (2012) aimed at investigating the effect of CALL on EFL students' writing achievement. Forty Iranian high school students were selected and randomly assigned to experimental and control groups of twenty members each. Two instructors were involved in the study with similar educational background holding master's degrees in English, and having more than five years of teaching experience. The control group received teacher's feedbacks and traditional materials which consisted of an edited version of a book entitled *Communication through Writing*. The teacher selected patterns to be taught such as: narration, explanation of graphs and diagrams, definition, description, argumentation, cause and effect, giving directions, and problem-solving. The experimental group attended CALL classes that were exposed to *WordPerfect, Office 2003*. The software provided students with same content of the control group and automatic feedbacks about their mistake/errors such as spelling, capitalization and subject-verb agreement. The learners were required to write a free composition, to be submitted at the next session. The first and the last composition written by the participants were regarded as a pre-test and post-test. In addition to the tests, two questionnaires were used as supplementary data elicitation instruments. The results of the statistical analysis revealed that CALL users' writing achievement was

significantly higher than the nonusers. The results also implied that the feedback provided by computers and the one provided by the instructor had a similar effect on students' final writing achievement. The researchers concluded that significant difference between the two groups, favouring CALL users, was an indication of the effect of CALL on improving students' knowledge and competency in EFL.

The research of Grgurović et al. (2013) aimed at evaluating the effectiveness of CALL from a meta-analysis[5] standpoint. The authors summarized thirty-seven empirical research (from 1970 to 2006) comparing traditional and technologically-enhanced pedagogies. Overall results favoured the technology-supported pedagogy, with a small, but positive and statistically significant effect on language learning. It was concluded that second/foreign CALL instruction was at least as effective as traditional instruction. The study results coincide with and confirm the positive effects on language learning associated with technology also found in Kulik (2003) and Zhao (2003) meta-analysis research.

1.2.2 Previous International Studies on the Effectiveness of Distance Learning

Pirasteh's (2014) research examined the potential effectiveness of CALL and in particular e-mail (Electronic mail) in helping EFL Iranian students to learn grammar more easily. The researcher first selected a group of seventy students who were studying English as a general course in Islamic Azad University of Saveh. Then based on the results of the Nelson Test, he formed a homogeneous group of fifty-two students who were later randomly assigned into experimental and control group. In the next phase of the study, the participants in both groups took a pre-test. After that, over a period of five weeks both groups were taught fifteen grammar points, to the experimental group via e-mail and to the control group through printed paper. At the end of the course, students were exposed to a post test. The results of the statistical comparison between the students' scores of the pre-test and post-test showed that the experimental group

[5] Glass (1976) first defined meta-analysis in the social science literature as *" …the statistical analysis of a large collection of analysis results from individual studies for the purpose of integrating the findings"* (Glass, 1976, p. 3).

outperformed the control group. The study concluded that the computer as a tool and email as an application can be an effective way in improving learners' grammar scores.

Soleimani and Morshedian's (2013) study sought to explore the effectiveness of CALL on Iranian EFL students' acquisition of grammatical forms instructed through MALL (Mobile Assisted Language Learning) as well as the relationship between students language proficiency and their attitudes towards CALL. To this end, an intact class of thirty-six students was chosen. Based on the results of a placement test, students were divided into pre-intermediate and intermediate groups. Both groups received mobile SMS (Short Message Service) containing grammar mini-lessons over a period of ten days. After the treatment period, a questionnaire measuring participants' attitudes towards CALL and a researchers-made grammar post-test were administered. The results of the statistical analysis showed that the interaction of language proficiency and attitudes towards CALL did not have any significant relationship with the learners' achievement. Likewise, no significant relationship was found between students' attitude towards CALL and their improvement in learning grammar. However, students' proficiency level alone was found to have a significant effect on the uptake of CALL.

Cheng's (2012) research explored the potential effectiveness of Twitter in improving EFL Taiwanese college students' English reading and writing outcomes. Fifty-six fourth-year students from Taichung Institute of Technology - Taiwan were selected to be part of this study. The participants were randomly assigned to two groups of equal size. The first group used Twitter for major writing activities while the second group were engaged in paper-based free-writing activities. Both groups' reading and writing performances were examined before and after the experiment using a pre/post-test assessment. The results of the statistical analysis showed that only the scores of the writing skills test reached the level of significant difference. Moreover, the analysis of students' responses to the attitudes questionnaire revealed that Twitter-assisted language learning had a significant positive influence on the experimental group's learning attitude.

Buckmaster (2006) experimental research investigated the comparative effectiveness of a web-based presentation of ESP vocabulary with face-to-face teaching. The study involved twenty-seven police officer students at the Public Service Academy and whose age ranged from eighteen to twenty-five years old. The participants were divided into three groups. The first group learned a set of ESP terms from a web-based material developed using Author Plus computer programme and the second group used paper-based materials while the third group acted as a control. The groups were tested at the beginning and end of the course. The results of the statistical analysis indicated a significant improvement in the vocabulary knowledge of both experimental groups. The police officers had reported positive evaluation of both sets of materials. The researcher concluded that Author Plus, used with face-to-face interactions, has the potential to be an effective way of improving ESP vocabulary learning.

Lin and Duy's (2014) study aimed at examining the effect of video-based Internet materials on international students' listening comprehension. The researchers recruited forty international students from Asian and South American countries who were studying at a public university in Taiwan. The participants were divided into an experimental and a control group. The experimental group completed listening tasks using video-based Internet materials, including spoken narrations and video, while the control group completed listening tasks with spoken narrations only. The data were collected using an immediate listening comprehension test and an Internet use questionnaire. The results of the statistical analysis indicated that the participants in the experimental group achieved a significantly higher score on the immediate listening test than those in the control group. The questionnaire results revealed that all participants believed that the Internet was a useful listening tool, 92.5% of the participants agreed that the Internet-based activities were valuable for English listening, and 92.5% expressed that they felt comfortable when using the Internet.

Zha's et al. (2006) study focused on the use of asynchronous electronic discussion boards with elementary-aged English as Second Language students. This research mainly aimed at investigating students' communicative competence in a computer-mediated communication environment. Both qualitative and quantitative methods were used to

analyse a total of 956 messages posted by twenty-eight ESL students to the electronic discussion board during a six-week period of time. The statistical analysis of the results showed a significant improvement in children's use of language for social purposes and appropriate use of language in different social and cultural settings. The researchers recommended teachers to include the design of online discussion activities and peer assistance in language learning.

Chun's (2001) empirical study explored the effectiveness of hypermedia [6] -enhanced environments on L2 reading comprehension. Twenty-three second-year German students were selected to be part of this research. They read and summarised two online texts in the *netLearn* programme, while their use of online multimedia support resources was tracked. Multimedia resources included a programme-internal glossary, an online bilingual dictionary, and an audio narration of the text. After reading each text, learners wrote summaries that were scored in terms of the number of propositions recalled. The tracker noted the number of words searched for and the amount of time spent on the tasks of reading and writing. The results from both the quantitative data; (number of words searched for, time spent on tasks and number of propositions recalled) and the qualitative data; (when and why learners searched for a specific word and whether they found the audio helpful) provided insights into how L2 learners used online textual and audio information to aid comprehension while reading.

Uzunboylu's (2004) experimental study aimed at determining the effectiveness of a web-assisted grammar instruction on high school students' achievement. The study was conducted at Lapta Yavuzlar Lisesi public high school in North Cyprus, with fifty-seven participants. The subjects were assigned to experimental and control groups (n = 29 and n = 28, respectively). The experimental group used a website, designed by the researcher, to do English grammar activities such as chat, writing messages on a discussion board, and playing educational games while the control group did similar learning activities through traditional methods. Two instruments were used to collect data: an English language grammar test and an English language attitude scale. The results of the

[6] Hypermedia is an extension of the term hypertext, a system with different forms of interactive information such as text, images, audio, video and data all linked together via hyperlinks.

statistical analysis showed that the grammar achievement of the experimental groups was significantly higher than the control group. The researcher also found that students had higher positive attitudes towards the newly integrated method.

Yusof's (2012) experimental study investigated the effectiveness of using computer-based software in teaching the listening skill at higher education institutions. The study mainly aimed at discovering whether computer-based software can be used as a teacher replacement or a supplement, either at the beginning or at the end of the listening lesson. In order to achieve the purpose of the study, eighty students from the University of UniSZA - Malaysia were chosen. The researchers used two achievement post-tests as data collection instruments. The data results were analysed using SPSS software. The results of the statistical analysis revealed that the way the computerized material was used made a considerable effect on students' achievement. Students who received computerised material as a supplement at the beginning of the lesson scored higher than those who received computerized treatment at the end of the lesson. Moreover, when the computerized material was used as a teacher replacement the students had lower scores in the tests. The results also showed that the non-computerised treatment was effective in teaching the listening skill.

Korkmaz's (2010) study aimed at exploring the effectiveness of MALL applications in supplementing ELT (English Language Teaching) coursebooks. A hundred students from KuĢadası School of Tourism and Hotel Management - Turkey, took part in the study. The participants were randomly assigned to experimental and control groups of fifty students each. During the eight weeks of the treatment period, the experimental group were sent supplementary SMS and MMS (Multimedia Messaging Service) messages in addition to regular in-class learning whereas the control group used conventional supplementary materials only. At the end of the experiment, achievement test scores of the groups were statistically analyzed and compared using the SPSS software. Additionally, a post-questionnaire was employed to elicit students' attitudes towards MALL supplementation for the ELT coursebooks. The findings of the study revealed that MALL supplementation had positive effects on students' achievement scores especially when the students read the messages regularly. The analysis of the

questionnaire results suggested that the students had positive attitudes towards the new language learning application as a supplementary material for ELT coursebooks.

Chen's (2014) empirical study focused on evaluating the effectiveness of a virtual reality courseware in learning occupational English. A total of one hundred and twenty freshmen and sophomores from the department of applied foreign languages at the University of Science and Technology - Taiwan were chosen to participate in this study. A quasi-experimental design consisting of a single group pre-test and post-test was applied. During a period of one semester, students received a 3D virtual environment courseware which was mainly focusing on the enhancement of basic EFL competencies. The statistical analysis of the data gathered showed that the participants had gradually increased their vocabulary competence. In addition, the overall analyses revealed a significant effectiveness of the virtual reality courseware on students' scores.

Chiu's (2014) study aimed at measuring the effects of a constructed cloud-based platform on Taiwanese junior high school students' English language attitudes. The participants were divided in three groups: group (A) employed the cloud-based platform with parental assistance, group (B) used the cloud-based platform without parental assistance, and group (C) received traditional teacher-led lectures. Chiu (2014) used a revised version of a learning attitude questionnaire proposed by Cid et al. (2009) in order to assess students' responses before and after the implementation of the three learning models. The results of the statistical analysis indicated that students of group (A) showed a significant increase in their attitudes towards instruction using the cloud-based platform whereas groups (B) and (C) did not reach the level of significance. The researcher concluded that the test, diagnosis, and remedy cyclic learning model could be an effective method for home-based self-study.

Chamorro's (2018) research attempted to compare traditional face-to-face and online English classes in terms of students' learning outcomes. To that end, a total of seventy-two students (only fifty-eight completed all the content of the course) from El Bosque private University in Colombia were chosen and randomly assigned into two major groups : face-to-face and online. Both groups took a six-level program of English

of the same content instructed by the same teacher and were tested before and after the experiment. Students' scores of each skill were statistically compared using one-way ANOVA. The research results showed no statistically significant differences between traditional face-to-face and online groups neither in the overall scores nor in the outcomes of any of the four skills. These findings were supported by results of the qualitative components including instructors' interviews, an end-of-course qualitative survey and class observations.

The experimental research of Vu et al. (2021) sought to explore the effectiveness of Second Life, as a Virtual Learning Environment, in enhancing students' speaking skills. To that end, a total of eighty-one students from the hospitality and tourism classes at the University Vietnam were selected through convenience sampling [7] and were divided into experimental (n=39) and control group (n=42). Students were first tested using a pre-test then after fifteen weeks of treatment with Second life learning experience they were tested again using a post-test. The T-test[8] analysis showed significant statistical difference between the pre and post tests results. The quantitative data were triangulated with qualitative ones from a questionnaire and a semi-structured interview collected at the end of the experiment. The researchers concluded that learning activities in a virtual language environment significantly affects the speaking performance and attitudes of students in a positive way.

The study of Güneş and Alagözlü's (2021) aimed at comparing asynchronous distance learning and blended learning in terms of EFL learners' autonomy, motivation and academic success. A total of one hundred forty-five freshmen students from a state university in Turkey were randomly selected on a voluntary basis to be part of this study. One hundred and fourteen participants were assigned to the asynchronous distance learning group and the rest were included in the blended-learning group. Over a period of

[7] Convenience sampling: also called haphazard, accidental or grab sampling, is a type of non-probability sampling, which doesn't include random selection of participants. The opposite is probability sampling, where participants are randomly selected, and each has an equal chance of being chosen.

[8] A t-test is a statistical test that is used to compare the means of two groups. It is often used in hypothesis testing to determine whether a process or treatment actually has an effect on the population of interest, or whether two groups are different from one another.

fifteen weeks, both groups received the same contents but were taught in different methods. Students from the asynchronous distance learning group were responsible for their own learning, they received the learning content in the form CDs with minimum or no instructor interventions while students from the blended learning group received the same materials in addition to being exposed to a weekly hour of face-to-face instruction. Students' academic success level was assessed twice using two grammar tests one at the middle and the other at the end. In addition to the grammar tests, a questionnaire was used at the end of the course in order and reveal participants' motivation and autonomy scores. After the statistical analysis of the results, it was concluded that the blended learning students had higher learner autonomy, motivation and academic success levels in comparison with the asynchronous distance learning students.

Swaity's (2021) study, which was conducted during the lockdown due to the COVID-19 pandemic, aimed at investigating the effectiveness of online learning on students' writing skills. The sample of the study consisted of thirty-six Twelfth-grade students (six males and thirty-six female) selected voluntarily from from Al-Lakiyya High School in Negev region, and who were divided evenly into experimental and control groups of eighteen students each. The experimental group was taught through online lessons using Google Classroom and Zoom platforms while the control group received conventional face-to-face lessons. In order to measure the overall progress achieved by both groups, students were assessed before and after the experiment using a pre-test and a post-test. The experimental groups were supplied with a survey as an additional tool to measure their attitudes and satisfaction regarding the method they were taught with. The data gathered from pre-test and post-test were statistically analysed using Microsoft Excel. The results of the analysis showed no statistical significant difference between online and face-to-face method. However, a slightly difference of 2.77% was noticed in favour of the experimental group. The analysis of the survey also showed that students are still having hesitant attitudes towards online learning.

Hamouda's (2008) quasi-experimental research examined the effects of using virtual classes on EFL students' speaking skills. The research was conducted on seventy English students from Qassim University - Saudi Arabia. After ensuring the homogeneity

of the group by administering a quick placement test, students were randomly assigned to experimental and control groups of thirty-five students each. The experimental group was taught in the virtual class method while the control group received the traditional method. Students speaking skills were tested at the beginning and the end of the treatment and the data gathered were statistically analysed using SPSS. The comparison between the groups with the T-test tool showed statistical significant difference in favor of the experimental group in pronunciation and fluency. These results were backed up with the findings from a questionnaire and an interview that revealed positive attitudes towards the use of the virtual class.

Following a meta-analysis methodology, Bernard et al.'s (2004) research attempted to assess the effectiveness of distance education in terms of students' achievement and attitudes. A collection of two hundred and thirty-two comparative empirical studies of interactive distance education conducted between 1985 and 2002 were analysed using statistical means. The results of the analysis revealed a very small but statistically significant positive difference on students' achievement in favour of the distance education studies compared to the traditional classroom-based instruction. A small statistical significant positive difference was also found on students' attitudes towards the technology used. The authors noticed that the use of synchronous communication and interactive technologies such as computer mediated two-way communication are among the most important factors influencing the effectiveness of distance learning.

1.3 Previous National Studies

In Algeria, only a few number of studies have been conducted to measure the effectiveness of CALL and distance learning on language teaching and learning. The researcher made a deep investigation in the Algerian database of researches which has yielded in no true experimental studies on the effectiveness of CALL and distance learning except maybe that of Saidouni (2019), Nachoua (2012), Reffas (2021) and Meddour (2006). Most of the other studies have based their results on questionnaires, interviews, and descriptive accounts while discussing the effectiveness and attitudes

towards the methods. In the following part, previous national studies related to the effectiveness of CALL and distance learning will be presented.

1.3.1 Previous National Studies on CALL Effectiveness

Houcine (2011) made an attempt to assess the impact of an Algerian language training centre on learning French as a foreign language. Based on their score on a written and listening test, students were divided into small groups of about fifteen each. The main activities and tasks of the lessons were supported by the computer, the Internet, audio tools and podcasts. The researcher concluded that the language training centre had a positive impact on students' listening skills. In addition to that, students who enrolled in the multimedia language centre were reported to have improved their motivation, attention and autonomy after attending the lessons.

Nachoua's (2012) study assessed the effectiveness of using CALL method to enhance students' motivation and their performance in the English listening skill. A pre-test/post-test methodology design was used to achieve the objective of the study. A total number of thirty students were randomly sampled into one of two groups of fifteen each. Over a period of three months, the groups were taught the same set of activities but using different methods, one of them was CALL. The resulted data of the study were statistically analysed using the Statiststica software package. The statistical results revealed a significant difference in gain between the two groups in favor of the experimental one. The results from the statistical analysis proved the effectiveness of CALL in enhancing students' motivation and improving their grammar, vocabulary, writing and listening performances.

Reffas's (2021) quasi-experimental research attempted to investigate the impact of computer-mediated task approach on secondary school students' vocabulary acquisition. The sample of the research was composed of thirty third-year secondary school scientific stream students from Sirine Lekhmissi Secondary School - Souk Ahras, who were divided into experimental and control groups of fifteen students each. Prior to the experiment, two questionnaires were distributed to ten teachers and thirty students from the same school with the aim of gathering information about teachers' perceptions of

vocabulary teaching strategies as well as students' attitudes towards vocabulary learning. The experiment consisted of a six months period of vocabulary instruction through which the experimental group was exposed to vocabulary using computer task-based approach with teacher-made quizzes in the Hot Potatoe Software, whereas the same vocabulary was presented in the traditional way to the control group. Students' vocabulary learning and retention was tested before and after the experiment and the scores of the two groups were compared using the T-test manual calculation. The T-test comparison between the pre and post-test results of the control group revealed a slight decrease in students' level. However the comparison of the experimental group's results indicated a statistical significant improvement in the students' lexical performance. Reffas concluded that computer-mediated task approach is more effective than the traditional way of teaching vocabulary.

Benboulaid's (2007) descriptive study aimed at investigating the impact of using computer technology on learning general culture. The purpose of the study was to identify the attitudes and opinions of both students and teachers towards the use of computer technology as a didactic support to achieve better learning. Two instruments were used for data collection: a questionnaire administered to a total of one hundred students and an interview with five English teachers. The results of the study suggested that teaching with techniques based on the stimulation of the senses (such as sight and hearing), which simultaneously allow the interaction of learners and teachers, enriches the learning and teaching experiences and enhances knowledge acquisition.

Meharet (2012) evaluated students' attitudes towards the integration of computer in an English for Specific Purposes class. Two questionnaires were conducted to gather the data: one for the students and another for the teacher. The sample was composed of forty second-year LMD (Licence Master Doctorat) students and their teacher of English from the department of Computing at the University of Chlef. Meharet (2012) found that both, the students and the teacher, had positive attitudes towards CALL.

Yaiche's (2018) study explored the effectiveness of Language laboratories in developing EFL learners' listening skill. Thirty students and fifteen teachers from Salhi

Ahmed University Center – Naama, were randomly selected to be part of this study. The experiment consisted of teaching students listening comprehension using a course assisted by multimedia computing in a language laboratory. Two research instruments were used to collect the data. An aural test measuring the level of students' performance before and after the experiment and a questionnaire administered to teachers aiming to evaluate the role of language laboratories in improving EFL students' aural skill. The main findings obtained from the analysis of the data gathered revealed that the language laboratory is influential in improving students' listening skills performance and in raising their interest and enjoyment while engaging in cognitive tasks.

Radji (2015) adopted the same research design to analyse the effectiveness of authentic videos in developing the speaking skill for third year LMD students of language sciences at the Department of English, University of Biskra. The results of the study stated that authentic videos helped the students to produce grammatical forms, acquire new vocabulary, and increase their level of achievement in the speaking skill.

Saci's (2014) descriptive study aimed at exploring the effect of video techniques on learners' oral production. The research was based on a questionnaire administered to a group composed of forty second-year students from the English Department at the University of Biskra. The results showed that students considered videotapes as an important technique for enhancing their oral performance.

Meddour's (2006) experimental research investigated the effectiveness of a Language Lab (Language Laboratory) as a teaching aid to improve second year students' aural-oral skills. First, the researcher started with a descriptive study. Two kinds of questionnaires were administered to both teachers and students for the purpose of obtaining their standpoints and perspectives concerning the language lab and the speaking-listening skills. Then the researcher moved to another research procedure which is the experimentation. A total of forty students were equally and randomly assigned into experimental and control group. The experimental group was treated with a laboratory instructional material whereas the control group was taught using the traditional method. During the period of three months, students' listening and speaking proficiency progress

was tested and evaluated. Students' results were then analysed using manual statistical calculation. The results showed a statistical significance in favour of the experimental group. The study concluded that the exposure to the authentic oral language in the language lab was an effective way of reinforcing EFL learners' listening and speaking skills.

In an attempt to discover the impact of the language lab on foreign language teaching and learning, Benmadani (2014) started by designing two questionnaires, one for the teachers and the other of the students. The questionnaires were administered to six teachers and forty-two third-year students at the University of Bouzareah. After the analysis of the results, the author of the study concluded that the language lab played a major role in improving EFL learners' listening skill.

1.3.2 Previous National Studies on the Effectiveness of Distance Learning

A further study of Benboulaid (2014) examined the effectiveness of the implementation of ICT (Information and Communications Technology) tools in the enhancement of EFL students' fluency. To achieve the purpose of his study, one hundred thirty-three EFL students from the department of English at the University of Batna were put in contact with seventy-two graduate students from the American University of Washington via a videoconferencing class over a period of six weeks. A self-assessment questionnaire was used to determine students' level of improvement. The findings of the research indicated that cross-cultural interaction with native speakers of English via DVC (Digital Video Conferencing) would be an effective way of improving students' oral expression.

Zitouni's (2013) study on young Algerians' internet users in Oran aimed at investigating language use and choice through CMC (Computer Mediated Communication). In addition to that, the study was concerned with whether or not the English language is there to foster and maintain communication ties through this new medium of communication. The study's author concluded, among other things, that email communication can be explored effectively by English students to develop their literacy and communication practices. The researcher also reported that students

displayed willingness to adopt the new technology and enthusiasm to participate in a future e-learning (Electronic learning) training programme.

Kerkeb's (2018) case study aimed at examining the effect online distance learning via Skype on ESP students' English oral communication skills. Her study was composed of two major parts, the first of which attempted to identify the Algerian students' and teachers' attitudes towards the use of new technologies in their learning and teaching process. Two questionnaires were administered to a sample composed of sixty-three ESP students and twenty teachers from different Algerian universities (Sidi Bel Abbes, Saida, Ain Témouchent, Oran, Tlemcen, Laghouat and Setif). The questionnaire responses showed the existence of a gap between students' and teachers' readiness to the immediate integration of new technologies in teaching and learning. The second part of the study dealt with an eight weeks experiment of instructing four female ESP students oral communication at a distance using Skype. In order to measure the effectiveness of the course, each online conversation session was recorded and later analysed through the observation of the complexity, accuracy and fluency of participants' oral performance. At the end of the experiment a questionaire measuring participants' attiudes towards the course was delivered. The analysis of the data gathered revealed positive results in regard to the participants' oral competency improvement, and in their motivation and attitude toward online learning.

Harikenchikh (2014) investigated the impact of Facebook as an online academic tool on the development of EFL students' writing skills. A total of thirty second year EFL students from the Department of English - Tizi-Ouzou were randomly selected, then assigned to experimental and control groups of fifteen participants each. The control group attended a regular class of writing while members of the experimental group were asked to join a Facebook group where they received assistance from a teacher practicing a series of writing exercises at least once a week. Each group submitted 15 essays in different topics at the beginning and another 15 essays at the end of the experiment. Students' improvement was calculated in percentage through the identification and the analysis of their errors made in the pre and post essays. The results of the comparison between the two groups revealed that the experimental group made a noticeable progress

concerning the different aspects of coherence and cohesion, whereas the control group did not show a considerable improvement. It was concluded that the use of social media is more efficient than the traditional method in improving EFL students' writing skills.

The research of Chefchouf and Benzaoui (2021) aimed at evaluating teachers and students' degree of preparedness for distance learning during the covid-19 pandemic. Forty EFL sophomore students and ten teachers from the Department of Foreign Languages at Mila University Centre were randomly chosen to be part of this research. Two separate surveys one for teachers and the other for students were distributed to collect information about participants' perceptions, opinions and attitudes towards the newly implemented method of teaching and learning at a distance. The analysis of the results demonstrated that students are not ready enough to shift from face-to-face instruction to internet-based learning and that the absence of the teacher, lack of technological devices, and poor internet quality are among the obstacles that hindered students to complete their courses online. In addition to that the majority of teachers perceived the new form of learning as distracting and time consuming and that it should not be maintained at the department unless adapted.

A recent study carried out by Ghounane (2022) attempted to discover which learning mode, from teachers and students perspective, is mostly used in Algeria during the pandemic. The study was conducted with four universities from different regions in Algeria, mainly Tlemcen, Saida, Ouargla, and Batna. The data were gathered from two questionnaires; one distributed online through Google Forms to fifty-two teachers and the other one was posted online on students' Facebook groups where one hundred and five students from different specialties and levels answered back the questionnaire by email. In addition to the questionnaires, an interview was conducted with twenty-three teachers that were selected following a purposive sampling. The analysis of the results revealed that during the pandemic most Algerian universities provided the majority of the educational lessons and lectures online through the asynchronous learning mode. The analysis also indicated that this specific learning mode had affected negatively students' attitudes and the learning process mainly due to of the lack of Teacher/students

interaction and the insufficient teacher training on practices that involve online learning and the associated platforms.

Another study conducted by Ghemmour and Sarnou (2016) aimed at investigating the potential of MOOCs (Massive Open Online Courses) as well as measuring students' and teachers' attitudes towards the integration of this model in teaching and learning EFL. Forty-two third year students and five teachers accustomed with the concept of MOOCs from the department of English at Abdelhamid IbnBadis University Mostaganem were non-randomly selected to be part of this study. After a three weeks experiment with an offline course entitled *"Developing Your Research Project"*, participants were asked to respond to a questionnaire related to their experience. Besides the questionnaires, an unstructured interview was also used to reinforce the quality of the investigation. The analysis of the data revealed that MOOCs are enjoyable, engaging, highly motivational and less teacher-centered mode of instruction. The researcher concluded that MOOCs make students more productive and it is high time for its integration in the teaching process

With relatively a much larger sample of seventy second year EFL students and ten teachers randomly selected from the Department of English at the university of Abd Alhafid Boussouf - Mila, Belli and Mezili (2021) attempted to determine the different technologies adopted and investigate their effectiveness in remote learning during the Covid-19 pandemic. The researchers opted for two separate questionnaires as data collection instruments one intended for teachers and the other for students. The analysis for the results yielded that during the pandemic period, distance learning at Mila University centre depended mainly on the moodle platform. The results also showed that teachers and students faced various issues that led them to develop negative attitudes towards distance learning, and among these issues the lack of teachers' explanation caused by the limitation of platform used in addition to some technical issues related to the internet speed and platform breakdown.

Bensafa's (2012) case study research explored the effects of using internet-based video conferences, as an example of synchronous distance learning, on improving the

language proficiency ESP students' learning outcomes. To achieve that purpose, fourteen ESP post-graduate students from department of foreign languages (English section) at Abou Bekr Belkaid University – Tlemcen, were observed while engaging in a series of six sessions of video conferences on different topics with professors from the universities of of Nantes and Sorbone Paris 3 – France. Data were gathered using a combination of quantitative and qualitative approach from an observation and a semi-structured interview. The analysis of the results carried out with Microsoft Excel indicated that talking with an ESP expert via video conferencing is and effective alternative to face-to-face teaching and among the key factors affecting that effectiveness is a reliable internet connectivity with a large bandwidth and a good preparation on how to use technology on the part of teachers and students.

In a similar related study, Boubekeur et al. (2017) attempted to explore the role of distance learning in supporting EFL Master students to enhance their English language learning. Two Intact groups of twelve teachers and fifty master students from Department of English at the University of Adrar were chosen to respond to two separate questionnaires. The data collected were subject to a manual statistical analysis. The results demonstrated that distance learning, in particular video conferencing increases students' learning satisfaction, develops their academic achievements and might be used as a solution to overcome the issue of teacher shortage in southern universities.

One of the most rare research conducted in Algeria on the effectiveness of distance learning that follows the a pre- post-test experimental design relying on students learning outcomes rather than on only the opinions of students or teachers is that of Saidouni's (2019). It aimed at investigating the effectiveness of using mobile devices on developing EFL students' speaking skills. To that end, a total of sixty-four second year students and nine oral expression teachers from the Department of English language and literature at Mostefa Benboulaid Batna-2 University were purposefully selected to be part of this case study. Students were randomly assigned into experimental and control groups of thirty-two students each. Both groups were taught the same content but using different methods. While the experimental group was taught using mobile devices as a supporting tool that provide access to the content anytime and anywhere, the control group was

taught using the traditional way without the use of mobiles or any other technological devices. The research was conducted in three phases with the adoption of a mixed method approach of collecting data qualitatively and quantitatively through four questionnaires and pre post-tests scores backed up with an observation grid. The T-test manual statistical analysis revealed statistical significant difference in favour of the experimental group. A further triangulation of the analysis showed that the results are satisfactory not only in increasing the speaking performance, but also in motivating the students who had expressed positive attitudes toward the integration of mobile devices in the learning process.

1.4 Conclusion

In this chapter, the researcher has attempted to present background studies related to the effectiveness of CALL and distance learning. It has been noticed that true experimental studies on CALL and distance learning effectiveness adopt a pre-test/post-test and experiment/control group research design. This type of research design, however, is rarely seen in the Algerian research projects. Indeed, most of the research conducted at the national level that claim to assess the effectiveness of CALL and distance learning were basing their results solely on subjective instruments (such as personal observations, questionnaires or interviews) which made their obtained results, to some extent, questionable in terms of validity and accuracy. All in all, according to the majority of the studies conducted, it has been concluded that CALL and distance learning have a positive impact on EFL learners' attitudes and language achievement in at least one language skill.

Chapter Two

Theoretical Considerations

Chapter Two: Theoretical Considerations

2.1 Introduction

The second chapter of the present research paper deals with an overview of different theoretical considerations pertaining to language learning in general. Emphasis is put on providing definitions, theories and explanations of relevant key concepts that can built adequate introductory ground from which the reader can move through the rest of the research. A large part of this chapter is concerned with learning, learning theories, learning styles and language skills. The other part mainly discusses ESP and briefly describes the notion of attitude and authentic material.

2.2 Education:

Etymologically speaking, the English word ‘Education’ derives from two different Latin roots: ‘Educare’, which means ‘to train’ or ‘to mold’, and ‘Educere’, whose meaning is to ‘draw out’ or to ‘lead out. Although the two meanings are relatively quite different, they are both represented in the term ‘Education’. While ‘Educare’ involves the preservation and passing down of knowledge, prepares the youths to fit into existing circumstances, and considers learners as recipients or consumers of knowledge, ‘Educere’ involves preparing new generations for the changes that are to come, readying them to create solutions to problems yet unknown and considers learners as creators or producers of knowledge.

The Oxford Advanced Learner's Dictionary defines education as:

> *“a process of teaching, training and learning, especially in schools, colleges or universities, to improve knowledge and develop skills.”*
>
> (Hornby, 2000, p. 401)

Education has a wide connotation with no precise or simple definition to which all would subscribe. The term is understood and interpreted in different ways by different scholars. In this respect, Sahu (2002) considers education as a lifelong continuous process. He states that:

> *"Education is a process of learning and development… It is acquisition and accumulation of knowledge, construction and reconstruction of experiences for living life… Education is a functional process of the development of the whole being of the individual. It is a process of all-round growth and development - physical, mental, social, emotional, moral and spiritual."*
>
> (Sahu, 2002, p.7)

Bailyn (1960) calls to rethink and revamp the meanings of education from the narrow focus on schools, policy, and institution to include a wider view on cultural transmission from one generation to another. He urged that education should be rather thought as:

> *"the entire process by which a culture transmits itself across generations."*
>
> (Bailyn, 1960, p.14)

Along the same line of thoughts, Cremin (1977) explains that education as a historical and contemporary phenomenon did not only occur in schools, but also in other social and cultural institutions. He defines education as any:

> *"deliberate, systematic, and sustained effort to transmit, evoke, or acquire knowledge, attitudes, values, skills, or sensibilities, as well as any outcome to that effort."*
>
> (Cremin, 1977, as cited in deMarrais & Lapan, 2004, p. 38)

Adams (1912), in his book 'Evolution of Education Theory', points out that education is a conscious and deliberate process that has its aims to modify the nature of the educand and not merely to supply a certain amount of knowledge.

As for Young (1971) gives another definition:

> *Education is not a product like cars and bread, but a selection and organization from the available knowledge at a particular time which involves conscious or unconscious choices.*
>
> (Young, 1971, p. 24)

Following these definitions, one can say that education encompasses teaching, training and learning. It is generally defined as a process of acquiring knowledge needed for growing and developing as a whole being. It is also a way of transferring knowledge and transmitting different cultures. Education happens most of the time formally in educational institutions as a planned activity where grown-ups shape the mind of the younger generations.

2.3 Learning

Learning represents one of the most central issues in the field of education. Various definitions and conceptions have been developed over the years as a response to people's endless trial to understand this complex mental process. Due to the complexity of the human nature, it is somewhat difficult to provide an explicit and meaningful definition just in few words to the concept of learning. The word 'Learn' is defined by the Cambridge Online Dictionary as:

1. to get knowledge or skill in a new subject or activity.
2. to make yourself remember a piece of writing by reading it or repeating it many times.
3. to start to understand that you must change the way you behave.
4. to be told facts or information that you did not know.

The most broad and open definition of learning is reported by Illeris (2007). Illeris views learning as a process involving the interaction between the individual and his environment. He states that:

> *"any process in living organisms that leads to permanent capacity change and is not solely due to biological maturation and ageing is learning."*
>
> (Illeris, 2007, p. 3)

As for Mumford (1995), learning is a process that comprehends the acquisition of skills as well as insights or factual knowledge. Mumford observed that the learning process takes place whenever:

> *"people can demonstrate that they know something that they did not know before (insights and realizations as well as facts) and/or when they do something they could not do before (skills)"*
>
> (Mumford, 1995, p. 13)

Brown (2007) noticed seven major constituents in the definition of learning, those are:

> *"1. Learning is acquiring or getting*
> *2. Learning is retention of information or skill*
> *3. Retention implies storage system, memory, cognitive organization*
> *4. Learning involves active, conscious focus on and acting upon events outside and inside the organism*
> *5. Learning is relatively permanent, but subject to forgetting*
> *6. Learning involves some forms of practice, perhaps reinforce practice*
> *7. Learning is a change in behaviour."*
>
> (Brown, 2007, p. 8)

Learning is a lifelong process that begins at birth and continues throughout life. It is a process of discovery, information processing and expression. It is an act of acquiring new, or modifying and reinforcing, existing knowledge, behaviours, skills, values, or preferences. Learning is not compulsory; it is voluntary, however, to survive we must learn.

Moreover, learning is thought to be a cumulative process where new learning builds upon knowledge acquired in a previous phase. The process may take place consciously or subconsciously but It does not happen all at once.

Learning is an active process of discovery whereby students are encouraged to engage in realistic problem-solving contexts, by exploring, experimenting and pondering a series of progressively difficult tasks in order to develop higher level skills and achieve deep understanding of major concepts.

Bicknell-Holmes and Hoffman (2000) described three main attributes for learning by discovery: 1) exploring and problem solving are to create, integrate, and generalize knowledge, 2) student-driven, interest-based activities in which the student determines the sequence and frequency, and 3) Activities to encourage the integration of new knowledge into the learner's existing knowledge base.

When it comes to language learning, the acquirement process occurs through exposure to different linguistic contexts, where learners interact with each others, process information and are ultimately pushed to express themselves through productive discussions.

Information processing is key to learning. The human brain, with its intricate cognitive mechanism, processes information with remarkable efficiency and usually performs way better than most advanced computers in tasks such as problem-solving and critical thinking. For cognitive psychologists, learning is a change in a person's mental structures that creates the capacity to demonstrate different behaviours (Eggen & Kauchack, 2007). From this reflexion emerged the idea of information processing theory which explains how individuals perceive, analyze, manipulate, use, and remember

information. It was theorized that the human brain works in a set of sequences, as does a computer. According to Atkinson and Shiffrin (1968) information is processed through three stages:

The first stage involves the 'Sensory Memory' which provides the initial screening and processing of incoming stimuli. In a classroom, student's senses are being bombarded with reading and listening as sensory inputs. The 'Sensory Memory' acts as a filter sifting out relevant from irrelevant information. It helps decide what is important enough to direct attention to.

The second process involves the 'Working Memory' which acts like a buffer that holds temporary data for immediate manipulation. When students decide that something is important, they start consciously building connections among the selected information into a coherent whole. In this phase students are required to use rehearsal so as to avoid information being forgotten.

The third process involves the 'Long-Term-Memory' where information is stored permanently. Alongside with Rehearsal, the creation of external connexions and some sort of meaning between the organized new information and existing knowledge is essential to encode the acquired information into the 'Long-Term-Memory'. The encoded information cannot be interacted with directly it first needs to be retrieved from the 'Long-Term-Memory' and brought back to the 'Working Memory' where it is once again processed for final use.

Hence, after going through all these phases, it can be said that learning has occurred and students are ready to express themselves in the form of a final output.

2.3.1 Learning Theories :

Students learn in different ways. Learning theories are a set of principles that describe and seek to explain how individuals take in, process, and acquire knowledge. Learning theories facilitate a better understanding of complex processes and key aspects of language learning. A great deal of research had been done in terms of what motives students and the way in which information is processed. Although there are numerous

different approaches to learning, some light will be shed on the three basic of these learning theories, namely; Behaviourism, Cognitivism and Constructivism.

2.3.1.1 The Behavioural Learning Theory:

Behavioural psychology or behaviourism is the first leading theory of learning which has marked the fields of education, teaching and training during the first half of the twentieth century. Its roots go back to the last years of the nineteenth century when animals' automatic and involuntary responses to stimuli were receiving much of researchers' interest (Jordan et al., 2008). The theory drew its inspiration from works done by several prominent scholars. Pritchard and Woollard (2010) states :

> *"The notable scientists who developed [the behaviorist] learning theory are: Pavlov (1849–1936) for the development of classical conditioning at the beginning of the twentieth century;Watson (1878–1958) for setting out the initial principles of behaviourism; and Skinner (1904–1990) for his pioneering work on the importance of reinforcement."*
>
> (Pritchard & Woollard, 2010, p. 4)

Behaviourism is concerned only with observable and measurable aspects of human behaviour and ignores internal processes such as, emotions, attitudes, beliefs, cognition or any other innate or inherited factors. Proponents of behaviourism view the mind as a blank slate or 'tabula rasa' believing that individuals are born without a built-in mental content and therefore all learning comes from environment or experience that takes place through a habit formation process as a response to a stimulus. Brooks (1964) argued:

> *"The single paramount fact about language learning is that it concerns, not problem solving, but the formation and performance of habits."*
>
> (Brooks, 1964, p. 49)

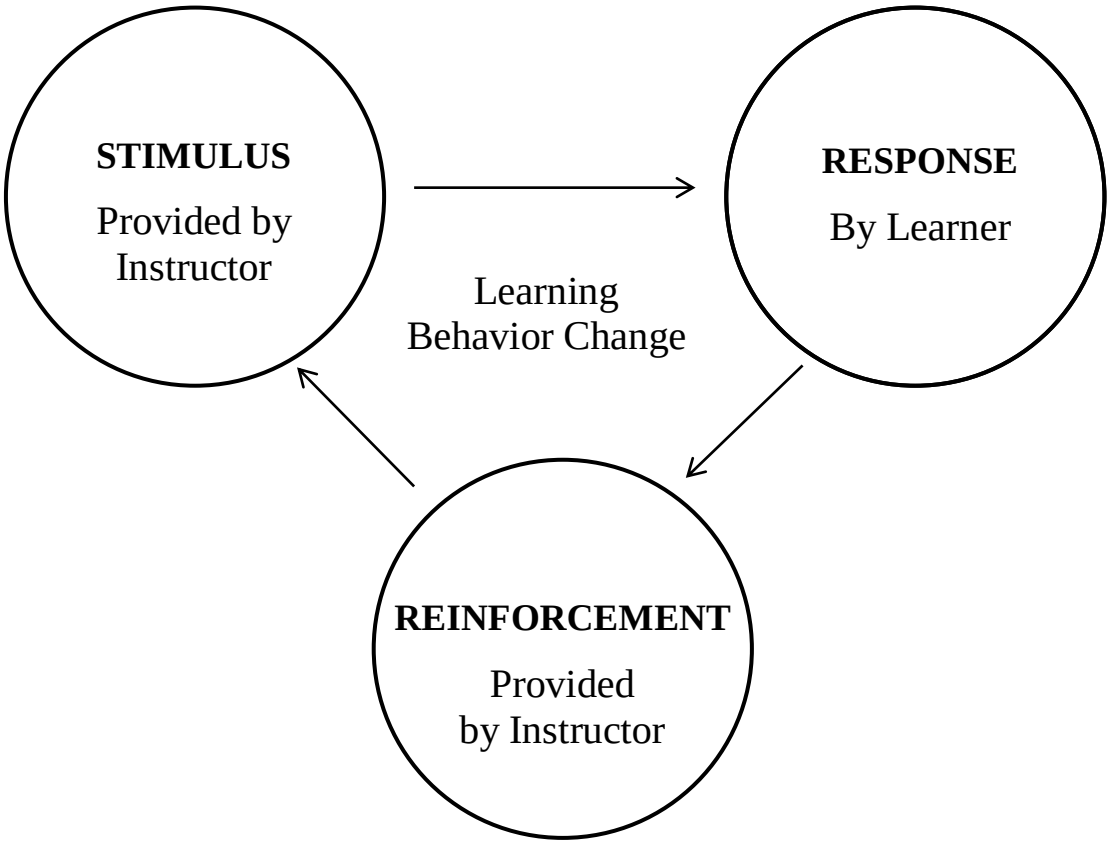


Figure 1: Behavioural Learning Process (https://sites.google.com/site/chiayeeyong/master/semester-2/adiscussionaboutbehaviorism)

In a behaviourist classroom, the lessons are organised and structures by the teacher who is the sole activator of the learning process, that is, students are passive recipients into which the teacher pours static knowledge. Thus, learning occurs as an automatic process of forming habits where the repetitive conditioning of the students responses are emphasized by means of positive reinforcements. Moreover, the behaviourist teacher will encourage rote learning through drills, imitation and recitation. Students in such a classroom will be given a large number of exercises for practice and those who are not able to achieve high scores will be asked to redo the task until the right answer is found. The main focus is on students' ability to answer questions correctly and not necessarily the ability to understand or explain the concepts taught. However, while emphasis is mainly placed on the lower levels of intellectual skills, it is commonly agreed that higher level skills or those requiring great depth of processing such as problem

solving, argumentation, and critical thinking are neglected since they cannot be adequately explained by the behavioural principles (Schunk, 1991).

The behaviourism theory was heavily criticised for showing many weaknesses in explaining language learning. Hence, researchers were bound to move to other new and more effective theories.

2.3.1.2 The Cognitive Learning Theory:

In the 1950's, scholars started to shift their attention away from the dominant paradigm of behaviourism towards a new approach that relies on theories and models from the cognitive science. The new emerged theory of cognitivism gained wide currency during the 1960s as a response to behaviourism and its overreliance on the external environment as well as the stimulus-response relationship in explaining the learning process. The cognitive learning theory was developed as a natural outcome of increased interest in research related to the internal mind processes and the widespread of cognitive experimentations. Among the other factors influencing the development of cognitivism was the advancement of computer technology and the interest in artificial intelligence (Jordan et al., 2008). Fontana (1988), in his book 'Psychology for Teachers', summarises the cognitive approach to learning as:

> *"The cognitive approach ... holds that if we are to understand learning we cannot confine ourselves to observable behaviour, but must also concern ourselves with the learner's ability mentally to re-organize his psychological field (i.e. his inner world of concepts, memories, etc.) in response to experience. This latter approach therefore lays stress not only on the environment, but upon the way in which the individual interprets and tries to make sense of the environment. It sees the individual not as the somewhat mechanical product of his environment, but as an active agent in the learning process, deliberately trying to process and categorize the stream of information fed into him by the*

external world."

(Fontana, 1988, pp. 126-127)

The discoveries made in the area of cognitive science helped gain valuable insights into the way in which the human brain deals with information received from the environment. According to the cognitive school of thought, the continuous refinement of understanding formed by previous experiences and new ones facilitates acquiring knowledge. In this sense, the cognitive theory of learning is interested in the learner's cognitive activities and mental operations involving processes such as memorisation, reasoning, problem solving and knowledge transmission instead of the habit formations. Scholars holding a cognitivist view seek, contrary to the behaviourists, to emphasize on the internal processes that affect learning.

Ausubel (1968) and Gagné (1965) were among the most prominent researchers who have contributed significantly in developing the cognitive theory of learning. According to these authors, an individual is an active system of information treatment, much like a computer system. Ausubel and Gagné started by investigating the physical constituents of the human memory and the way in which information is received, represented, stored and retrieved by the human brain. Among their findings was that the human brain retains information in the memory sections where it is treated and used to solve problems. This process of information treatment was elaborated in 1976 by Gagné. He explained how the stimulus or the information received from the environment in various forms (auditory, tactile, visual, etc...) was processed and interpreted. The data is at first captured by the human senses and then sent to the sensory memory where it is deciphered. Once the information is received by the short-term memory it needs to be analysed and interpreted by means of reactivating the knowledge stored in the long-term memory. From this process of interpretation a symbolic construction in the form of schemes or representations are shaped as thoughts, concepts, ideas or notions that help the individual to picture reality.

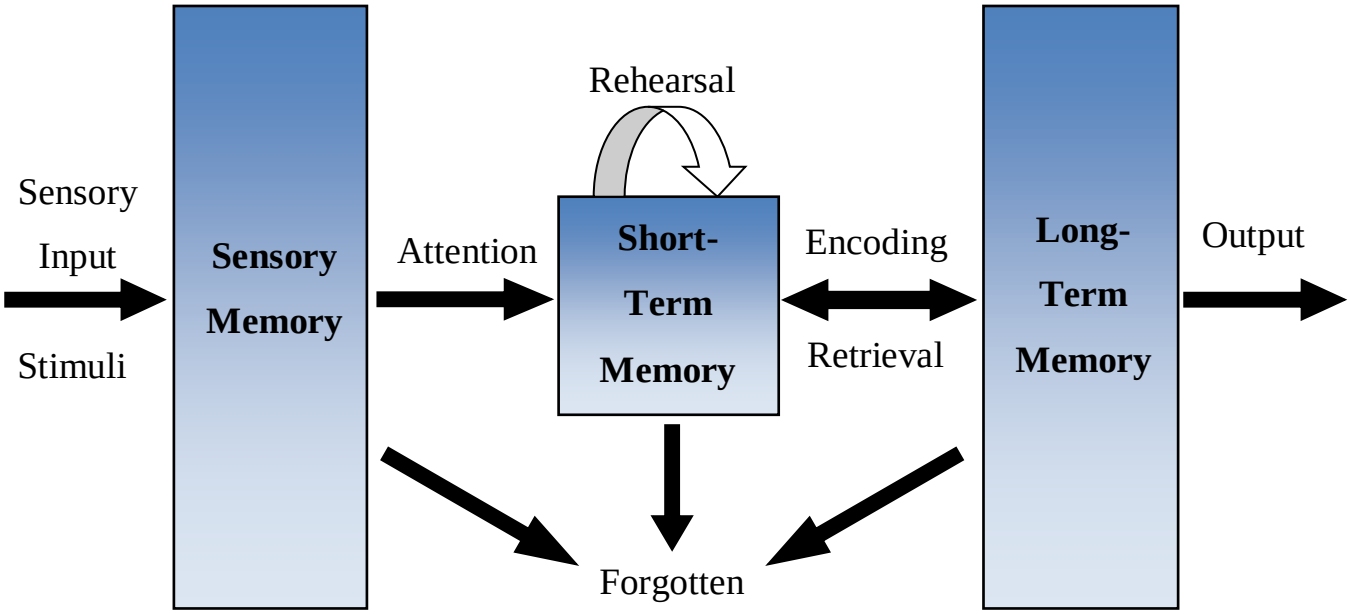


Figure 2: Information Processing Model (Adapted from Gagné et al., 2005)

Inside a cognitive classroom, rather than practicing drills to form habits, students are encouraged in meaningful learning and interactive activities that stimulates their thinking potential. The use of thought-provoking questions, for example, guides their brains to delve deeper into their previous knowledge to find solutions and solve problems. Hartley (1998) explained:

> *"Learning results from inferences, expectations and making connections. Instead of acquiring habits, learners acquire plans and strategies, and prior knowledge is important."*
>
> (Hartley, 1998, p. 18)

The following major principles associated with the cognitive theory can be drawn out from the above:

- Instruction organization: in order to facilitate the learning and the retrieval of information from the memory, the instructional material needs to be well organized.

- Instruction structuring: lessons from the curriculum need to have inherent structures formed by the logical relationship between concepts and key ideas linking all the components together.
- The task's perceptual features: depending on their learning style, students selectively perceive different aspects of the environment. Careful considerations need to be given to the way in which a problem is presented if students are to understand it.
- Prior knowledge: if learning is to take place, new knowledge needs to be linked to the one that had already been acquired.

Though the advocates of the cognitive theory describes it as a sophisticated explanation of the human learning and use scientific foundation to back up their claims, its opponents perceive it as a limited theory which cannot account for the development of human knowledge. This critique was one of the reasons behind the emergence of constructivism (Jonassen, 1991).

2.3.1.3 The Constructive Learning Theory:

Constructivism became the mainstream during the late 1980s and early 1990s as interest started to shift gradually far away from the behavioural and cognitive theories which both seemed unable to demonstrate either the active role of the learner or the impact of social-interactive environment on the learning process. The constructivist theory stems from the work of John Dewey (1859-1952), Jean Piaget (1896-1980) and Lev Vygotsky (1896-1934), among others in the field of cognitive psychology.

According to Naylor and Keogh (1999), the constructivist theory is an approach to learning in which the central principles are that:

> *"learners can only make sense of new situations in terms of their existing understanding. Learning involves an active process in which learners construct meaning by linking new ideas with their existing knowledge."*
>
> (Naylor & Keogh, 1999, p. 93)

As for Fosnot (1996), learning from a constructivist standpoint is not a passive accumulation of knowledge but rather an active creation and modification of thoughts, ideas, and understandings as the result of experiences that occur within the socio-cultural contexts. She reflects:

> *"Learning from [a constructivist] perspective is viewed as a self-regulatory process of struggling with the conflict between existing personal models of the world and discrepant new insights, constructing new representations and models of reality as a human meaning-making venture with culturally developed tools and symbols, and further negotiating such meaning through cooperative social activity, discourse, and debate."*
>
> (Fosnot, 1996, as cited in Mella, 2020, p. 13)

Based on the reflexions of Boethel and Dimock (1999) and Fox (2001), Yilmaz (2008) outlined some of the guidelines which identify the basic assumption and principles of the constructivist learning theory. They are presented as follows:

- Learning is an active process.
- Learning is an adaptive activity.
- Learning is situated in the context in which it occurs.
- Knowledge is not innate, passively absorbed, or invented but constructed by the learner.
- All knowledge is personal and idiosyncratic.
- All knowledge is socially constructed.
- Learning is essentially a process of making sense of the world.
- Experience and prior understanding play a role in learning.
- Social interaction plays a role in learning.
- Effective learning requires meaningful, open-ended, challenging problems for the learner to solve.

The constructivist theory is basically based on the premise that students learn best when they actively construct their own understanding. In this sense, knowledge and understanding is not acquired by passively perceiving it within a direct process of knowledge transmission; rather, it is constructed through experience and social interaction whereby the newly generated information is integrated with the already existing structured knowledge.

It is worth mentioning that within the constructivism spectrum there are two major schools of thoughts: cognitive constructivism and socio-cultural constructivism. The former is related to the work of the Swiss developmental psychologist Jean Piaget and the later with that of the Russian researcher Lev Vygostsky. These two schools are not considered a complete disjoint set as they both acknowledge the responsibility of the students to construct their own understanding. However, the two schools main emphasis is different as it will be explained hereinafter:

2.3.1.4 The Cognitive Constructive Theory

Piaget is considered as the father of constructivism and one of the most influential figures in the field of cognitive science. His research led to the expansion of understanding of how learning takes place as a process of construction. Based on the cognitive constructivist theory, students construct their understandings by building it through experience. Each experience allows them to create new knowledge.

In order to explain the process of learning, Piaget (1954) employed two complementary concepts, which are to be known as ‘assimilation’ and ‘accommodation’. He claims that humans are born with some rudimentary mental structures named ‘schemes’ (or schemata), which develop and change depending on the personal experience an individual goes through. Each time a person faces new information (a new object or an abstract concept) he tries to make sense of this information by referring to his pre-existing schemas (information and knowledge already acquired). If the new information fits into the current schemas than it can be said that a person has undergone a process of assimilation characterised by an overall state of equilibrium. However, when a person is unable to integrate unfitting new information into his existing schema, he faces

a state of disequilibrium which he attempts to overcome. This problem can be solved through accommodation, a process in which the existing cognitive schema is revised and adjusted so that the new information can be incorporated. In other words, the new information revised becomes new schema which will be enriched and recycled again and again whenever a new experience is encountered. The more a person goes through these processes of assimilation and accommodation, the more knowledge and experience he gains about the world and himself as a manipulator of this knowledge and the more he becomes cognitively more mature.

Piaget's work about how knowledge is constructed, and meaning is formed based on personal experiences had a great influence on nearly all the written references related to constructivism, especially in the early stages. Constructivism has, then, developed from such a Piagetian perspective to other theories which focused more on the social and cultural aspects that impacts the development of learning.

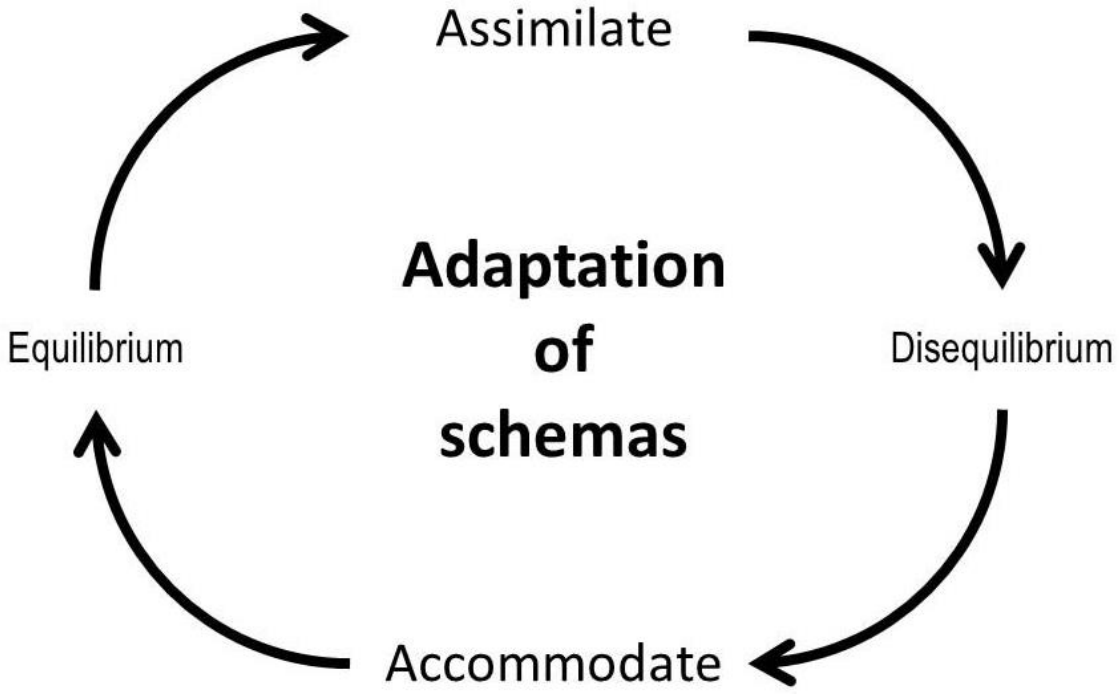


Figure 3: Piaget' Learning Model (https://www.simplypsychology.org)

2.3.1.5 The Social Constructive Theory

The origins of the social constructivist view of learning have their roots in the work of Vygotsky, a Russian researcher whose theory was formulated at the beginning of the twentieth century but not widely available in the West until many years later. Vygotsky (1978) shared many of Piaget's assumptions related to the way in which humans learn, but put stronger emphasis on the social aspects of constructing knowledge. His view has been named 'Social Constructivism' to differentiate it from Piaget's view that is often referred to as 'Cognitive Constructivism', and is less concerned with language and social interaction (Santrock, 2019).

Vygotsky's theory differs from that of Piaget in a number of ways. The following table summarizes the major differences between cognitive constructivism and social constructivism:

	Cognitive Constructivism (Piaget)	**Social Constructivism (Vygotsky)**
Knowledge	Knowledge of cognitive structures are actively constructed by learners themselves based on existing structures.	Knowledge is socially constructed.
Learning	Active assimilation and accommodation of new information to existing cognitive structures. Discovery by learners.	Integration of students into knowledge community, collaborative assimilation and accommodation of new information.
Motivation	Intrinsic: learners set their own goals, motivate themselves to learn.	Intrinsic and extrinsic: learning goals and motives are determined by learners and extrinsic rewards

		provided by the knowledge society.

Table 1: Differences between Cognitive Constructivism and Social Constructivism (adapted from Larochelle et. al., 1998)

Vygotsky believes that students can attain higher cognitive development when working together with others in a joint collaboration. And by doing so, these students can obtain important information that may be difficult to obtain by other means. In other words, sharing ideas between peers, group discussions and feedback have a strong influence on learning. Pritchard and Woolard (2010) support this claim by stating that:

> *"Effective and lasting learning takes place for the individual when engaged in social activity with a range of others."*
>
> (Pritchard & Woolard, 2010, p. 7)

Another focal point worth considering in order to gain a better understanding of the social constructive theory of learning is the notion of the Zone of Proximal Development (ZPD) which Vygotsky (1978) defines as:

> *"the distance between the actual development level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers."*
>
> (Vygotsky, 1978, p. 86)

The ZPD is a theoretical space of understanding that a student is unable to attain independently without the assistance and guidance of a More Knowledgeable Other (MKO) –a tutor, a teacher, a skilful peer or a parent. This means that the teacher, after having assessed the actual development of his students, can boost their learning by accompanying them through tasks that are moderately beyond their ability level. Over time, and as the student becomes more competent, the teacher gradually ceases assisting

them until they are able to perform the skill or the activity on their own. Only a small amount of assistance is required when learning is taking place in the ZPD; otherwise the students will only parrot the teacher rather than mastering the skill independently.

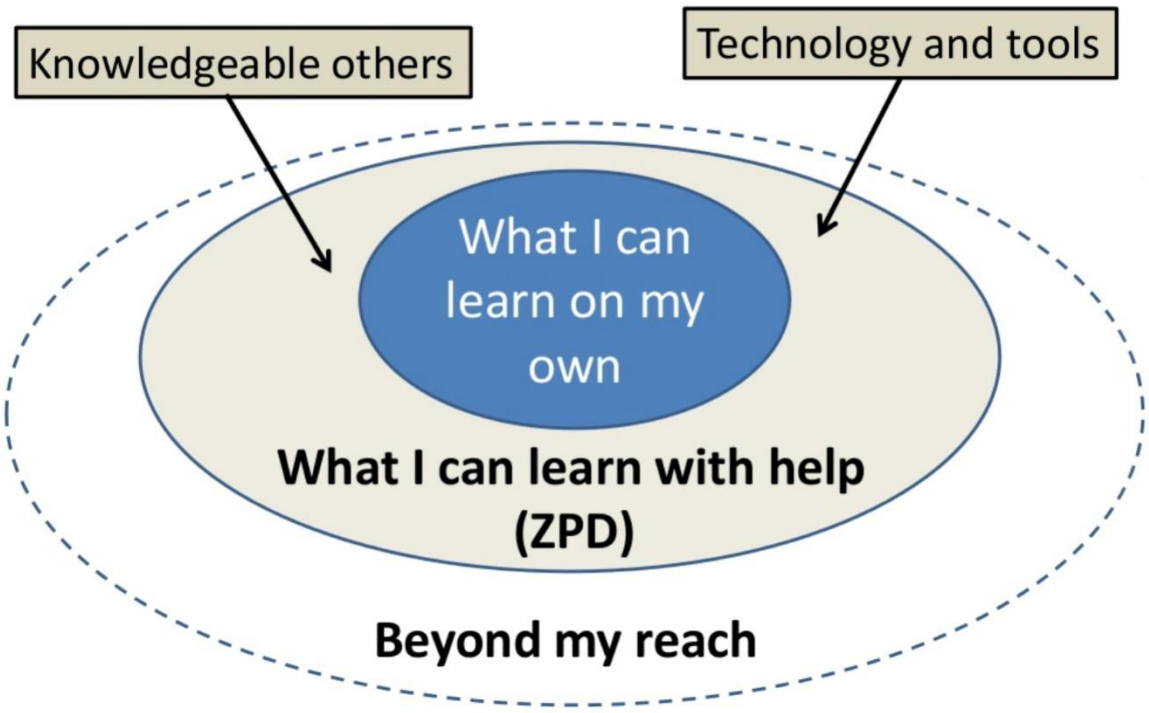


Figure 4: Vygotsky' Zone of Proximal Development (Abhishek, 2019, p. 45)

Moreover, students working in groups have different ability levels so more advanced peers can assist less advanced members to operate within the ZPD. This process of giving a tailored support that might include technology tools, hands-on activities, or direct instruction for each student is referred to as 'scaffolding'. Scaffolding is typically discussed in conjunction with the ZPD. However, Vygotsky himself never mentioned the word scaffolding in his writings the term was coined and developed by Bruner et. al. (1976) while they were applying ZPD concept to different educational contexts.

2.3.2 Learning Styles:

Because individuals are born different from one another, they do not approach a problem in the same way. While learning, each individual is supposed to adopt the way that mostly suits him, and with which he would feel more comfortable (Pritchard, 2008). This particular way of learning is named a learning style. A learning style then is simply a learning approach that is preferred by a learner. Hence, matching learning content to students identified learning styles would greatly enhance the learning outcome.

Learning style is not a new idea. Aristotle noticed individual differences among young children as early as 334 BC. However, and according to Cassidy (2004), research in the area of learning styles emerged only four decades ago. These researches helped in the classification of learning styles and preferences into various models. In this respect Barbara (1993) states the following:

> *"Researchers Claxton and Murrell (1987) have grouped various models of learning styles into four general categories. Personality models: refer to basic personality characteristics (for example, extrovert versus introvert). Information-processing models reflect how people take in and process information (for example, holistic manner — seeking overall understanding — versus serial manner — adopting a step-by-step approach). Social-interaction models focus on how students interact and behave in the classroom (for example, learning oriented versus grade oriented). Instructional preference models focus on the medium in which learning occurs (for example, listening, reading, direct experience)."*
>
> (Barbara, 1993, p. 785)

Introduced by Neil Fleming in 1987, the VARK model is one of the most commonly used models of learning styles, especially when learning takes place in a multimedia-rich environment (Fleming & Mills, 1992). The word VARK is an acronym that stands for visual, auditory, read/write, and kinaesthetic sensory modalities. Students

are classified into one of these four main categories based on how they prefer to receive information.

In order to distinguish which category a student belongs to, Fleming (2006) designed a self-report inventory[9] which consists of sixteen multiple choice closed-ended questions. Each question has four possible answers that correspond to the four main sensory modalities: visual, auditory, read/write, and kinaesthetic. The participants can select one or more answers based on the modalities they prefer to take in new information. This learning preference assessment tool is available online in multiple languages via the web site: www.vark-learn.com. The results from the VARK tool generally identify four major types of learners:

2.3.2.1 Visual Learners:

Visual learners, or often called spatial learners, are individuals who prefer to rely on their sight to take in information (Renou, 2009). They often use their imagination, but they mostly prefer to observe and represent information in flow charts, spider diagrams, pictures, graphs, maps, and pictographs. These learners learn best through demonstration and they depend much on using symbolic tools such as drawings and colours to highlight and reinforce the recall of key ideas. According to Prithishkumar and Michael (2014), visual learners have a preference to use lists to stay organized. They also tend to pay close attention to details and body language. However, these learners are very impatient and they can easily be distracted by actions and movements (Drago & Wagner, 2004).

2.3.2.2 Auditory learners:

Unlike visual learners, auditory ones like to hear rather than to see or read what they are being taught. These learners listen more than they speak and are known to excel when the topic is explained verbally in great details through lectures, music, audiobooks, and podcasts. Auditory learners are one of two types. Those who absorb verbal presented information as they silently carry on mental dialogue. These learners are called auditory

[9] A self-report inventory is a type of psychological test in which a person fills out a survey or questionnaire with or without the help of an investigator. Self-report inventories often ask direct questions about personal interests, values, symptoms, behaviors, and traits or personality types.

non-verbal learners or simply listeners. And those who tend to learn by discussing and reciting the information out loud and these are called auditory verbal learners. In other words, auditory non-verbal learners favour listening to others silently while auditory verbal learners prefer listening to themselves speaking out loud. Auditory learners in general are easily interrupted by noise (Drago & Wagner 2004). They need a quite environment to be able to listen intently to the learning content.

2.3.2.3 Reading/Writing learners:

Learners who tend to take in information better when reading, writing and interacting with words and textual-based forms are the read/write learners. To them, text is more powerful than any type of visual or auditory modality. Their primary means of learning are through reading textbooks, writing essays, reading lecture notes and summarising handouts. Learners with reading and writing preference like the clarity that comes from writing their ideas in a list form which can help organise their learning into categories. These learners prefer to arrange their lecture notes into outlines, rewrite lesson in their own word, and study in traditional classes while being examined with multiple choice questions (Murphy et al., 2004).

2.3.2.4 Kinaesthetic learners:

Learners who prefer to learn by doing are called kinaesthetic learners. Oftenly identified as being tactile learners, they enjoy hands-on practice through real personal experience. These learners learn best when they are actively engaged in purposeful activities as they need to feel they are physically involved in the learning process (Marcia, 1995). This type of learners likes to interact with objects from their environment and move around while talking or listening. Hence, it is difficult for them to sit still for a long period of time in a teacher-centered classroom without getting distracted (Montemayor et al., 2009). Kinaesthetic learners use all modalities to take in information. However, their speaking skill is limited as they demonstrate slow talking ability compared to other types of learners.

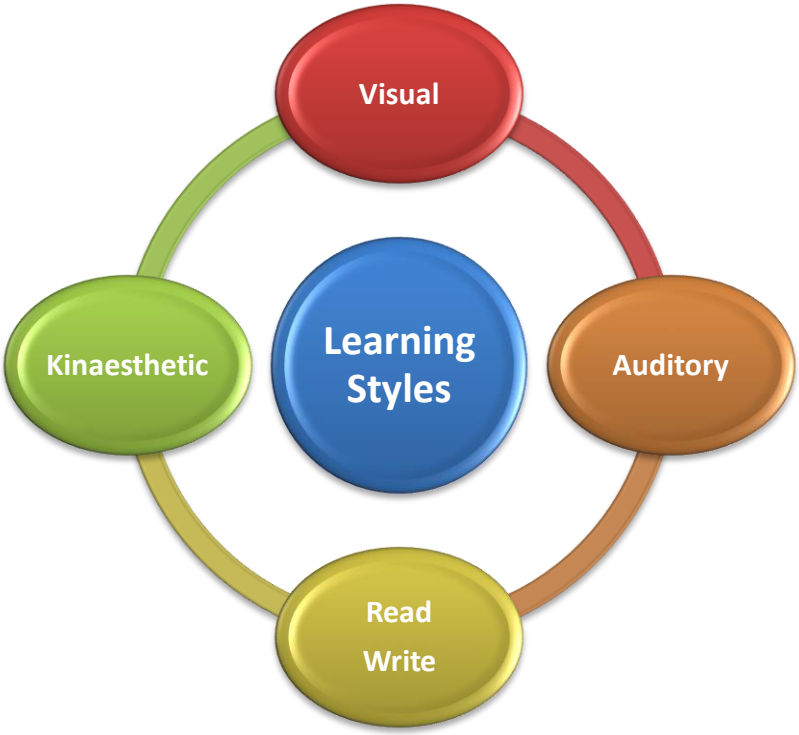


Figure 5: VARK Learning Model.

It is worth mentioning that learners are not simply visuals, auditory, read/write or kinaesthetic. Notably, some learners favour the use of one dominant learning style while other opts for the combination of more than one. Therefore, it is of importance for learners to first identify the dominant learning style they belong to and then work on improving the weaker learning modalities they are having difficulties with. Following this strategy is beneficial in making learners more adaptable to various learning situations.

2.4 Language Skills :

When learning a language, there are four macro language skills that need to be taken into consideration: Listening, Speaking, Reading and Writing. In case of a native language, kids usually learn to listen first, then to speak, then to read, and finally to write. EFL learners in general need to master all four skills to achieve complete language proficiency. In ESP classes sometimes one skill is emphasised more than the others depending on the teaching method, course objectives and students' need (Derradji, 1995).

This does not mean that the four skills are separated from each other but they are interrelated as clarified in the following diagram:

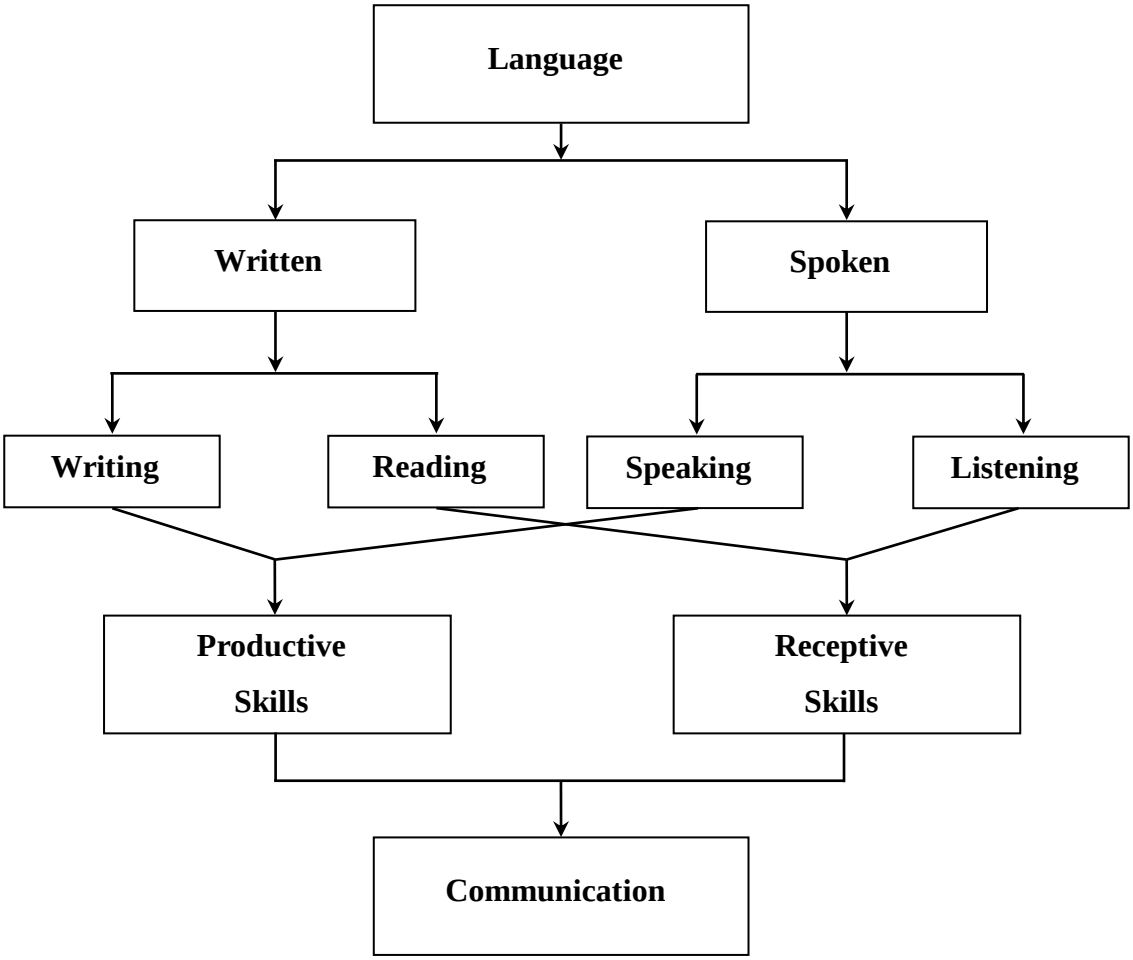


Figure 6: The Four Macro Language Skills Interrelationship. (adapted from Robinett, 1978)

Language can either be written or spoken. Written language is divided into: reading and writing, whereas speaking and listening are classified under the spoken language. Moreover, writing and speaking belong to the productive skills as they both require learners to actively produce language output while reading and listening are commonly referred to as receptive or passive skills.

2.4.1 Receptive Skills:

Receptive skills are the ways in which learners extract meaning from a written or spoken discourse (Harmer, 2001). The meaning-exacting process is related to the basic

skills of listening and reading. Although these skills are different from one another in the way they are taught and learnt, they both rely on previous knowledge to approach the process of comprehension. This means that making sense of any discourse we hear or read involves schematic knowledge or more precisely schema which is defined by Cook (1989) as:

> *"[…] Mental representations of typical situations…used in discourse processing to predict the contents of the particular situations which the discourse describes."*
>
> (Cook, 1989, p. 69)

For example, when people read a newspaper or listen to a story, they use their schematic knowledge and bring into action a range of receptive skills. Researches into the listening and reading processes revealed that when learners are stimulated with particular words, discourse patterns or context their previous knowledge is automatically activated. Thus they become able to recognize what they see or hear because it fits into patterns that they already know. Harmer (2001) explains this process as follows:

> *"If a British reader walks past a newspaper stand and sees headline „England in six-wicket collapse" he or she will almost certainly guess that the England cricket team has been beaten in an international match. This guess will be based on the reader's pre-existing knowledge of newspaper, their experience of how headlines are constructed, their understanding that wicket is a cricketing term, and their knowledge that England has not been doing well in the sport lately. If the reader then goes on to buy the newspaper he or she will use all this pre-existing knowledge to predict the relevant article's contents both before and during the reading of it. However, a reader who did not have such pre-existing knowledge (because he or she did not know anything about cricket, for example), would find the reading task more difficult"*
>
> (Harmer, 2001, p. 199)

Harmer's example demonstrates that it requires much more than knowing the rules of language to grasp the meaning of a piece of written or spoken discourse. Schematic knowledge in this case plays a crucial role in helping learners to quickly identify the idea or the topic in question. This ability allows them to perceive and understand the discourse more effectively as it progresses.

2.4.1.1 Listening:

Listening is the receptive skill in the oral mode. It is the first language skill native speakers acquire at a very young age, so they probably are not aware of how complex it is until they start learning a second or foreign language. By listening we refer not only to hearing but to the linguistic and cognitive processes of comprehension and understanding of what is heard as well. Basically, listening involves three basic steps:

1. **Hearing:** hearing is the physical process of intercepting the sounds waves generated by a speaker. This happens automatically, provided that the listener does not have any hearing issues.
2. **Understanding:** the next step of listening happens when the listener takes what he has intercepted as sounds and attempts to understand it in his own way based on the previous knowledge he has already accumulated.
3. **Judging:** once the message conveyed is understood, the listener will try to think about whether it makes sense. Does he believe in what the speaker is trying to say?

Listening also involves two types of processes: the bottom-up and the top-down processing. Hedge (2000) explains the former as follows:

> *"In the bottom-up part of listening process, we use our knowledge of language and our ability to process acoustic signals to make sense of sounds that speech presents to us. In other words, we use information in the speech itself to try to comprehend the meaning".*
>
> (Hedge, 2000, p. 230)

This means that in the bottom-up processing meaning is constructed by decoding the input sounds in a linear fashion mode from phonemes, to words, to phrases, phrases make sentences, and sentences in their turn are connected together to form a complete meaningful text (Bueno et al., 2006). In addition to the grammatical knowledge, the ability to interpret suprasegmental phonemes such as pitch, intonation patterns, and stress also contribute to the comprehension of the whole message (Van Duzer, 1997).

On the other hand, in the top-down processing the background knowledge is used to interpret and understand the meaning of the spoken message. It is a process in which the listener employs his schematic knowledge and contextual clues such as topic and settings to reconstruct the speaker's original meaning. It is obvious that the difference between the two processes lays in the way in which meaning is constructed. While the top-down processing goes from meaning to language, the bottom-up processing goes from language to meaning (Richards, 2008).

2.4.1.2 Reading:

Reading is the receptive skill in the oral mode. Commonly, it is the ability to draw meaning from a written or printed message form and interpret that information appropriately (Grabe and Stoller, 2011). Reading is typically a silent and individual activity, although on some occasions a student may practice reading out loud either alone or in front of his peers for the sake of improving both his pronunciation and reading comprehension skill. Similar to the listening skill, reading is divided into three overlapping steps :

1. **Decoding:** the first step of reading happens at the phonological level and consists of the reader's ability to recognize and identify the connection between the forty-four phonemes and the twenty-six characters of the English alphabets when dealing with a written text.
2. **Structuring:** structuring involves combining written characters to form words, phrases and sentences. Linguistically speaking, this step happens at the syntactic level of language.

3. **Interpretation:** moving to the semantic level of language, it is not enough to just simply be able to understand the meaning of each word separately. Accordingly, Interpretation allows the reader to get a general idea of the whole text, distinguish facts from opinions and make inferences and predictions.

Moreover, students read mainly for two reasons: either for pure pleasure and this is done in an extensive way by reading long texts and a large amount of material to develop general reading skills or for the purpose of study and this is mostly done in an intensive way by reading short texts carefully and deeply so as to gain specific details. For whichever reason, reading helps to learn language and improve students' vocabulary, grammar and writing skill. Harmer (1998) states :

> *"At the very least, some of the language sticks in their minds as part of the process of language acquisition, and if the reading text is especially interesting and engaging, acquisition is likely to be more successful"*
>
> (Harmer, 1998, p. 68)

Depending on the reading purpose, different strategies are involved to achieve reading comprehension. Harmer (2001) points out that:

> *"The process we go through when reading a novel or listening to a poem are likely to be different from those we use when we are looking for some one's number in a telephone directory".*
>
> (Harmer, 2001, p. 201)

Students are not required to read the whole text in order to check for specific or general information. A good reader in this situation is the one able to understand the gist of discourse without giving much attention to details. Reading for such 'general' comprehension means reading without stopping and analysing each word and every sentence a writer has included in his text. A commonly related term to this type of reading strategy is 'Skimming', which means quickly running one's eyes across a whole text at a comparatively faster rate without going into an in-depth reading.

Skimming, therefore, allows students to get a quick look and a general idea about the text before diving into details.

In contrast to reading for gist, students in some occasions go to written texts simply because they are in need of specific details or want to answer a particular question. For example they may quickly glance at a book's pages concentrating only when they come across particular items they are looking for such as names, dates and statistics, and ignore all other information. This reading strategy is commonly referred to as 'Scanning'.

2.4.2 Productive Skills:

Writing and speaking are called productive skills because they enable learners to produce a language output in the form of oral or written communication. These skills are basically different in various ways. Writing is more organised and less spontaneous than speaking as learners have a relatively longer period of time to think and reconsider what they are about to write. Speaking on the other hand, appears to be spontaneous, more chaotic and disorganized than writing (Harmer, 2001). Brown (2001) summarises the major characteristics that differentiate writing from speaking :

- **Permanence:** speaking is transitory and needs to be processed in real time. By contrast , a written text is more permanent and can be read as often as one wants.
- **Production time:** writers generally have more time to plan, review, and revise their idea before submitting their final form to their intended audience, while speakers must plan, formulate and deliver utterances in a limited amount of time if they are to maintain a conversation.
- **Distance:** the distance between the writer and the reader is greater than the one between the speaker and listener. Usually that distance is eliminated in ordinary face-to-face contact. In the case of writing, the absence of a direct contact between the writer and the reader and the lack of a rich shared context creates a distance of both time and space that requires a great deal of clearness and exactness from the part of writer to overcome that distance.

- **Orthography:** for a speaker, a great deal of suprasegmental devices such as : stress, intonation, pitch, volume, and pausing are available to enhance his message, whereas the writer is limited to the amount of information orthography can convey.
- **Complexity:** at the syntactic level of language, writing tends to be more complex than speaking. While speaking is characterised by shorter clauses connected by coordinators, writing tends to have longer clauses and more subordinators.
- **Vocabulary:** written language places a heavier demands on vocabulary use as it contains a larger variety of words and more lower-frequency words than the spoken language.
- **Formality:** generally speaking, written language tends to be more formal than oral speech and this is mainly due to the social and cultural uses in which writing is ordinarily put.

2.4.2.1 Writing:

Writing is the productive skill in the written mode. It is not an imitative skill that can be acquired naturally but it has to be learned. Writing is one of the skills difficult to be learned and mastered by EFL learners, and even by native speakers, because it is not simply just a graphical representation of speech sound, but it extends beyond to include the generation of relevant ideas and the meaningful synthesis and representation of these ideas into a coherent and cohesive piece of writing.

For students to be able to produce an effective piece of writing, a considerable amount of knowledge about some important elements such as organisation, clarity, coherence, and word choice is required (Starkey, 2004).

1. **Organisation :**

Organisation is the first step in the writing process and the internal structure of a piece of writing that holds together the thread of central meaning. According to Swales and Feak (2012) any piece of good writing, even shorter ones, have a systematic patterns of organisation that the readers are expected to be presented with. The writer needs to take

advantage of these patterns to help his readers believe in what he is trying to convey and makes them willingly follow his lead. Starkey (2004) explains:

> *"By following [an organized method of writing], you will guide your reader from your first to last sentence. He or she will be able to see how the various points you make in your [piece of writing] work together and how they support your thesis."*
>
> (Starkey, 2004, p. 2)

The organisation of a written text is usually decided upon before engaging into the physical act of writing through some prewriting techniques including mainly free-writing and brainstorming. These two techniques are similar in that they are both meant to elicit as many thoughts and ideas as possible. However, free-writing requires writing the whole phrases or sentences down on paper whereas brainstorming involves simply creating a list of words that contains various individual thoughts related to a particular topic.

2. Clarity:

Clarity is an essential element of a good writing. A skill that a writer needs to possess in order to make easily readable and understandable writings. Clarity is often achieved through simplicity by composing short and relevant sentences in which no more than one idea is expressed in each point. According to Starkey (2004), to achieve clarity the writer should:

- Avoid ambiguous terms and phrases that have more than one possible meaning or interpretation that can mislead the reader.
- Use powerful and precise modifiers such as adjectives and adverbs in order to convey a message in fewer and more accurate words.
- Be concise, this means getting directly to the point, eliminating information that do not add relevant value to the text and avoiding unnecessary details or repetitions.

3. Coherence:

Coherence is another important quality that constitutes a good piece writing. It refers to the semantic unity created by achieving a consistent relationship between and among text parts. In other words, coherence is the extent to which a flow of ideas is easily understood by the readers. In a coherent piece of writing all ideas should be connected to the main theme or topic and each idea should clearly be linked to the idea that precedes it and to the one that follows it. This way the readers will be able to make sense of what they are reading at any particular point in the text. Murray and Hughes (2008) state that:

> *"A good writer 'sticks' their ideas together so that they act as links in a chain, each link connecting the one before it with the one after. If any links are missing, the connections become unclear and the argument structure breaks down."*
>
> (Murray & Hughes, 2008, p. 45)

One way for a writer to ensure that his writing has coherence is to organise his ideas in a logical way. The following are some of the common patterns of organisation that a writer can use:

- **Chronological order** is the arrangement of events by their time of occurrence (i.e. from first to last or from last to first).
- **Spatial order** is the organisational structure in which details are presented as they are positioned in space from the writer's perspective (i.e. from top to bottom, right to left, etc.)
- **Logical order** is the presentation of ideas from general to specific or vice-versa.
- **Climatic order** is the arrangement of details or ideas in an ascending order of importance from the least to most significant.
- **Comparison and contrast** is a type of organisation that shows the reader similarities and differences between two distinct subjects. There are two main ways to organise a compare and contrast text: the Block Method and the Point-by-Point method. The Block Method consists of presenting all arguments related to

subject A, and then compares or contrasts them to all arguments related to subject B, whereas the Point-by-Point method alternates arguments of the two subjects.

4. Word choice:

Good writers all share one thing in common; they recognize the importance of word choice in writing. Word choice refers to writer's decisions regarding the selection of particular vocabulary to be used in order to convey a message to the readers in the best possible way. This precise selection of words is determined by a number factors including: the type of audience, the purpose of writing, and the meaning the writers wants to express. According to Starkey (2004) the two major factors worth considering while choosing vocabulary are the denotation and connation of a word.

The denotative meaning of a word is the explicit and literal meaning that is commonly shared by a large members of a speech community. It is the meaning which is usually found in a dictionary. A writer needs to make correct word choice to avoid any confusion that may arise from:

> *"words that sound or look similar (but have very different meanings), words and usages that sound correct (but in fact are not considered standard English), or words that are misused so often that their wrong usage is thought to be correct."*
>
> (Starkey, 2004, p. 22)

The connotative meaning, on the other hand, is the subjective or implied meaning of a word that a reader may infer from a text based on his personal experience, emotions or cultural assumptions. It is a broad range of positive and negative associations most words naturally carry. Considering connotation requires the writer to think not only about the dictionary meaning but to also be aware of the implied meaning of the word that might in some cases irritate or possibly offend the readers. Thus, a careful selection of vocabulary should be made to avoid clichés, informal language, slangs and buzzwords.

2.4.2.2 Speaking:

Speaking is the productive skill in the oral mode and the second naturally acquired skill by native speakers after listening. For ESL and EFL learners, it is often considered as the most important skill to learn because it is believed that being able to speak fluently in a given language is a sign of mastery of all the other four language skills. Ur (1996) declares that:

> *"Of all the four skills (listening, speaking, reading and writing), speaking seems intuitively the most important: people who know a language are referred to as 'speakers' of the language, as if speaking included all other kinds of knowing; and many if not most foreign language learners are primarily interested to speak."*
>
> (Ur, 1996, p. 120)

Speaking is to communicate one's feelings, thoughts, ideas and opinions to a listener through spoken words. It is a skill used in almost every situation of daily life from a simple conversation between friends or colleagues to formal public speaking. Singh (2022) distinguishes three types of situations in which a speaker may find himself: interactive, partially interactive, and totally non-interactive situations.

1. **Interactive situations:** An interactive speaking situation is a conversation type in which participants can alternatively take turns in listening and speaking. This means that each participant has the opportunity to ask for clarifications, slower speech speed or repetitions from his conversation partner. Some examples of interactive speaking situations are face-to-face conversations, two-ways video conferencing and telephone calls.
2. **Partially interactive situations:** A partially interactive speaking situation, as the name suggests, does not require much interaction. A good example is giving a presentation to a live audience. The convention in this type of situation is that only one person is allowed to speak while the other members of the audience stay passively concentrated on listening. The speaker nevertheless can still check

whether his message has been understood or not by observing the facial expression and body language feedback of his audience.

3. **Totally non-interactive situations:** A totally non-interactive speaking situation is a one-way communication where there is no possibility neither for the speaker nor for the audience to provide any kind of feedback. Totally non-interactive speaking situations include radio broadcasts and recorded speech such as podcasts.

Moreover, speaking is a difficult skill to learn as it involves a variety of complex and interrelated elements. Speaking fluently according to Harmer (2001) requires the speaker to possess an ample knowledge of language elements in addition to the ability to process information and language spontaneously without much hesitation. For him, the essential language elements necessary for the production of fluent speech are as follows :

Connected speech: besides being able to produce individual phonemes, a fluent speaker of English needs to have the ability to produce fast and connected speech as a native speaker does. This can be achieved through the right application of elision, contraction, intrusion, assimilation, and linking rules. For instance, instead of saying 'I am' or 'I would have been' a fluent speaker would use the contracted form and say 'I'm' and 'I'd've been'.

Expressive devices: in order to deliver a fluent speech in a face-to-face interactive situation, communicators are required to properly insert all the possible suprasegmental language features such as intonation, stress, pitch and rhythm. The use of these features along side with the paralinguistic signs are of great importance in conveying a meaningful message.

Lexis and grammar: The principal distinguishing characteristic of spontaneous spoken language is the use of a number of common lexical phrases to perform certain language functions. Thus, and in order to reach fluency, speakers need to learn a variety of expressions and then practice their use in specific situations such as: expressing agreement, disagreement, surprise or approval.

Negotiating language: When communicators interact with one another, they often come across the barrier of misunderstanding that may hinder the flow of communication. To overcome this issue and reach a clear understanding of each other, fluent speakers apply strategies for the negotiation of meaning. For instance, they ask for clarifications, rephrasing or confirming what they think they have understood.

2.5 English for Specific Purposes

2.5.1 Definition

ESP as a concept originated in the early 1960s as English became a dominant language in the field of science, technology and economics (Strevens, 1977). ESP or English for Specific Purposes is a subdivision of a wider field called LSP (Language for Specific Purposes). It involves teaching and learning the specific skills and language needed by particular learners for a particular purpose. However, different scholars have given different definitions to ESP.

Despite the fact that ESP has been used widely over the last decades, Anthony (1997) notes that there has been a considerable debate about what ESP really means. One of the first definitions of ESP is the one proposed by Hutchinson and Waters (1987) in which ESP is simply perceived as an approach to language teaching. Hutchinson and Waters (1987) explain:

> *"ESP is an approach to language teaching in which all decisions as to content and method are based on the learner's reason for learning".*
>
> (Hutchinson & Waters, 1987, p. 19)

Robinson (1989) describes ESP as a goal-oriented type of English Language Teaching. This means that students of ESP have a specific goal in mind to be reached. She states:

> *"ESP (English for Specific Purposes) is a type of ELT……ESP is goal-oriented. Students study ESP not because they are interested in the English language as such but because they have to perform a task in English.*

> *Their command of the English language must be such that they can reach a satisfactory level in their specialist subject studies.“*
>
> (Robinson, 1989, p. 396)

The main goal in the learning process is not the English language per se. English becomes rather a vehicle for acquiring the specific knowledge.

Kim (2008) and Hyland (2006) consider ESP as a form of English instruction for academic, occupational or professional purposes. In fact, they stress the specificity aspect of knowledge and skills found in ESP in contrast with EGP (English for General Purposes).

Another definition is that of theorists Dudley-Evans and St. John (1998). Their definition is based on categorisation of ESP into absolute and variable characteristics:

Absolute characteristics:

- *ESP is defined to meet specific needs of the learner;*
- *ESP makes use of the underlying methodology and activities of the discipline it serves;*
- *ESP is centered on the language (grammar, lexis, register), skills, discourse and genres appropriate to these activities.*

Variable Characteristics:

- *ESP may be related to or designed for specific disciplines;*
- *ESP may use, in specific teaching situations, a different methodology from that of general English;*
- *ESP is likely to be designed for adult learners, either at a tertiary level institution or in a professional work situation. It could, however, be for learners at secondary school level;*
- *ESP is generally designed for intermediate or advanced students;*

> •*Most ESP courses assume some basic knowledge of the language system, but it can be used with beginners.*
>
> (Dudley-Evans & St. John, 1998, pp. 4-5)

By and large, most of ESP definitions identify three fundamental and very much interconnected components:

- The nature of language to be instructed and used; i.e. the specialised discourse,
- The learners; who are usually adults,
- And the settings in which the other two would take place, like agriculture, aviation, engineering, business, medical field, etc.

2.5.2 Branches of ESP

According to Belcher (2009), under the umbrella term of ESP there are as many types of ESP as there are seemingly endless specific learner needs and target communities that learners wish to thrive in. Subsequently, it is difficult, if not impossible, to assert with exactitude the number of ESP sub-branches.

Nevertheless, Hutchinson and Waters (1987) view ESP types from a metaphorical stand-point. Their view demonstrates the relationship between ESP, ESP types and ELT under the form of a tree.

Based on Figure 7, ESP can be divided into three prominent branches:

- English for Science and Technology (EST).
- English for Business and Economics (EBE)
- English for Social Studies (ESS).

Each of the above three categories can be further sub-divided into: English for Academic Purposes (EAP) or English for Occupational Purposes (EOP)/ English for Vocational Purposes (EVP). For instance, in the case of Mechanical Engineering EAP for the EST category would be “Technical English for Mechanical Engineers”, whereas EOP for the EST category would be “Technical English for Mechanical Technicians”.

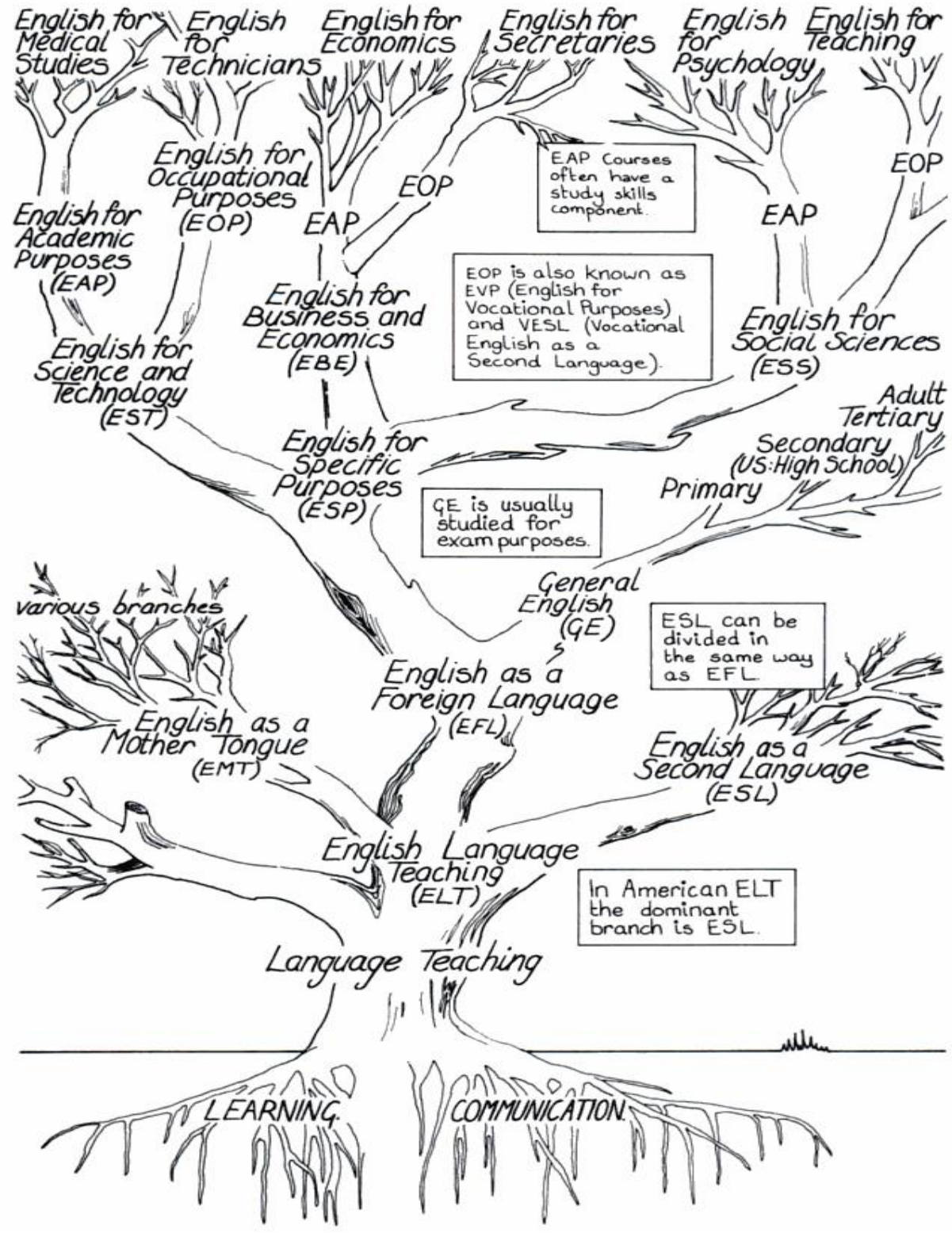


Figure 7: ELT Tree (Hutchinson & Waters, 1987, p. 17)

2.5.3 ESP versus General English

It appears that ESP and EGP are so intermingled that a clear distinction line is often very vague (Anthony, 1997). Hutchinson and Waters (1987) answer the question about the difference between ESP and EGP simply by: "*in theory nothing, in practice a great deal*". (Hutchinson & Waters, 1987, p. 53)

Among the features that differentiate ESP from EGP is the students and their purpose of learning the language. EGP students are usually young learners in junior and senior high school expected to have a beginner or pre-intermediate proficiency level of English. These students have no particular purpose for learning English.

On the contrary, ESP students are generally adults at a higher educational level who have at least a basic acquaintance with the English language. Their main focus is not English, the English language is rather a tool used to facilitate communication and performance in a targeted professional or job-related situations.

Another difference lies in the way the four basic language skills are orchestrated. In an EGP class, the four skills are equally developed. At the same time, an emphasis is placed on teaching grammar and general vocabulary mostly in an isolated context.

In the case of ESP, "*it is a needs analysis that determines which language skills are most needed by the learners, and the syllabus is designed accordingly*." (Rahman, 2015, p. 24). In addition to that, ESP concentrates more on language in a closely related context than on teaching grammar and language structure. Table 2 summarises the most distinctive features of ESP and EGP:

Characteristics	EGP	ESP
Students	Junior or senior high school.	Usually adult either at a tertiary level institution or in a professional work situation.
Students' needs	Cannot be readily specified	Awareness of the need.
Language skills	The four skills are stressed equally.	Needs analysis determine which language skills are most needed.
Subject of the class (course content)	Concentration on teaching grammar and language structures (mostly in isolation).	Concentrates more on language in context (training).
	As the future English needs of the student's are impossible to predict, course content is more difficult to select.	As the English is intended to be used in specific contexts, selection of appropriate content is easier.
Knowledge about the topic area of the lesson	The teacher knows more than the learner.	The learner knows more than the teacher.

Table 2: An Overview of the Main Distinctive Features of ESP and EGP

2.5.4 Needs Analysis

It is widely agreed that among the distinguishing features which are critical to ESP, needs analysis is one of them. Also known as needs assessment or skills audit it is broadly defined as a procedure to collect information that serve as a solid foundation for designing and developing a stable and well-equipped ESP program that will meet the needs of a particular community or group of students.

In fact, the aim of conducting a students' need analysis experience is to discover WHO the learners are, WHAT they ALREADY KNOW, and WHAT THEY WANT from the course.

> "*The foundation of all ESP is the simple question: why does this learner need to learn a foreign language? From this question will flow a whole host of further questions, some of which will relate to the learners themselves some to the nature of the language the learners need to operate, some to the given learning context*."
>
> (Hutchinson & Waters, 1987:19)

However, pinpointing the students needs is a challenging task since the concept need seems to carry both ambiguity and imprecision.

In this respect, Hutchinson and Waters (1987) have classified needs into three categories: necessities, wants and lacks. According to them, necessities are concerned with the demand of the target situations "what the learner has to know in order to function effectively in the target situation" (p.55). Lacks refer to the learner's existing language proficiency in order to help determination of the starting point of the teaching and learning process "necessities the learner lacks" (p.56). Wants relate to what the learner would like to gain from the language course "what the learners want or feel they need" (p.57).

Accordingly, we should make a distinction between objective and subjective needs analysis. Objective needs according to Brindley (1984) as cited by Nunan (1988)

refer to information concerning facts about how learners will need to use the language in authentic communication scenarios in addition to their current level of language proficiency and language difficulties. Subjective needs refer to cognitive and effective factors that can impact on L2 acquisition such as, personality, confidence, attitudes, wants and expectations of the course.

> *"The 'objective' needs are those which can be diagnosed by teachers on the basis of the analysis of personal data about learners along with information about their language proficiency and patterns of language use ...., whereas the 'subjective' needs (which are often 'wants', desires' 'expectations', or other psychological manifestations of a lack) cannot be diagnosed as easily, or in many cases, even stated by learners themselves."*
>
> (Nunan, 1988: 44)

Dudley-Evans and St. John (1998) propose that a complete model of Needs Analysis in ESP should encompass the eight following aspects:

1. Professional information about the learners: the tasks and activities learners will be using English for.
2. Personal information about the learners: factors which may affect the way they learn such as reasons for attending the course and subjective needs.
3. English language information about the learners: what their current skills and language use are.
4. The learners' lacks: the gap between the current and desirable skills of the learners.
5. Language learning information: effective ways of learning the skills and language determined by the lacks.
6. How to communicate in the target situation: how language and skills are used in the target situation –
7. What is wanted from the course: learners' needs from the course.
8. Information about the environment in which the course will be run.

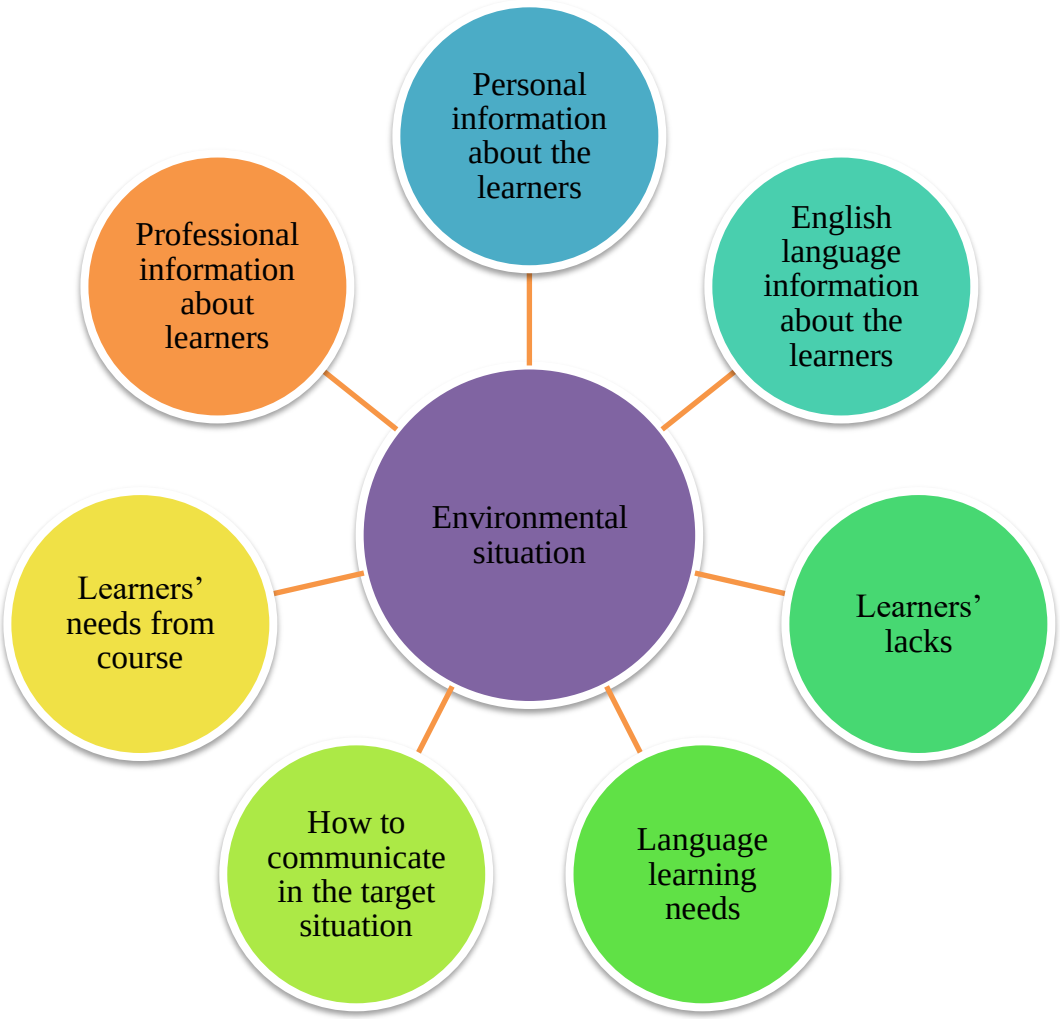


Figure 8: Needs Analysis Model (Adapted from Dudley-Evan & ST John. 1998)

2.6 Authentic Material

The use of original texts that has not been simplified or adapted to serve language teaching purposes has always been regarded as a crucial element of ESP courses. Long (2007) is clear in his defence of genuine or authentic materials by stating:

> *"texts in language teaching materials bear little resemblance to the genuine target discourse samples learners encounter in the world outside classrooms", and that "every study in which language teaching materials – even supposedly LSP materials –and genuine texts have*

> *been compared has found the former to be unrepresentative in important ways."*
>
> (Long, 2007: 121)

Although the idea of using authentic materials in teaching foreign language is widely accepted by a large number of foreign language teachers, some are somehow still reluctant when it comes to its integration in the classroom.

Wegener (2008) distinguishes three functions of authentic texts in teaching ESP:

> *"First, inviting authentic materials from the learners' work environment to the classroom, the teacher offers assistance (...).Second, the ESP teacher always looks for texts that are as close to the learners' target situations in their jobs as possible which enable him to design meaningful materials (...).Third, authentic texts serve as sources of information for the teacher and may already be collected during the needs analysis period."*
>
> (Wegener, 2008: 137)

Language teaching materials need to be carefully selected. According to Flowerdew and Peacock (2001) there are arguments in favour and others against the use of authentic materials. The use of authentic texts in ESP courses is justified on the assumption that non-authentic materials, whether being qualified as simplified or adapted, are solely produced for language teaching purposes and may not provide appropriate material needed by ESP students. Simplified texts often lose meanings and they are generally far from being able to adequately prepare ESP learners to face real-world scenarios in the target situations. In fact, every authentic material is not automatically considered to be authentic for any specific language class, in other words, just because a text is authentic does not mean it is relevant in every language situation.

Those who are against the use authentic materials claim that these materials are usually found to be more difficult from a linguistic standpoint. In some cases they can even be more harmful than useful to foreign language learners because the language is

often written in a more complex style. Kilickaya (2004) and Kim (2000) assume that authentic material can be used only in upper intermediate or advanced language classes, that is B1 and C1 levels according to the Common European Framework of Reference for Languages.

2.7 The Notion of Attitude

There are many factors that can influence language learning, one of the most primordial of which is attitude. Attitude is acknowledged as one of the most important factors that impacts on learning a language (Fakeye, 2010). Attitude is quite a common term in the English language; probably everyone has the notion of its meaning. Unfortunately, however, there may be relatively little overlap between one's notion and that of another.

Historically, the term "attitude" referred to a person's bodily position or posture. It is still sometimes used to convey this meaning. In social science, however, the term has come to mean 'a posture of the mind' rather than of the body (Oskamp & Schultz 2005). In psychology, an attitude refers to a set of emotions, beliefs, and behaviours toward a particular object, person, thing, or event.

Many scholars from the fields of psychology and education, especially language learning, consider several definitions of the concept of attitude which mention different meanings from different contexts and angles (Alhmali, 2007). One of the earliest definitions that substantially contributed in the understanding of the attitude concept is that of Allport (1935). He states:

> *"An attitude is a mental or neural state of readiness, organized through experience, exerting a directive or dynamic influence upon the individual's response to all objects and situations with which it is related."*
>
> (Allport, 1935, as cited in Murchison, 2005, p. 810)

Fishbein and Ajzen (1975) stressed the learned aspect of attitudes:

> "*An attitude is a learned predisposition to respond in a consistently favourable or unfavourable manner with respect to a given object."*
>
> (Fishbein & Ajzen, 1975, p. 6)

Another definition is that of Eagly and Chaiken (1993). It is an extensive one in the sense that it brings together many ideas related to concept of attitudes. They point out:

> *"Attitude is a psychological tendency that is expressed by evaluating a particular entity with some degree of favour or disfavour. Psychological tendency refers to a state which is internal to the person, and evaluating refers to all classes of evaluative responding, whether overt or covert, cognitive, affective or behavioural. This psychological tendency can be regarded as a type of bias that predisposes the individual towards evaluative responses that are positive or negative. An attitude develops on the basis of evaluative responding: an individual doesn't have an attitude until he or she responds evaluatively to an entity on an affective, cognitive or behavioural basis. Evaluative responding whether it is covert or overt can produce a psychological tendency to respond with a particular degree of evaluation when subsequently encountering the attitudes object. If this tendency to response is established, the person has formed an attitude towards the object."*
>
> (Eagly & Chaiken, 1993, pp. 1-2)

The fundamental idea surrounding Eagly and Chailen' analysis is that on 'evaluation' but their insights reflects the type of approach which is accepted by the

majority of researchers today. Accordingly, the following description summarises these major aspects:

- Attitudes are enduring evaluation tendencies which means they involve a preference for or against the attitude object expressed in terms such as like, dislike, hates and love.
- Attitudes include the three following components in varying proportions:
  Cognitive component: A knowledge about the object: the beliefs, ideas.
  Affective component: A feeling about the object: like or dislike.
  Behavioural component: A tendency towards action.
- Attitudes are not fixed, they can be learned and developed with new input of a cognitive, affective or behavioural nature.
- Attitudes can affect subsequent behaviour.
- Attitudes cannot be directly observed, they are inferred from observed behaviour, usually in the form of verbal responses or observable actions

In regards to the relation between attitudes and motivation within the context of language learning, Gardner (1985) considers attitudes as constituents of motivation. According to him:

> *"Motivation refers to the combination of effort plus desire to achieve the goal of learning the language plus favorable attitudes toward learning the language".*
>
> (Gardner, 1985, p. 10)

The attitudes towards the languages are closely related to learning a language (Starks & Paltridge, 1996). Karahan (2007) affirms the observation of Starks and Paltridge stating that:

> *"Positive language attitudes let learner have positive orientation towards learning English".*
>
> (Karahan, 2007, p. 48)

Accordingly, attitudes play a direct important role in language learning as they would appear to influence students' success or failure in achieving their learning goals. While positive attitudes provide success and higher students' achievements during the educational process, negative attitudes leads to a complete failure (Gagne, Briggs & Wager 1992). In the same way, Ghazali (2008) suggests that attitudes are related to students' language proficiency levels. Thus, it is well acknowledged that one's attitude may affect the achievement of language mastery.

Attitudes do matter, if learners are to adopt new technologies and computers in particular, they need to have the right kind of attitudes towards that technology. Many scholars have attempted to explore the relationship between computer attitudes and computer adoption or uptake. For Woodrow (1992) positive teacher attitudes toward computers are widely recognized as a necessary condition for effective use of technology in the classroom. Attitudes have also been found to be a predictor of the adoption of new technologies such as computers (Klassen et al.1980).

2.8 Conclusion

The purpose of this chapter is to provide some general theoretical background to this study. We have tried to review some of the key concepts relevant to the themes of our research. First, we have attempted to explain how the process of learning occurs by referring to the major learning theories. Then, we discussed the four language skills and identified the four main types of learners based on the VARK learning model. Second, we presented the field of ESP, its definition, branches and the distinctive features that distinguish it from EGP. After that, we briefly addressed the notions of attitude, Need Analysis and authentic material.

Chapter Three

Computer Technology & Distance Learning

Chapter Three: Computer Technology & Distance Learning

3.1 Introduction

During the Covid-19 pandemic, social distancing became the norm and social contact in terms of physical one-to-one interaction had been reduced. This safety measure that had been employed to decrease the spread of the virus lead many universities and colleges around the world to close their doors. In order to maintain the learning process and ensure the continuity of the academic year during the crisis, it was inevitable to use computer technology and the internet to keep teachers in contact with their students. The main concern of the third chapter of the present research paper is to cover the major relevant aspects in the area of computer technology and distance language learning in terms of history, evolution, theories, and the advantages they may offer to both teachers and students.

3.2 Computer Technology:

During the beginning of twentieth century, the world had witnessed a scientific revolution in almost all fields of science. In the domain of technology, the advancement of researches enabled the emergence of a brand new way of communication possibilities. A large variety of machines were invented to optimise and speed the laborious work of complex calculations researchers were struggling with. These novel machines did not only optimised the analysis and results of the research but also gave academics the opportunity to gain more time to be dedicated to the teaching and learning process.

The computer is one among the best and ingenious machines invented in the domain of technology and to many it represents an extension of the human memory. The American inventor and futurist Raymond Kurzweil (1990) states that:

> *"A computer can remember billions of facts with extreme precision, whereas we are hard pressed to remember more than a handful of phone numbers"*
>
> (Kurzweil, 1990 p.17)

In its simplest definition, a computer is a digital electronic machine or device that is capable of storing, processing and retrieving information. The early computer or what was referred to as the Mainframe was large; did not even fit the size of a single room, and very expensive that only major corporations and government research laboratories had access to. The miniaturisation of electronic components and the continuous Operating System (OS) upgrades played a crucial role in the creation of small and inexpensive computers for personal use making the digital device available nowadays for a major category of public users and students.

Any computer system is composed of two elements: hardware and software. For the purpose of understanding, one can make an analogy with the human being. While the hardware is considered as the body of a computer the software is seen as the soul.

3.2.1 Computer Hardware:

In a computing context, the word 'Hardware' refers to the computer's tangible components. Without a hardware, there would be no way of running the software. Although the design of hardware differs between desktop computers and laptops due to their differences in size, the same basic components will be found in both. These components include: a power supply, a microprocessor with a cooling system, a motherboard, volatile memory modules, a Hard Disc Drive (HDD) for data storage and a case that serves mainly as a way to physically mount and contain all of the actual parts. Hardware also include a mouse and keyboard as input devices and a screen for displaying output information.

In most regular laptops and desktop computers, the motherboard or the main circuit board is the central communications backbone connectivity point, through which all components and external devices connect. As a minimum, a motherboard holds at least one Central Processing Unit (CPU). The CPU, which is often compared to the human brain, is the logic circuitry that instantly responds to the softwares and processes the basic program instructions that drive a computer.

A computer's main memory or the Random Access Memory (RAM) is a fast and volatile storage that the CPU has a direct access to. It is used to store currently running

programs and immediately needed information. Unlike mass storage devices that can store data permanently, the main memory loses all its content once the computer is switched off.

The graphic card, or what is also referred to as a video card, is an essential part of the computer's hardware. It is an output device that has the prime functions of processing and rendering the images on a display screen; the higher the performance of the graphic card, the smoother and clearer the images will be displayed. Most standard laptops are equipped with an integrated graphic card built in the motherboard. Integrated graphic cards are ideal in the home and office work to perform standard tasks such as website surfing, reading emails and displaying document but are difficult to be upgraded.

Discrete graphic cards are another type of graphic cards that can be installed as an extra component on the motherboard. These cards are a good solution for those who want to upgrade their personal computer to be able to cope with gaming or professional work purposes which requires running graphics-intensive software such as Computer-Aided Design (CAD) programs.

3.2.2 Computer Software:

'Software' is a general term used to describe different types of programs that make computers or other similar related devices function properly and execute users' commands. The term was coined as such due to its intangible aspect that consists of processes and data in a digital form and to differentiate it from hardware. From a computing standpoint, software is a sequence of instructions written using a computer programming language to perform a specific task when run through hardware. In other words, the software tells the hardware what to do and how to perform a specific task in a binary sequence.

Computer software can broadly be classified into two major categories : 'system software' and 'application software' (the terms 'application', 'program' and 'application program' are all often used interchangeably to refer to the 'application software'). System software is a set of programs that controls a computer's internal

functioning. It includes the OS, device drivers, diagnostic tools and all the utilities that enable the hardware devices and the application softwares to work together. Application softwares, by contrast, are those programs which help a user to process data and solve his common problems. Application softwares thus include: word processing, web browsing, database management, calculation and many other applications. The relationship that exists between the two main categories of sofwares is that of dependency; the application software cannot be run without the presence of a system software.

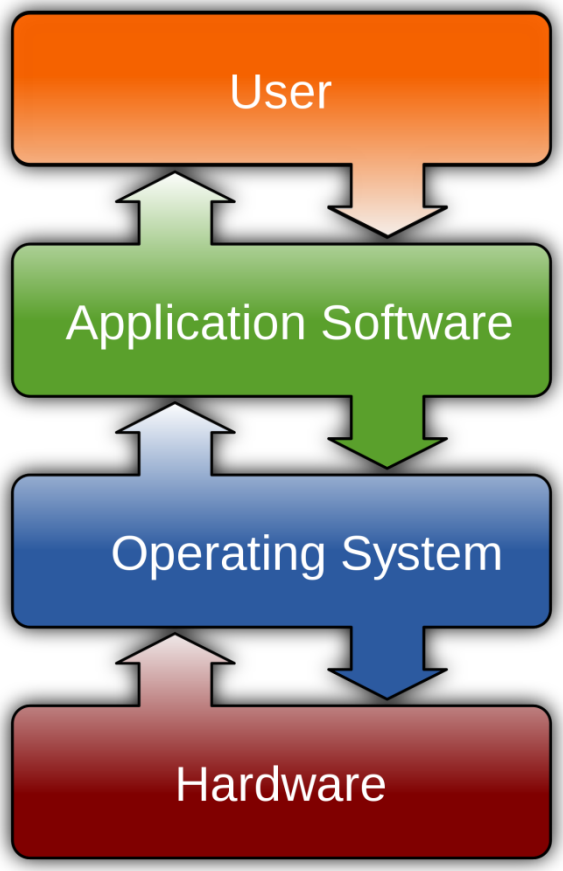


Figure 9: Relationship between System Software and Application Software. (www.wikimedia.org)

3.3 Computer-Assisted Language Learning (CALL)

3.3.1 Definition

CALL stands for Computer-Assisted Language Learning which is a form of CAI (Computer-Assisted Language Instruction). It is considered as an approach to language teaching and learning in which the computer is used as an aid to support the teaching-learning process. Davies (2002) explains:

> *"Computer is used as an aid to the presentation, reinforcement and assessment of material to be learned, usually including a substantial interactive element."*
>
> (Davies, 2002, p. 1)

Levy (1997) provides a concise definition supported by the majority of modern CALL practitioners. He states:

> *"The search for and study of applications of the computer in language teaching and learning."*
>
> (Levy, 1997, p. 1)

Chapelle (2012) argues that the meaning of CALL is a continuously changing environment and new revisions for the term are regularly suggested. She argues:

> *"CALL can refer to such practices as using a vocabulary Web site to engage in self-study of relevant vocabulary during a semester-long reading class. CALL could also refer to use of a multimedia program to give interactive listening practice over the course of five weeks in a listening class. It could mean regular use of computer-generated feedback on grammatical errors in a semester-long writing class, or it could mean a single Internet collaboration with a speaker of the target language in a class in another country. These are just a few examples of what CALL can mean."*
>
> (Chapelle, 2012, p. 1002)

Along the same line, Beatty (2003) offers the following definition of CALL that accommodates its changing nature:

> *"any process in which a learner uses a computer and, as a result, improves his or her language."*
>
> (Beatty, 2003, p. 7)

Egbert (2005) gives a broader definition. For him, CALL means:

> *"learners learning language in any context with, through, and around computer technologies."*
>
> (Egbert, 2005, p. 4)

CALL integrates a large variety of state-of-the-art ICT devices and applications as well as a multitude of language teaching and learning approaches, from the famous "classical" CALL drill-and-practice programmes that characterised the behaviourist period to the more recent manifestations of "intelligent CALL"[10] embracing interactive VR (Virtual Reality) learning environment and AI (Artificial Intelligence) applications.

3.3.2 History of CALL

The use of computers in classrooms as instructional technologies aiding teachers dates back to the 1960s (Cunningham, 2000). The initiation of the PLATO [11] (Programmed Logic for Automatic Teaching Operations) project on the Illinois University's mainframe [12] is considered as an important milestone in the early development of CALL (Marty, 1981).

The historical development of CALL can be divided into three main phases comprising: behaviourist CALL, communicative CALL, and integrative CALL

[10] "intelligent CALL" involves the use of computers and programs with a certain level of intelligence Underwood (1989).
[11] a system that included central computers and terminals and performed tasks such as vocabulary drills, grammar explanations and drills, and translation tests (Ahmad, Corbett, Rogers, & Sussex, 1985)
[12] Cambridge online dictionary defines a Mainframe computer as: A large, powerful computer that many people can use at the same time via connected terminals.

(Warschauer, 1996). This classification was a result of the parallel development of both technology and pedagogical theories.

3.3.2.1 Behaviourist CALL

According to Warschauer (1996), the first phase of CALL was conceived back in the 1950s and later implemented in the 1960s and 1970s. It was based upon the premises of the behaviourism learning theories in which language was commonly perceived as a behavior learned through stimulus-and-response. Rivers (1981) argues:

> *"The behaviorist theory of stimulus-response learning, particularly as developed in the operant conditioning model of Skinner, considers all learning to be the establishment of habits as a result of reinforcement and reward".*
>
> (Rivers, 1981, p. 73)

In this period, the mainframe computers were an excellent tool for delivering grammar and vocabulary individual drill-and-practice activities because, unlike flesh-and-blood teachers, programmed teaching machines would never get bored or tired.

However, by the end of the 1970s, the rejection of behaviouristic approach to language learning and the introduction of the microcomputer had naturally led CALL to a more promising evolution toward a next stage.

3.3.2.2 Communication CALL

The second phase of CALL was based on CLT (Communicative Language Teaching), a mainstream approach in the late 1970s and 1980s (Underwood, 1989). The advocate of this phase felt that the drill-and-practice programme of the previous decade did not allow the learners to develop the communication skills needed in real-life situations. Thus, communicative CALL emphasised on the language use in authentic computerised contexts rather than merely practicing prefabricated language forms. It also gave students more freedom and encouragement to produce original and creative language output. Wang suggests that:

> *"The purpose of the communicative CALL activity is not so much to have students discover the right answer, but rather to stimulate students' discussion, writing, or critical thinking."*
>
> (Tim, Lee, & Wang, 2008, p. 41)

Nevertheless, by the end of the 1980s, the majority of teachers and researchers were not satisfied with the outcomes of communicative CALL. Kenning and Kenning (1990) point out that instead of supporting the language teaching process, the computer was used in an ad hoc and disconnected mode.

3.3.2.3 Integrative CALL

The third phase of CALL arose in the mid 1990s. It had been made possible by two important technological advancements. One was multimedia technology which allowed a combination of texts, pictures and videos to be accessed on a single desktop computer. The other was the World Wide Web[13] and the subsequent emergence of CMC (Computer Mediated Communication) that facilitated opportunities for English language interaction beyond the classroom walls and beyond the appointed class hours.

These sophisticated forms of technologies enabled the integration of the four language skills LSRW (Listening, Speaking, Reading and Writing). Research methods in the field of integrative CALL are still under development (Seljan, Berger, & Dovedan, 2014).

[13] a part of the Internet often referred to as "The Web" or simply abbreviated as WWW.

Stage	1970s–1980s: Structural/Behaviouristic 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, ESP/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	And Fluency	And Agency

Table 3: Warschauer's Three Stages of CALL (Warschauer, 2004)

Warschauer (1996) indicates that, moving forward toward a new phase does not necessarily mean a total rejection of the programmes and methods of the preceding phase. He further adds that, like any innovation, each phase gained slow and gradual acceptance.

3.3.3 Advantages of CALL

CALL, when properly integrated into English language classes, can provide numerous advantages over traditional approaches for both teachers and learners. Some of these advantages are as follows:

3.3.3.1 Motivation and Interest

Most of the time, students consider their traditional chalk and talk classroom as monotonous, boring, and even frustrating. Learning English through computer applications and problem solving techniques with the help of multimedia aids like

pictures, sounds and animated graphics make CALL more interesting. Warschauer (1996a) pointed out that using computer in language classes enhance students' motivation to learn the language and improve their communication skills.

3.3.3.2 Individualisation and Self-pace Learning

CALL offers individualised learning practice which matches students' comprehension, interest and learning speed (Davies, 2006). Individualisation refers to the fact that computers give opportunities for students to work alone and at their own pace. So shy, introverted and low-level students who lack the particular skills can obtain additional practice without being prevented by elevated level peers. In addition, advanced students who finish their class work earlier can also benefit from extra work based on the subject being studied.

3.3.3.3 Students Learn more and Achieve better Results

Students' English language achievements can be improved to a proficient level using computer and modern technologies. Kulik (1994) in a meta-analysis of over 500 individual studies concluded that students usually learn more in classes in which they receive computer-based instruction. Similarly, the study of Taylor et al. (2004) indicated that students in a technology rich environment learn considerably more than students who have been instructed in classical classes. In addition, Siribodhi (1995) found that students taught foreign languages using CALL programmes improved their level to a certain extent and achieved better outcomes than those taught using the traditional methods.

3.3.3.4 Time-saving

By using computers for presentation, giving automatic feedback and keeping records for each student, teachers can save a great amount of time which could then be dedicated to more creative and communicative aspects of language teaching.

Alyaz and Gürsoy (2002) offer an extensive list of CALL advantages as a result of a study conducted in private and government schools in Bursa. They state that computers:

> *"(1) are inevitable in every field, including education, they are one of the fundamentals of the new millenium, (2)*

> *provide fruitful opportunities to work, (3) provide visual support, (4) enable to reach knowledge fast and easy, (5) have endless sources of information, (6) support democratic education, (7) "partly" provide equal opportunities in education (because they are available to those who do not have financial restrictions), (8) provide opportunities for individualized learning, (9) break the boundaries of time and place in learning, (10) enable efficient learning and teaching, (11) enable the learner learn faster, (12) provide opportunities for deeper understanding of a subject."*
>
> (Alyaz & Gürsoy, 2002, p. 10)

All these advantages, and many more, should be used wisely and appropriately to better attain the learning objectives of the curriculum. Otherwise the advantages may turn into disadvantages.

3.3.4 Disadvantages of CALL

Although CALL offers numerous opportunities and advantages, as with all teaching methods, it also has some limitations. These limitations include the dependence on technology, the technological cost and the lack of training.

3.3.4.1 Dependence on Technology

Students who rely on extensive use of computer technology in various educational activities for a long period of time tend to develop a dependence on technology. Just as students who are never required to do mathematics without a computer lose the ability to solve simple mathematical equations manually, students who rely heavily on computer softwares to write and check their grammatical mistakes experience a decrease in their ability to spell and even write by hand. Thus, simple skills need to be practiced manually on a regular basis in order not to be forgotten.

3.3.4.2 Technological Cost

The implementation of CALL requires technological equipments which are not always available in all educational institutions. These new arrangements would cost a lot of money and additional expenses. Moreover, It may be difficult for low-budget institutions to purchase the necessary equipments and pay the salary for the employees responsible for technical support issues.

3.3.4.3 Lack of Training

Teacher training is often neglected by administrators who often perceive technology alone as a panacea for all language teaching and learning problems. It is worth to mention that before the implementation of any kind of a CALL teaching course, it is necessary to ensure that both teachers and students have at least a basic control over technology that enables them to handle the available supporting materials properly. Otherwise, a great amount of valuable time might be wasted dealing with students with little prior experience using computers. Furthermore, a lack of appropriate training among CALL practitioners can generate negative attitudes and ineffective teaching techniques which systematically lead to undesirable learning outcomes.

3.4 The Language Laboratory

3.4.1 Definition

The language lab is one of the first widely accepted technological aid to language learning. According to Hocking (1967), the term Language Lab was first coined in the 1930 by Ralph Waltz. Language Labs are sometimes referred to as:

> *"language resource centers, multimedia labs, centers for language study, language learning centers, interactive media centers, language and technology centers, media centers, open access centers, foreign language centers, open learning centers, open access multimedia centers, self-access centers, individualized language learning centers, independent learning centers, CALL centers/labs,*

> *world media and cultural centers, language acquisition centers, and language and computer laboratories."*
>
> (Alexander, 2007, p. 1)

Perhaps the first appearance of a language lab was in 1908 at the University of Grenoble, France (Roby, 2004). But it was not until the 1950s and 1960s that it gained popularity in response to the emergence of a new approach to language learning which came to be known as the audio-lingual approach.

Hayes (1968) defines a language lab as a special classroom equipped with special technological materials where language is taught and learnt more effectively than it would be in a classical classroom. He explains:

> *"a classroom or other area containing electronic and mechanical equipment designed and arranged to make foreign language learning more effective than is usually possible without it"*
>
> (Hayes A. S., 1968, p. 1)

Lorge (1964) conceptualised a language lab as an additional teaching aid, somewhat as the blackboard provides additional visual experience, used as part of class instruction to reinforce aural experience.

A more recent and extended definition of a language lab is found in the Longman Dictionary of Language Teaching and Applied Linguistics, it has been customarily understood as:

> *"a room that contains desks or individual booths with tape or cassette recorders and a control booth for teacher or observer and which is used for language teaching. [...] students can practice recorded exercises and follow language programmes either individually or in groups, and the teacher can listen to each student's performance."*
>
> (Richards & Schmidt, 2013, p. 318)

During previous decades, language labs were tape based systems (Roby, 2004) but now in current installations, digital systems have replaced cassettes and video monitors and computer keyboards are fitted in the students' booths (Hélot, 1989).

3.4.2 Components of a Language Lab

A Language lab is basically composed of a teacher console and a set of student's booths electrically connected together. The teacher console is equipped with monitoring management functions allowing the teacher to supervise and distribute lesson materials to students' position. Each student's booth contains a playback control keypad as well as a noise cancellation headphone to which a microphone is attached.

Figure 10: Teacher Console (http://www.asia.ru/en/ProductInfo/988326.html)

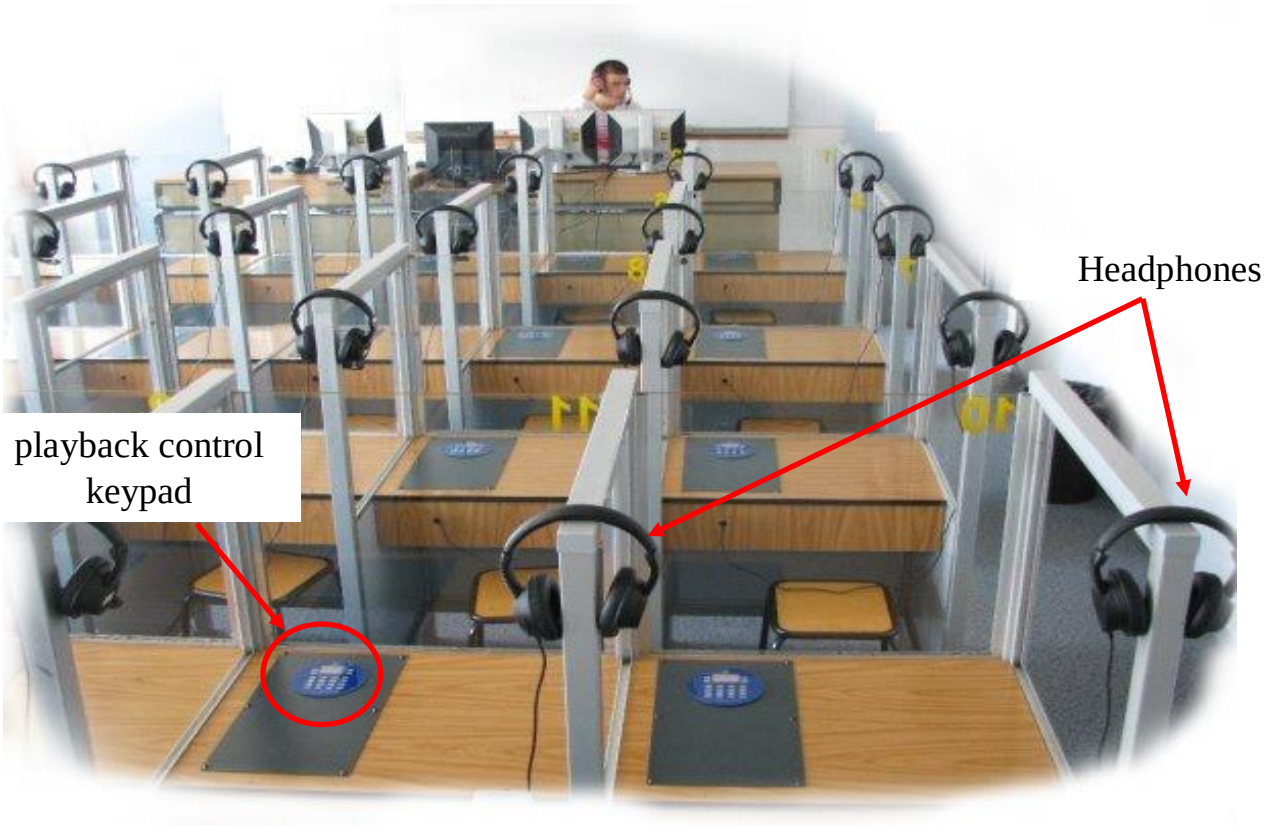


Figure 11: Students' Booth

(http://vercors.univ-savoie.fr/ressourcesenligne/cav/Labo.htm)

3.4.3 Types of Language Labs

According to Hutchinson and Hutchinson (1970), Language labs fall broadly into three main types: AP (Audio Passive) lab, AA (Audio Active) lab and AAC (Audio Active Comparative) lab or listen-respond compare.

3.4.3.1 AP Language Lab

In this type of system the instructor first sends lesson materials through audio wiring, then students are allowed to listen and repeat the target language exercises without being able to record their own responses. After the Introduction of AA, this type was hardly used any more.

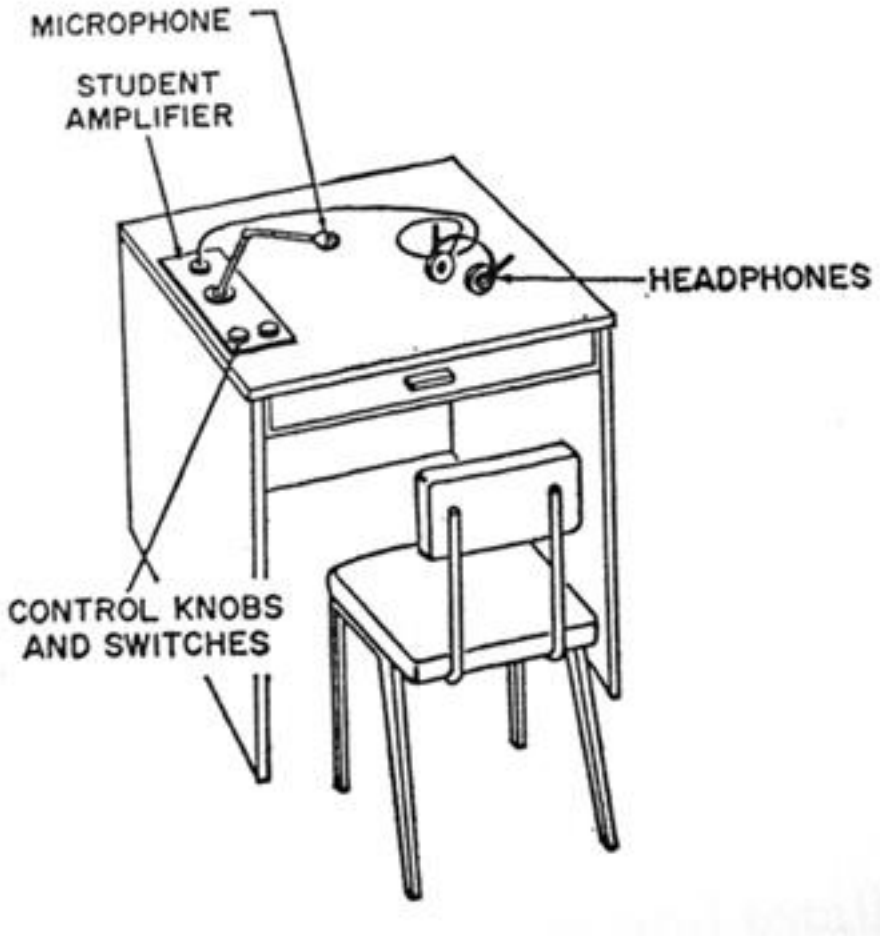


Figure 12: Students' Booth for AP Language Lab (Hayes A. S., 1968, p. 3)

3.4.3.2 AA Language Lab

Students' booths are supplemented with a microphone and an audio recorder. So in addition to listening and repeating, students now are able to record and listen back to their own voices. Another important feature of this improved lab is the ability of the instructor to listen to the individual student and intervene with help or corrections if necessary.

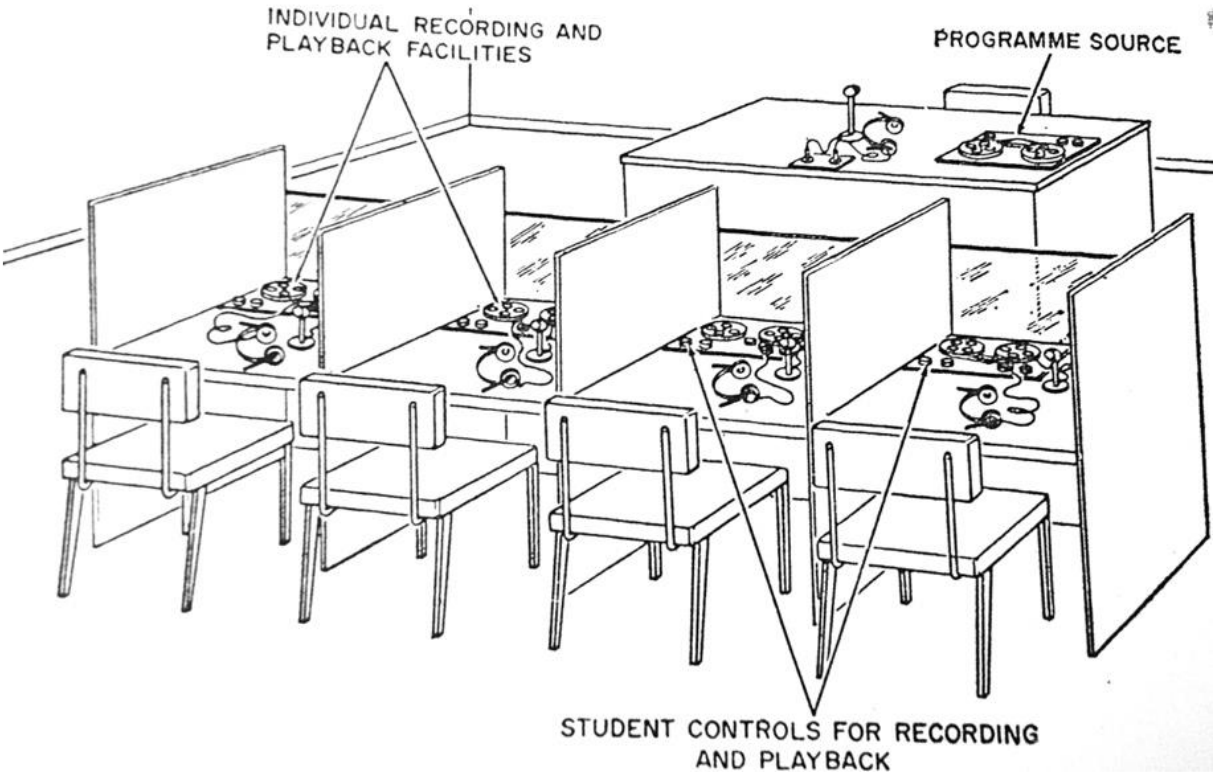


Figure 13: Students' Booths for AA Language Lab (Hayes A. S., 1968, p. 29)

3.4.3.3 AAC Language Lab

This lab is more sophisticated and more technically complex. The use of the dual-channel tape recorder enabled students to simultaneously listen to the audio material whilst at the same time being able to record their voices in the pauses. Labs of this type focus on individual learning by encouraging the learners to work on their own using the lab in a self-access mode.

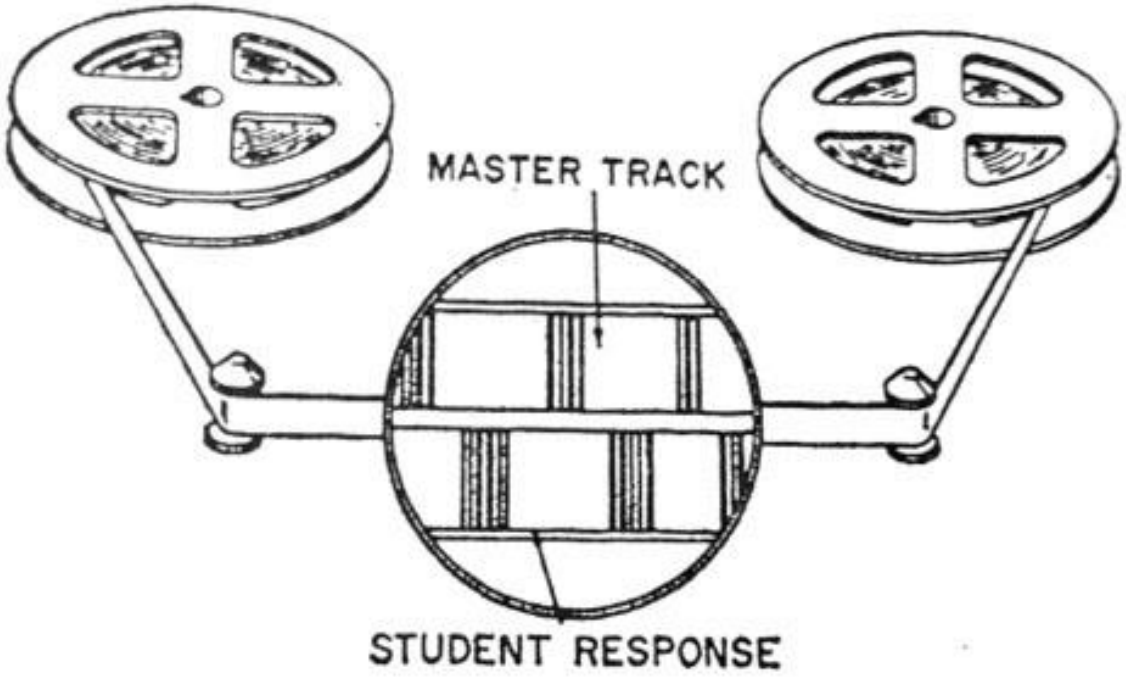


Figure 14: Dual Tape Channel Recorder (Hayes A. S., 1968, p. 33)

Another recent categorisation is proposed by Singh (2013). She further classified language labs into seven distinctive categories: Conventional Laboratory, Lingua Phone Laboratory, Computer Assisted Language Laboratory, Dial Access Laboratory, Mobile Laboratory, Wireless Laboratory and Portable Laboratory.

3.4.3.4 The Conventional Language Lab

A conventional lab is simply a regular classroom supported by a tape player and a few audio cassettes. The instructor plays the tape and students stay passively listening. It is similar to Hutchinson and Hutchinson (1970) AP laboratories except that instead of equipping each booth with a headphone, a loud speaker is used to teach the whole class.

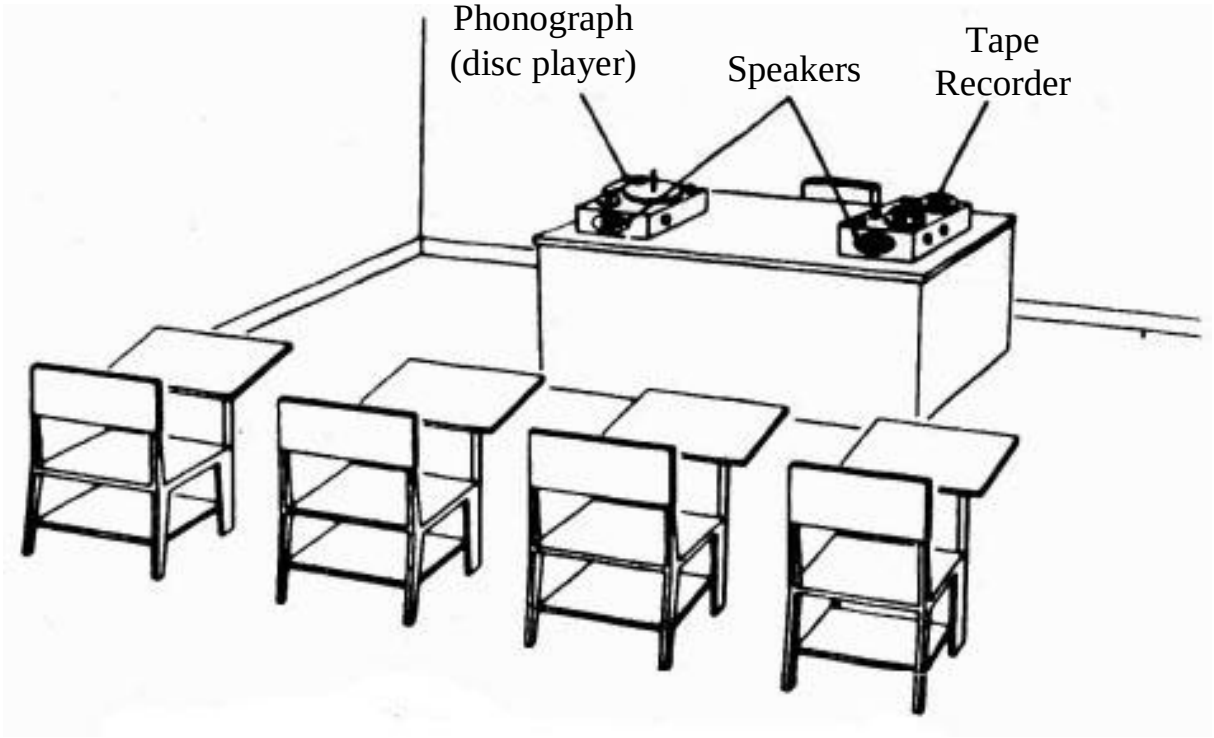


Figure 15: Conventional Language Lab (Hayes A. S., 1968, p. 30)

3.4.3.5 Lingua Phone Language Lab

Lingua phone laboratory are also referred to AA lab. (See Hutchinson & Hutchinson (1970) AA laboratory above.)

3.4.3.6 The Computer Assisted Language Lab

This is one of the most modern language labs available today. Teacher and students' positions are equipped with computer headsets[14] and PCs connected via LAN[15] (Local Area Network). Entire course materials including text, picture, audio, and video can be digitally stored and instantly distributed with a simple computer click. With its limitless application and features, Computer Assisted Language Laboratory offers the ability to improve the four language skills.

[14] A head-worn unit containing a microphone and one or two speakers. Employed in call centers and phone-intensive jobs, headsets allow people to easily have a phone conversation while using the computer.

[15] A local area network (LAN) is a computer network that interconnects computers within a limited area such as a residence, school, laboratory, or office building.

Figure 16: Computer Assisted Language Laboratory
(http://www.roycan.com/fr/produits/technologie_optimas/installer.php)

3.4.3.7 The Dial Access Language Lab

This is an old language lab system which was most suitable for group settings, in campus for example, where a large number of students needed a large number of programmes. The listening material is activated by the first student who deals in. In case another student deals the same listening material a few minutes later, he would not be able to listen to the beginning of the material until the entire lesson cycle is completed.

3.4.3.8 Mobile Language Lab

A mobile lab is a flexible solution that can transform any regular classroom into a language lab. This is ideal for institutions that do not have enough space to dedicate an entire separate room for a language lab facility. It is basically a cart in which the necessary equipments, such as headphones and a laptop, are stored. The lab can be moved from classroom to classroom but it is heavy, and it requires a great deal of time and energy to set up.

Figure 17: Mobile Language Laboratory; SANAKO Lab 100 Language Cart (http://www.tandbergeducational.com/products/portable_language_lab.php)

3.4.3.9 Wireless Language Lab

In a wireless lab, the electrical wires linking students' booths to the teacher console are all replaced by a wireless radio transmission system. Singh (2013) claims that one of the drawbacks of this type of lab is its incapability of the intercom[16] operation mode. However, the two-way communication mode has been recently integrated in more advanced systems, such as Labear Wireless Laboratory, through a WiFi[17] connection.

[16] Two-way communication between teacher and student.
[17] WiFi (or Wi-Fi) is a local area wireless computer networking technology that allows electronic devices to connect to the network, mainly using the 2.4 gigahertz radio frequency.

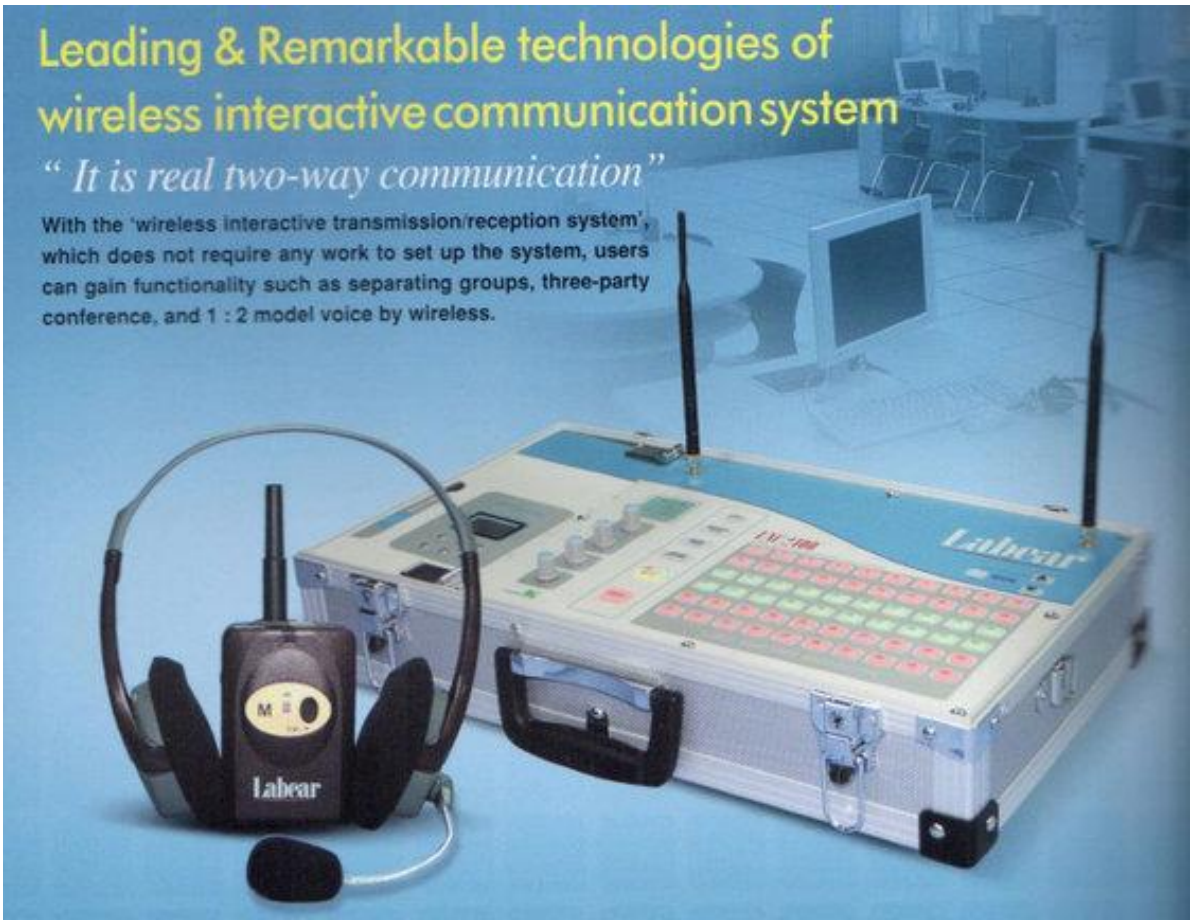


Figure 18: Wireless Language Laboratory; Labear (http://seingo.en.ec21.com/Wireless_Language_Lab_Systems--5225051_5297804.html)

3.4.3.10 Portable Language Lab

This lab is ideal for poverty-stricken regions where the Power Grid is not stable. It consists of multiple tablets housed in a weather-proof trolley. The trolley is powered by batteries or portable electric generators. It is also equipped with a WiFi connectivity ensuring student-teacher interaction via the tablets.

Figure 19: Portable Language Laboratory; EnglishEdge (http://www.liqvid.com/technology-product-innovation.php)

3.5 Distance Education

3.5.1 Definition:

Distance Learning, Correspondence Education, Open Education, Online Education, or E-learning are all terms that are often used interchangeably to refer to Distance Education. It is a form of education, different from the one used in the traditional classes, where the learner may not always be physically present in the educational institution. It is a way of learning remotely, the learning process takes place in distance space and/or time without requiring the face-to-face contact between teacher and the learner.

Distance Learning continues to gain a significant popularity among educational specialists who have attempted to gain insights and to define this vast concept. Distance education was defined for the first time as:

> *"the family of instructional methods in which the teaching behaviors are executed apart from the learning behaviors, including those that in a contiguous situation would be performed in the learner's presence, so that communication between the teacher and the learner must be facilitated by print, electronic, mechanical, or other devices."*
>
> (Moore, 1972, p. 76)

A few years later, in 1996 and in collaboration with Kearseley, Moore introduced another definition:

> *"Distance education is planned learning that normally occurs in a different place from teaching and as a result requires special techniques of course design, special instructional techniques, special methods of communication by electronic and other technology, as well as special organizational and administrative arrangements"*
>
> (Moore & Kearsley, 1996, p. 2)

Holmberg (1995) proposed the following definition:

> *"The term distance education covers the various forms of study which are not under the continuous, immediate supervision of tutors present with their students in lecture rooms or on the same premises, but which nevertheless benefit from the planning, guidance and tuition of a tutorial organization".*
>
> (Holmberg, 1995, p. 2)

The concept of distance education implies consistent non-contiguous communication between the educational institution and its students (Holmberg, 1995). This communication according to Holmberg can be of two kinds:

- One way traffic: It refers to a simulated communication in the form of expository teaching method through which the pre-produced course materials are dispatched from the educational institution and involving students in interaction with texts or other educational technology supports without receiving any feedback.
- Two-way traffic: it refers to real communication between students and the education institution through emails, telephone interactions, IM (Instant Messaging) or video conferencing. Two-way communication enables students' access to personal tutoring and counseling.

Along the same line, Garrison and Shale (1987) defined distance education in terms of non-contiguous communication between teachers and learners by putting an emphasis on both two-way communication and technology. They argued:

> *"Distance education implies that the majority of educational communication between (among) teacher and student(s) occurs non-contiguously (at different times and at separate places – separating the instructor-tutor from the learner). It must involve two-way communication between (among) teacher and student(s) for the purpose of facilitating and supporting the educational process. It uses technology to mediate the necessary two-way communication"*
>
> (Garrison & Shale, 1987, p. 11)

According to Peters (1973, as cited in Keegan, 2013) distance education is:

> *" a method of imparting knowledge, skills and attitudes which is rationalised by the application of division of labour and organisational principles as well as by the extensive use of technical media, especially for the*

> *purpose of reproducing high quality teaching material which makes it possible to instruct great numbers of students at the same time wherever they live. It is an industrialised form of teaching and learning."*
>
> (Peters, 1973, as cited in Keegan, 2013, p. 41)

For Greenberg (1998) contemporary distance education is:

> *"a planned teaching/learning experience that uses a wide spectrum of technologies to reach learners at a distance and is designed to encourage learner interaction and certification of learning"*
>
> (Greenberg, 1998, p 36)

Keegan (2013) repeatedly revised his definition. He finally proposed an analytic, comprehensive and modern definition of distance education which includes the following five basic key characteristics:

1. The quasi-permanent separation of the teachers and learner throughout the length of the learning process. (This characteristic distinguishes distance learning from the traditional face-to-face approach).
2. The influence of an educational organization both in the planning and preparation of learning materials and in the provision of student support services. (This characteristic distinguishes distance learning from private and self-study programmes)
3. The predominant use of -technical media, print, audio, video or computer- to unite teacher and learner and carry the content of the course.
4. The provision of two-way communication –between student and teacher or between students themselves- so that the student may benefit from or even initiate dialogue. (This characteristic distinguishes distance learning from other uses of technology in education.)
5. The quasi-permanent absence of the learning group throughout the length of the learning process so that people are usually taught as individuals and not in groups,

with the possibility of occasional meetings for both didactic and socialization purposes.

3.5.2 The Evolution of Distance Education

Contrary to popular assumption, distance education is not a new phenomenon. It has been around in the field of education for at least a hundred years. Its evolution and progression run parallel with innovations in communications technology. Scholars argued that the concept of distance education has evolved through a number of successive waves called generations. Garrison (1985) categorised distance education technological innovations into three generations: correspondence, telecommunication and computers.

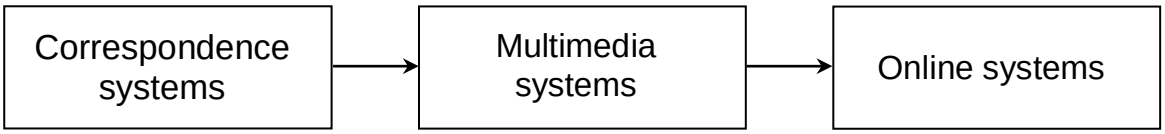


Figure 20: Distance Education through Three Successive Generations (White, 2003, p. 13)

Rumble (2001) favours a four-generational model:

1. Correspondence education,
2. Educational broadcasting,
3. Multimedia approaches
4. and E-education approaches

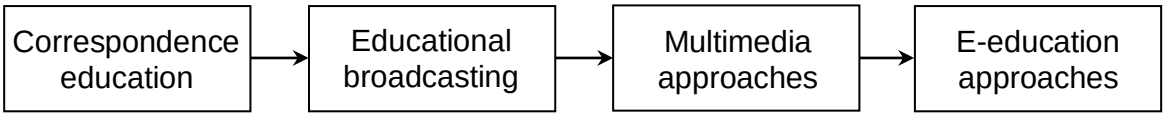


Figure 21: Distance Education through Four Successive Generations (White, 2009, p.13).

For Moore and Kearsley (2012) distance education can be categorised into five generations. Each generation is based on a dominant communication technology of the era:

3.5.2.1 First Generation: Correspondence:

The history of distance education started with courses of instruction that were delivered by traditional mail. The development of low cost and reliable postal services by the late nineteenth century made it possible, for the first time, for individuals who wanted to study at home or at work to obtain lessons from a distant instructor. The only support available to deliver the educational content was the print and the interaction between teacher and learners was restricted to a one-way communication only.

At this stage, the number of distance language courses offered was very limited since the context did not support opportunities to develop the listening and speaking skills. This first generation of correspondence study provided the foundation for individualized instructions at a distance.

3.5.2.2 Second Generation: Broadcast Radio and Television

The impetus for the second generation course model was the invention of radio and television technologies in the early part of the twentieth century. These mass media technologies capable of reaching a large audience supplemented the distance learning environment with instructional media additional to the print-based sources. The second generation of broadcasting radio and television had little or no interaction between the teacher and learners. However, it added the oral and visual dimensions to the presentation of information for the distance learners.

3.5.2.3 Third Generation: Open Universities

The third generation of distance education took shape in the late 1960s and early 1970s when experiments were conducted to test the integration of different communication technologies to deliver instructional content to distance learners. The idea was initiated in the Articulated Instructional Media (AIM) Project and was later borrowed in setting up the Open University in Great Britain. Though the dominant technology remained the print, this was the first time an integrated multiple-media

approach was applied on a large scale. Both one-way (from university to students in the form of print, broadcasts, and audiotapes) and two-way interaction (between teacher and students through correspondence tutoring, face-to-face tutorials and short residential courses) were integrated.

3.5.2.4 Fourth Generation: Teleconferencing

The fourth generation of distance education emerged in the 1980's based on the teleconferencing technology. The application of audio-conferencing technology changed the mode of instructor-student interaction. Unlike the previous forms of distance education, which were primarily one-way exchanges between the teacher and the students either by correspondence or via received-only transmissions of broadcast lessons, audio-conferencing allowed a student to answer back, and instructors to interact with students, in real time and in different locations.

3.5.2.5 Fifth Generation: Internet and the Web

The fifth generation of distance education appeared in the 1990s, with computers and computer networks as its main channels for delivering multimedia-rich learning content. The teacher-learner level of interaction increased as well as the collaborative work among students. Students had the convenience of attending virtual classes from the comfort of their homes simply by using their personal computers and the internet.

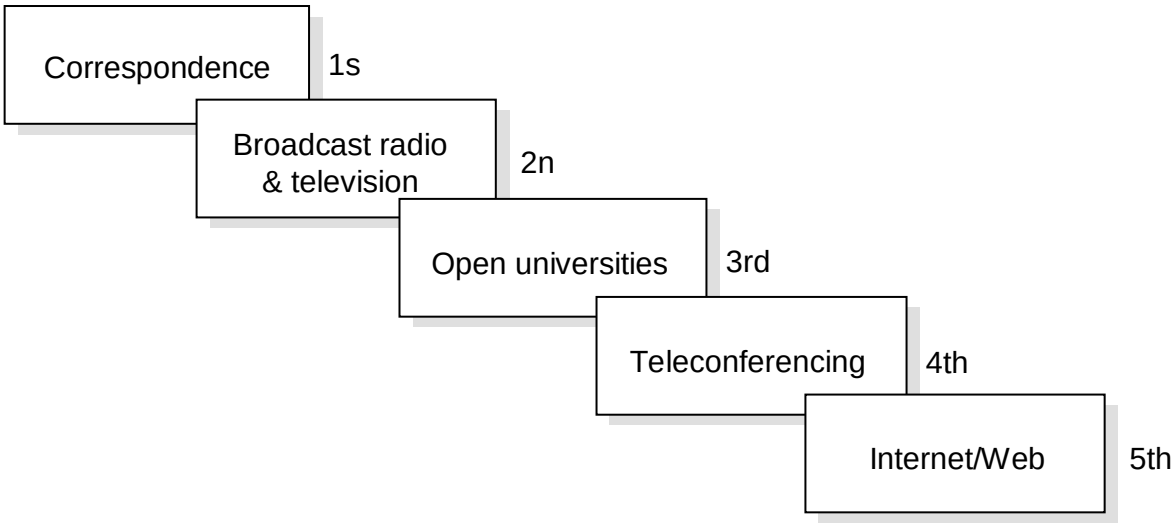


Figure 22: Distance Education through Five Successive Generations (Moore & Kearsley, 2012, p.13).

Along the same line, Taylor (2001) proposed a more detailed five generations model of distance education: First, the Correspondence Model founded on print technology; Second, the Multi-media Model based on print, audio and video technologies; Third, the Tele-learning Model, based on applications of telecommunications technologies to provide opportunities for synchronous communication; Fourth, the Flexible Learning Model based on online delivery via the Internet; and Fifth, Intelligent Flexible Learning Model, derived from the previous generation model and exploited the new interactive feature of the internet.

Taylor summarised the transformation of the five generations in table 4:

Models of Distance Education and Associated Delivery Technologies	**Characteristics of Delivery Technologies**					
	Flexibility			**Highly Refined Materials**	**Advanced Interactive Delivery**	**Institutional Variable Costs Approaching Zero**
	Time	**Place**	**Pace**			
FIRST GENERATION - The Correspondence Model						
• Print	Yes	Yes	Yes	Yes	No	No
SECOND GENERATION - The Multi-media Model						
• Print	Yes	Yes	Yes	Yes	No	No
• Audiotape	Yes	Yes	Yes	Yes	No	No
• Videotape	Yes	Yes	Yes	Yes	No	No
• Computer-based learning (eg CML/CAL/IMM)	Yes	Yes	Yes	Yes	Yes	No
• Interactive video (disk and tape)	Yes	Yes	Yes	Yes	Yes	No
THIRD GENERATION - The Telelearning Model						
• Audioteleconferencing	No	No	No	No	Yes	No
• Videoconferencing	No	No	No	No	Yes	No
• Audiographic Communication	No	No	No	Yes	Yes	No
• Broadcast TV/Radio and Audioteleconferencing	No	No	No	Yes	Yes	No
FOURTH GENERATION - The Flexible Learning Model						
• Interactive multimedia (IMM) online	Yes	Yes	Yes	Yes	Yes	Yes

• Internet-based access to WWW resources • Computer mediated communication	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes **No**
FIFTH GENERATION - **The Intelligent Flexible Learning Model** • Interactive multimedia (IMM) online • Internet-based access to WWW resources • Computer mediated communication, using automated response systems • Campus portal access to institutional processes and resources	Yes Yes Yes Yes	Yes Yes Yes Yes	Yes Yes Yes Yes	Yes Yes Yes Yes	Yes Yes Yes Yes	Yes Yes **Yes** **Yes**

Table 4: Distance Education through five successive generations (Taylor, 2001, p. 3)

3.5.3 Theories of Distance Education:

Numerous scholars have attempted to determine the fundamental characteristics upon which a theory of distance education could be based. Notable contributions have been made by: Wedemeyer's liberal, individualizing 'independent study' (1981); Baath's two-ways communication (1982); Peters' industrialised form of teaching and learning (1983); Holmberg's theory of the guided didactic conversation (1983); Garrison' Theory of communication and learner control (1987); Keegan's theory of the reintegration of the teaching acts (1990); Moore's theory of transactional distance including the concept of dialogue, structure, and the characteristics of each learner (1973), 1991); Verduin and Clark's three dimensional model with its concept of: dialogue/support, structure/specialized competence, general competence/ self-directedness (1991).

In his prominent book 'Theoretical Principles of Distance Education', Keegan (1993) classifies theories of distance education into three main groups: theories of independence and autonomy, theories of industrialization of teaching, and theories of interaction and communication. Each of these major theories will be explained below:

3.5.3.1 Theories of Independence and Autonomy:

Theories of independence and autonomy encompass two versions: the American version embracing ideas advanced by Charles Wedemeyer (1981) and the European one led by Michael Moore (1991).

3.5.3.1.1 Wedemeyer's Theory (1981)

Wedemeyer's theory of Independence study hypothesised that students' independence is the essence of distance education. Wedemeyer (1981) criticised the outdated concepts employed in teaching and encouraged the use of modern technologies that guarantee greater learner freedom. He assumed that students can get their independence by a variety of means and strategies, including the possibility to learn anytime and anywhere, while being in control over the pacing of their learning process (Saba 2003).

Wedemeyer (1981) set forth a system of ten characteristics emphasizing students' independence and the integration of technology as a way to implement that independence. According Wedemeyer the instructional system should do the following:

> *1. Be capable of operation anyplace where there are students or even only one student whether or not there are teachers at the same place at the same time;*
> *2. Place greater responsibility for learning on the student;*
> *3. Free faculty members from custodial-type duties so that more time can be given to truly educational tasks;*
> *4. Offer students and adults wider choices (more opportunities) in courses, formats, and methodologies;*
> *5. Use, as appropriate, all the teaching media and methods that have been proved effective;*
> *6. Mix media and methods so that each subject or unit within a subject is taught in the best way known;*
> *7. Cause the redesign and development of courses to fit into an "articulated media program";*
> *8. Preserve and enhance opportunities for adaptation to individual differences;*
> *9. Evaluate student achievement simply, not by raising barriers concerned with the place, rate, method, or sequence of student study; and*
> *10. Permit students to start, stop, and learn at their own*

pace.

(Wedemeyr, 1981, as cited in Holmberg, 1995, p. 8)

3.5.3.1.2 Moore's Theory (1973):

The transactional distance theory, first formulated by Moore in 1973, seeks to explain the learning relationship between the teacher and the students in a distance learning situation. Transactional distance refers not only to the physical or temporal distance, but also includes a psychological and communication gap of potential misunderstanding between the inputs of the instructor and those of the learners (Moore 1993).

In Moore's theory, three clusters of variables control the extent of transactional distance: Dialogue, Structure, and Learner Autonomy. Depending on how these variables manifest, transactional distance will be higher or lower, allowing for a typology of educational programs (Weidlich & Bastiaens 2018).

Structure refers the rigidity or flexibility of the instructional methods and strategies whilst dialogue refers to the interaction between the instructor and the learners during a distance learning experience. The third variable controlling the theory is Learner Autonomy. It refers to:

> *"the extent to which in the teaching/learning relationship it is the learner rather than the teacher who determines the goals, the learning experiences, and the evaluation decisions of the learning programme."*
>
> (Moore, 1993, as cited in Keegan, 1993, p.28)

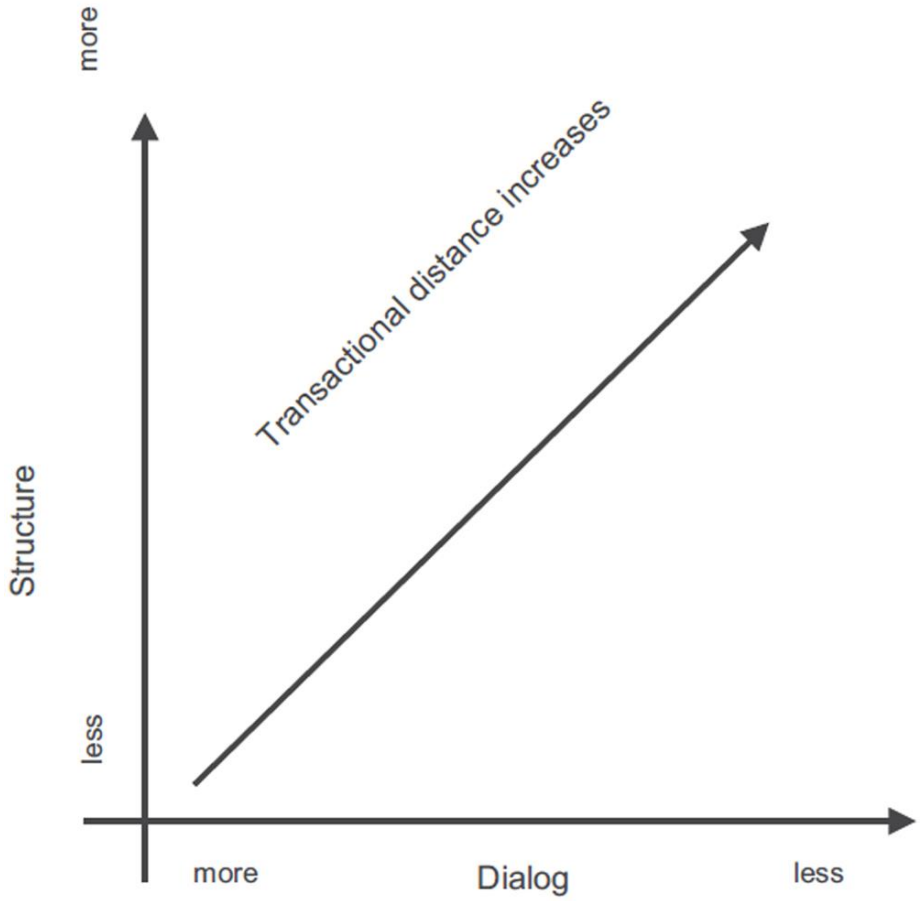


Figure 23: Dialog, Structure and Transactional Distance Relationship (Moore & Diehl, 2019, p. 37)

As figure 23 shows, Transactional Distance is a function of dialogue and structure. When an educational program is highly structured and teacher-learner dialog is non-existent the transactional distance between teachers and learners is high. On the opposite side, when the program contains a great deal of dialog and small amount of predetermined structure the transactional distance is low.

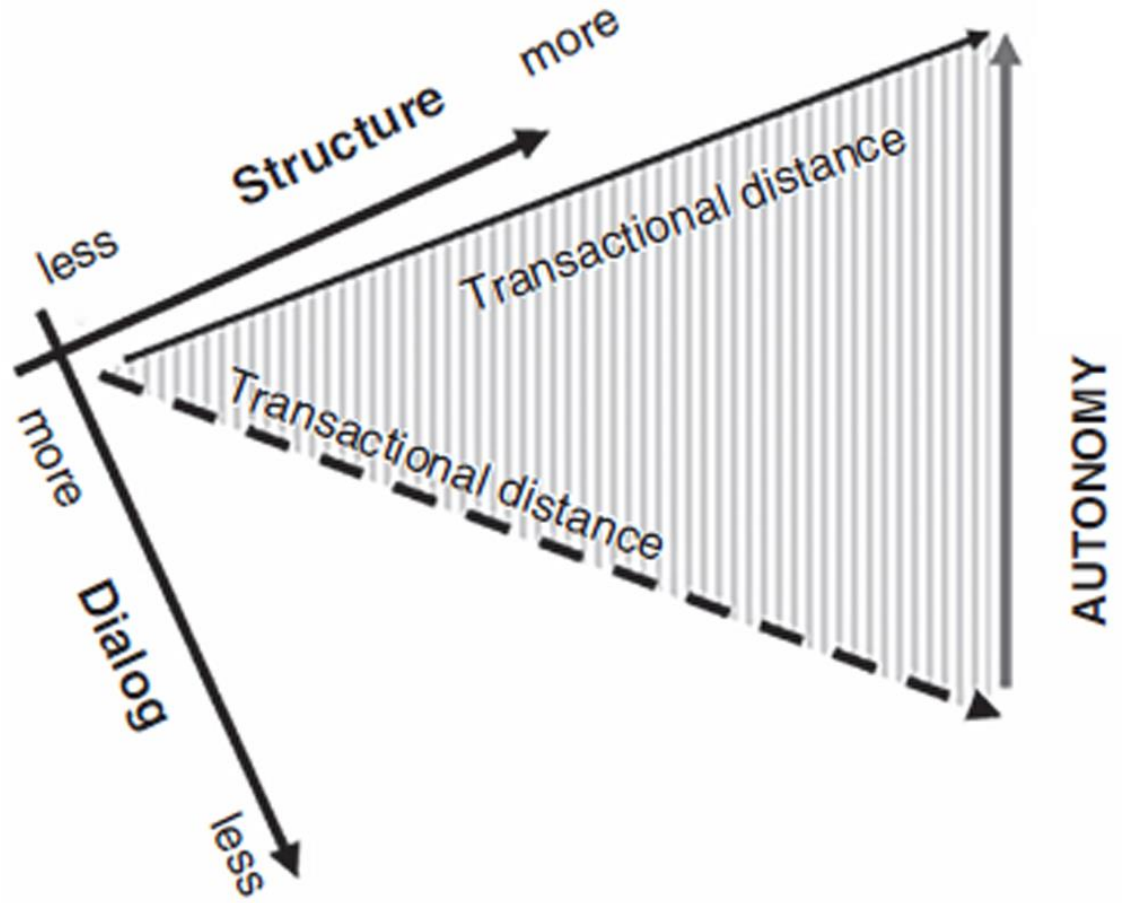


Figure 24: Autonomy and Transactional Distance (Moore & Diehl, 2019, p. 39)

From figure 24, the greater the transactional distance, the more autonomy the learner has to exercise. Therefore, if the target learners in a distance learning situation are demonstrating a high sense of autonomy the instructor can adjust the course design in that direction, e.g., making the course highly structured with a minimum of dialogue, thus increasing transactional distance.

3.5.3.2 The Theory of Industrialisation of Teaching

The theory of Industrialisation of teaching was developed by Otto Peters in 1983 after an extensive distance education survey he done during the 1960s. Peters perceived distance education as an industrialized form of teaching and learning with a structure based on the same rules and principles that governs the industrial process for producing goods.

In order for a distance education program to be successful, the application of industrial techniques for the delivery of instruction needs to be implemented. These techniques include rationalisation, division of labour, specialization of the workforce, systematic planning, mass production of materials, automation, standardization, and quality control, as well as using a wide range of modern communications technologies.

Peter comparison between distance education and the industrialization process showed the following striking similarities:

> *1- The development of distance study courses is just as important as the preparatory work prior to the production process.*
> *2- The effectiveness of the teaching-learning process is particularly dependent on very careful planning and adequate organization.*
> *3- The function of the teacher is split up into several subfunctions and performed by specialists as, for instance, in the production process at an assembly line.*
> *4- Distance education can only be economical if the number of students is great: mass education corresponds to mass production.*
> *5- As is the case with the production process, distance education needs capital investments, a concentration of the available resources, and a qualified centralized administration."*
>
> (Peter, 1993, as cited in Keegan, 1993, p.36)

From the above results, Peter was able to validate the industrial principles of distance education that distinctly separated it from the classical face-to-face instruction. Therefore, a careful consideration should be taken into account before taking decisions about the process of teaching and learning at a distance.

3.5.3.3 The Theory of interaction and communication

Börje Holmberg's Theory of interaction and communication, which he originally termed 'guided didactic conversation' theory, was reported for the first time in English in 1983. The theory considers the learner-teacher dialogue as the fundamental element of distance education. While Peter and Moore emphasise on the analysis of the structure of distance education, Holmberg concentrates rather on the interpersonalisation of the teaching process at a distance. According to Simonson et al. (2015), Holmberg approach is based on the following seven background assumptions:

> *1- The core of teaching is interaction between the teaching and learning parties; it is assumed that simulated interaction through subject-matter presentation in preproduced courses can take over part of the interaction by causing students to consider different views, approaches, and solutions and generally interact with a course.*
> *2- Emotional involvement in the study and feelings of personal relation between the teaching and learning parties are likely to contribute to learning pleasure.*
> *3- Learning pleasure supports student motivation.*
> *4- Participation in decision making concerning the study is favorable to student motivation.*
> *5- Strong student motivation facilitates learning.*
> *6- A friendly, personal tone and easy access to the subject matter contribute to learning pleasure, support student motivation, and thus facilitate learning from the presentations of preproduced courses (i.e., from teaching in the form of one-way traffic simulating interaction, as well as from didactic communication in the form of two-way traffic between the teaching and learning parties).*
> *7. The effectiveness of teaching is demonstrated by students' learning of what has been taught."*

(Simonson et al., 2015, pp. 46-47)

Holmberg's theory assumed that personal relations, study pleasure, and feelings of empathy, between teachers, students and supporting organisation is the core of effective distance education. This means that, friendly conversation and a feeling of personal connection are essential to promote intellectual pleasure and motivate students to learn, which is possible through the well-developed self-instructional materials and two-way communication systems.

Holmberg (1989) perceived genuine learning as primarily an individual activity which can only be achieved through a process of internalization. For him, learner autonomy is the ideal and the aim of distance education is therefore to assist students to achieve complete autonomy.

In his recent writings, Holmberg (2003) notes that the expression 'guided didactic conversation' was an unfortunate terminology choice explaining that he was unaware of the British/American interpretation of the term didactic which implies an authoritarian approach and student subordination, the opposite of what he first meant. He now prefers to call his approach '*the theory of teaching-learning conversation*'.

3.5.4 Synchronous VS Asynchronous Distance Education:

Synchronous distance education refers to a virtual learning event in which the teaching and the learning process happens simultaneously but from different locations. The teacher and learners need to be both online at a specific hour to communicate directly with each other in real-time using IM, live streaming, or audio and video teleconferencing technologies.

On the flip side, in asynchronous distance education instructions and learning occur not only in a different place but also at different times. The courses can even be carried out when the teacher or the student is offline. This makes it an ideal instruction mode for adult learners with busy time schedule who are coping with work and studies or work and family or all of these at the same time. The readily available lessons can be

delivered in the form of audio/video lectures, electronic handouts, articles and power points presentations (Perveen,2016).

Synchronous and asynchronous distance education are considered both advantageous. McVay Lynch (2004), indicates four crucial benefits for each mode of instruction.

On one hand synchronous mode reflects the following benefits: first, it motivates online learners by encouraging them to interact with their peers to work in group rather than individuals. Second, instantaneous interaction develops group cohesion and the sense of belonging to the learning community. Third, it allows learners to provide quick feedback on ideas and support decision making in group activities which make the lessons more entertaining. Finally, it encourages students to keep up-to-date with the course and provide a discipline to learning which help them prioritize their studies and manage their time more effectively.

On the other hand, asynchronous mode offers the following advantages: first, it provides students with the flexibility to access lessons any time and from any location equipped simply with a computer connected to the internet. Second, it provides learners with sufficient time to reflect, check references and prepare answers and comments. Third, it provides easy integration of the course concepts and material into the working or home environment. Finally, it is a less cost-effective technology since it requires only a minimum internet speed and a low-end personal computer to operate.

3.5.4.1 Synchronous Tools for Distance Education

Live chat: it is a text-based communication that allows the instructor and students to engage in real-time written conversation. Participants are often logged in a chatroom where they can ask questions and share resources and ideas. This is an excellent tool especially for introverted and shy students who feel uncomfortable expressing themselves orally around other classmates. However, the only drawback for this tool is that when there are a lot of participants logged in and everyone is attempting to chat at the same time the conversation can break down. The chat session may be archived in a *.txt or *.rtf document for later viewing by students who were not able to attend the session.

Voice chat: it is a voice conference call that uses VoIP (Voice over Internet Protocol) technology or a regular telephone line linked to a toll-free numbers[18] in order to make free or inexpensive phone calls to almost anywhere in the globe. The purpose of the voice conference is to create collaborative environment between the instructor and students when reviewing a documents or presentation.

Video conferencing: also referred to as video chat. It requires the participants to activate their webcams and microphones to be able to communicate and see each others. A video conference usually involves a webcam live-stream from a classroom but it may transmit power point presentations and graphical media as well. The transfer of these large files requires a good internet connection with a large bandwidth. The video conferencing is also a good tool that can be utilized to verify students identity and prevent common cheating practices in distance education especially during exams.

Virtual Worlds: a virtual world is a computer-simulated 3D (Three-Dimensional) environment, like Second Life, where instructor and students can meet in real-time using avatars as personal representations of themselves. It is an ideal and engaging educational tool for learning languages because it is possible for participants to communicate with each other through a headset and VoIP technology while at the same time being able to navigate a virtual world that looks and feels like another country or culture. Virtual worlds are not accessible to all learners but only the privileges few who can afford a good configuration computer with high rendering graphic card along with a significant large internet bandwidth.

3.5.4.2 Asynchronous Tools for Distance Education

Digital libraries: in an asynchronous learning mode, students are provided with instructional materials and documents in a portable format that can first be stored online then retrieved from a digital library. A digital library is an online database of stored digital objects consisting of digital documents, presentations, images, graphics, audio files, videos and even full-length movies such as educational documentaries. Besides

[18] Toll free numbers are telephone numbers with distinct three-digit codes that can be dialed from landlines with no charge to the person placing the call.

storing content, a digital library offers to its users means for organizing, searching, and retrieving content contained in the collection.

E-mails: emails are the fundamental and most common communication between the instructor and students throughout a distance learning course. It is a great asynchronous tool for making inquiries, keeping in touch with students, sending reminder and updates, and receiving materials and assessments. Some asynchronous learning classes rely solely on emails as the main method of communication, others use it just as a tool to supplement additional learning materials.

Discussion forums: a discussion forum is an online collaboration board where the instructor and students can continue their discussion asynchronously on various course-related topics. Content in a discussion forum is usually structured into topics called threads. Generally, the teacher starts by posting a thread to initiate the discussion, and then each student has the opportunity to reply to the teacher's post and responds to other peers' postings. Published postings are automatically saved allowing the teacher to track students' participation and assess the quality of their contributions. A discussion forum is a great place for learners to ask questions, clarify ambiguities, and share links and documents.

Compact discs: some asynchronous distance learning courses are often delivered in the form of a textbook accompanied by an offline electronic storage such as DVDs or CD-ROMs for multimedia support. Some other courses are delivered in form of data discs containing educational standalone interactive software similar to 'Tell Me More' and 'Rosetta Stone'. The advantage of the compact disc tool is that it enables students to access the learning content offline even where there is slow, limited or expensive internet connectivity.

3.5.5 Advantages and Drawbacks of Distance learning

As any other learning method, distance learning offers many advantages and drawbacks. According to Sadeghi (2019), the most important advantages of distance learning are the following:

Eliminating the barriers of space and time: the good thing about distance learning is that students are no longer restricted to the classroom for information. Empowered simply by a computer or a smartphone connected to the Internet, any student can have access to all the information needed right at his fingertips. This means that learning can take place anytime and anywhere. A student can even have access to courses offered by international universities no matter which country he is living in or which citizenship he is holding.

Cost effectiveness: for most educational programs, the tuition fees of a distance learning degree is less expensive than a regular on-campus one. Students who have a tight budget can opt for distance learning as an economical and affordable option that can help them save a significant amount of money. Beside the tuition fees, more savings can be gained by cutting the costs of expenses and accommodations especially when a distance learner is studying at home.

Time and Pace Flexibility: unlike the traditional face-to-face classes where students have to follow a teaching speed determined by the educator and respect the institution's rigid time schedule, distance learning enables students to learn at the pace they feel comfortable with and coordinate their learning around their commitments by setting their own flexible and convenient schedule. This learning flexibility provides students with full control and accountability for their learning and could alleviate much of the pressure received when asked to complete tasks on a tight deadline.

Earning while Learning: for those working professionals who want to improve their resume but find it quite difficult to manage their studies and job at the same time then distance learning is the best option for them. Without pausing or discontinuing their carrier, distance learning allows full-time professionals a flexible learning schedule in which they can continue their higher education studies and earn revenue simultaneously.

Besides its advantages, distance learning also has many drawbacks some of which are presented below:

Sense of Isolation: in a traditional classroom, a great deal of learning can happen when students are being in the company of their peers. However, in a distance learning class, there is a lack of physical interaction between the teacher, students and peers. This lack of interaction often generates a sense of isolation for the students. One way to overcome this issue is to integrate other forms of communication including emails, chatrooms, and video conferencing that enables face-to-face interaction.

Lack of motivation and self-discipline: the lack of motivation and self-discipline are among the most common reasons why students fail to finish their distance learning courses. In a typical classroom-based environment, students are constantly being pushed toward their learning objectives by several variables. Strict time management, peer-to-peer activities and face-to-face interaction with the instructor are all variables that work together to keep students focused on their learning. In a distance learning environment, however, there are less extrinsic variables that motivate students to perform at the best of their abilities. On many occasions during a distance learning process, students are left alone with their computers without any encouragement or support to achieve their goals. Accordingly, in order to succeed in a distance learning environment, students have to develop a strong intrinsic motivation and self-discipline.

Academic dishonesty: unfortunately, one of the serious disadvantages of distance learning continues to be the prevalence of different cheating methods in exams and assessments. Distance learning students are able to cheat more easily than on-campus students because the tests and exams are taken in their own environment while using their personal devices. In this particular situation, students cannot directly be monitored during evaluation without a live video feed from their testing location which makes the cheating detection process more complicated than with the standard testing procedures. Additionally, in the absence of an adequate identity authentication system during a distance learning evaluation, some students engage in the fraudulent practice of impersonation in which they ask a third-party to take an exam in their place resulting in a

totally fabricated test scores. The distance learning institution or the instructor may use some available ready-made anti-cheating solutions such as: Udutu, Talview and ProctorU which use Automated Identity Verification (AIV) and Machine Learning[19] (ML) to identify fraudulent test-takers.

Lack of development of communication skills: the distance learning method has been proven to be highly effective in improving students' comprehension skills. The development of students' communicative skills, however, is a subject often neglected in distance learning sessions mainly due to the lack of students' face-to-face interaction with their instructor and peers. Hence, not giving much attention to the development of students' communicative skills would inevitably lead to a large number of graduates who excel in their theoretical knowledge but who are unable to communicate that knowledge to others effectively.

3.6 Conclusion

In this chapter, the researcher has attempted to provide the reader with the theoretical background needed to understand and follow with ease the different steps of the experimental research. Since the main concern of this study is to evaluate the effect of the implementation of a distance learning ESP course on mechanical engineering students' language learning achievement and attitudes, it was necessary to shed light on some key concepts relative to CALL, Language labs, and distance learning.

[19] Machine Learning: is a type of artificial intelligence that allows software applications to become more accurate at predicting outcomes without being explicitly programmed.

Chapter Four Fieldwork: Data Analysis and Interpretations

Chapter Four: Fieldwork: Data Analysis and Interpretations

4.1 Introduction

The fourth chapter of this study is devoted to the presentation of an experimental research conducted at the Department of Mechanical Engineering, USTO-MB Oran University. The experiment aimed at investigating the effectiveness of distance learning in improving EFL learners' achievement scores. In order to achieve this purpose, quantitative data were gathered using various tailor-made instruments, namely a pre-test, a post-test, and a questionnaire. The data collected from the pre and post tests were then statistically analysed using SPSS version (20) and the other data from the questionnaire were represented in tables and charts. This chapter presents the methodology adopted and the different steps followed while gathering and analysing the data. The chapter starts with a presentation of the current situation of English at the Department of Mechanical Engineering then it provides a description of the sample, the methodology employed and the different instruments used for data gathering. After that it reports the major results of the data analysis. The chapter concludes with a discussion of potential explanations of the results in addition to some recommendations for future research perspectives.

4.2 English at the Department of Mechanical Engineering USTO-MB

At the Department of Mechanical Engineering USTO-MB, English is taught under the name of 'Anglais'. The module is included in the first and second year curriculum as a compulsory subject. The lessons are in the form of lecture-based sessions held in an amphitheatre and usually assigned to temporary fresh graduate instructors.

However, due to the large demand of skilled engineers in the Algerian job market, the department has lately witnessed a steady increased flow of students which has led systematically to an unprecedented overload of groups. The current average group size ranges from fifty to sixty students whereas general theory classes may reach up to one hundred and eighty students.

Moreover, when close attention is paid to the timetable, one can very easily notice that the English lessons are planned only once a week lasting for a single academic unit and usually scheduled in the afternoon period. This means that the interval between two sessions is quite long and relatively not sufficient to have a sound impact on students' level.

Another point worth mentioning is that educators, administration and learners do not give the same rate to the English language compared to the core subjects. More importance is given to students' technical knowledge rather than their English language competence.

4.3 Description of the Sample

The present study population includes first year undergraduate LMD students from the Mechanical Engineering Department at the University of Sciences and Technology Oran USTO-MB. The sample consists of thirty students among whom sixteen males and fourteen females who willingly volunteered to participate in this study. All students are native speakers of Arabic and their age varies between eighteen and twenty years old. These freshmen were assigned to one of the following groups: Traditional group, Distance Learning group or Language lab group. The Distance Learning and the Language lab groups acted as an experimental group whereas the Traditional group served as a control.

	Control	**Experimental**		**Total**
	Traditional method group	**Distance learning group**	**Language lab group**	
Number of students	10	10	10	30

Table 5: Sample Distribution

4.4 Methodology

There is a variety of methods that can be used to carry out an educational research. However, it is the investigator's duty to select which method is mostly appropriate for his research. This selection depends to a large extent on the nature of the problem, the research objectives, the type of information that needs to be collected and the sample involved.

Since we are dealing with a computer technology language learning environment and want to assess the potential effectiveness of distance learning, the most convincing way is the use of an experimental design through the study of learners' performances. Chapelle (2001) suggests researchers to follow a design that involves conducting a pre-test at the outset of the experimentation and an immediate post-test upon completion of the treatment. In order to get stronger evidences about the potential effectiveness of the method a researcher want to assess, she further recommends employing a control group that does not receive any intervention and then compare the difference in gains.

The present study is concerned with the effectiveness of distance learning on EFL Algerian students' outcomes. To achieve the purpose of the study, an experimental design method was adopted. First, two major groups were formed: experimental and control then students were assigned to one of the three following groups: Traditional group (control), Distance Learning group (experimental), or Language lab group (experimental) as shown in table 5.

At the beginning of the experiment, all participants completed a computerised pre-test in the language lab at the Mechanical Engineering Department USTO-MB Oran. After completion, all students were exposed to an intensive ESP course of the same content instructed by the same teacher but with different methods; the control group was taught using the conventional method of teaching, the Language lab group was taught in the language lab where each student was equipped with a personal computer linked to the SANAKO system, while the distance learning group was taught asynchronously at a distance with a learning material integrated with sounds, pictures, and video files sent via email.

At the end of the treatment, all participants took a computerised post-test in the language lab as well as a paper-based questionnaire (see Appendix Four and Five) measuring their opinions, attitudes, and preferences towards the implemented teaching methods. The tests results were statistically analysed with the help of IBM SPSS software version 20. It is worth mentioning that the experiment lasted ten weeks for all groups, however, not all groups were treated at the same point of time. The traditional and the language lab groups were part of a previous experiment conducted between the period of November 2nd, 2015 and January 7th, 2016 within the framework of our magister research project whereas the distance learning group experiment took place between October 10th, 2021 and December 18th, 2021.

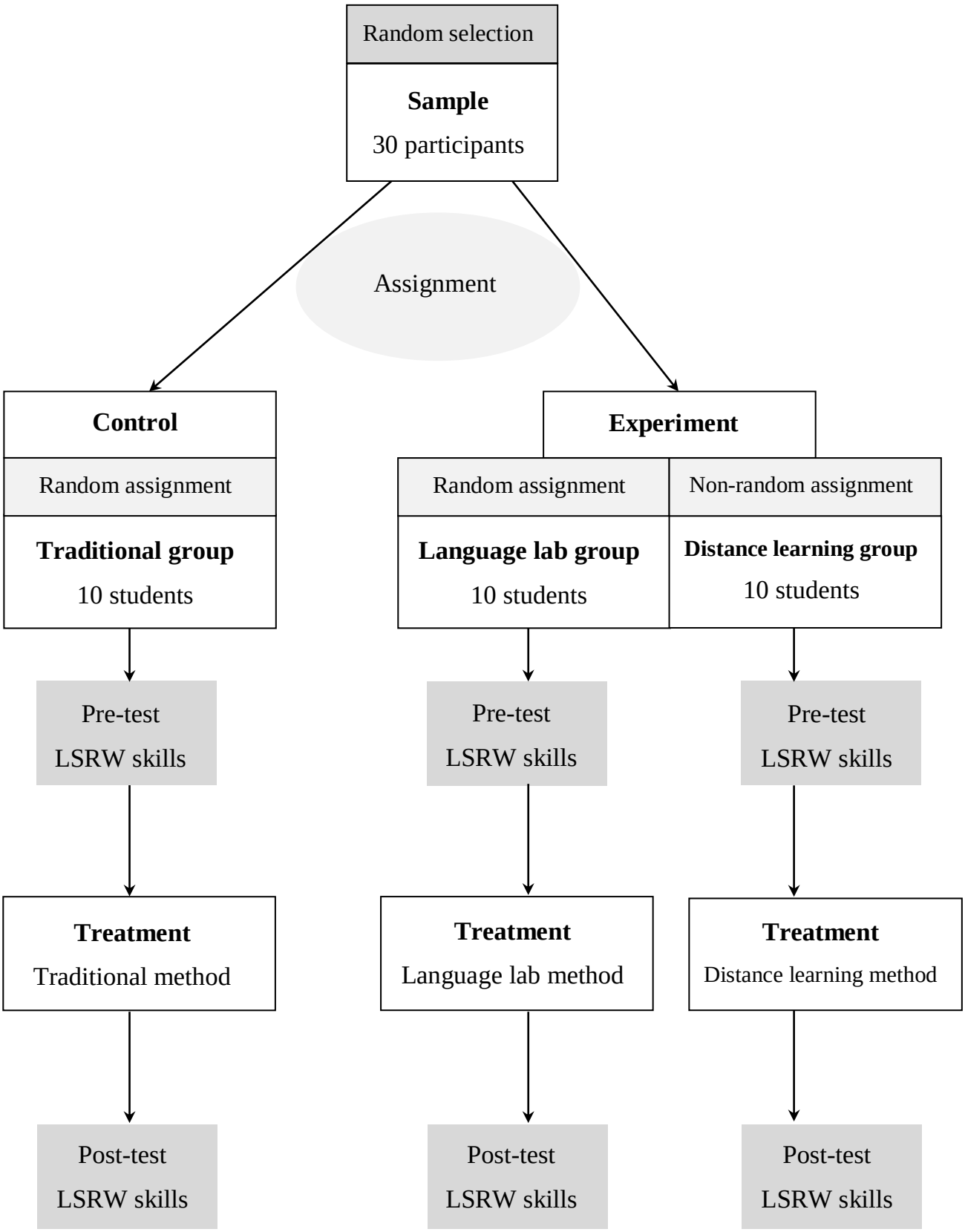


Figure 25: Research Design

4.5 Research Tools

In order to achieve the aims of the study, three quantitative instruments were utilised for data collection: a computerised pre-test, a computerised post-test and a paper-based questionnaire. The reason behind choosing quantitative research instruments is the fact that these instruments provide numerical data that can easily be analysed through statistical means which makes the results obtained be more objective and accurate than its qualitative counterpart.

4.5.1 The Pre-test

The research method selected requires the groups to be homogeneous in terms of students' initial language proficiency level. To this end, the researcher had developed a computerised self-made EGP test composed of four parts, with each part assessing a different language skill. In the reading comprehension part, students used a word processor to answer open-ended questions about a given text. The second part dealt with listening comprehension in which students were first asked to listen to short audio passages produced by native speakers of English and then to respond to multiple-choice questions accordingly. In the third part of the test, students' basic writing skills were evaluated using activities that ranged from reorganising sentences to correcting and punctuating a paragraph. The last part of the test covered the speaking skill. In this part of the test, and with the assistance of a speech synthesiser, a dialogue was conducted between a computer and the students in the form of question-answer dialogue. Students' oral responses were recorded for later analysis (see Appendix Six).

4.5.2 The Post-test

Immediately after the experimentation, a computerised self-made post-test which aimed at measuring the participants' language achievement on the four basic LSRW skills was conducted. The post-test had the same parts and similar types of questions as the pre-test but the content was different. Rather than assessing students' general English achievement, the post-test focused more on evaluating students' technical language assimilation in relation to the content of the ESP course received (see Appendix Seven).

4.5.3 The Questionnaire

In addition to the computerised pre- and post-tests, a paper-based questionnaire was developed to collect data on students' basic information, opinions, attitudes, and preferences towards the implemented teaching methods including distance learning. The questionnaire designed contained twelve items, all of which were closed-ended questions. Response formats ranged from dichotomous items to five-points Likert scale. The tool was originally designed in English and then translated into students' native language (Arabic) to ensure accurate understanding. It is worth mentioning that a prior pilot study of five students from the same population was conducted to attest the validity and reliability of both the pre-test and the questionnaire. After the piloting, some minor alterations were undertaken and the instruments were improved accordingly.

4.6 The Language lab at the Mechanical Engineering Department USTO

Participants of the present study, especially the language lab group, had the opportunity for the first time in the faculty's history to explore the potential of a functional language lab facility. The acquisition of a language lab at the Department of Mechanical Engineering USTO-MB falls within the framework of empowering the faculty with effective pedagogical and technological means that can maximise students' potential of learning foreign languages. The language lab was first acquired in 2012 and since then it has never been operational. Both teachers and students alike claim the ignorance of the availability of such facility in the department. Additionally, although a great deal of financial investment was devoted to the purchase of such expensive piece of equipment, all the other essential factors of a successful language lab implementation such as teachers training as well as administrative and pedagogical support had been neglected. This situation is unfortunately far from being an exception. Benabdallah (2008) encountered similar conditions at the University of Souk-Ahras. He relates:

> *"In 2008, the department of foreign languages at Mohamed-Cherif Messadia University has been equipped with a new digital dedicated language laboratory, a Sanako 100 Lab. Since then, it has never been exploited but rather used as an ordinary classroom. All students*

> *asserted that they have never manipualted such facility. Instructions not to touch them were very clear. As for teachers, they argue that they do not have any idea on how to exploit the [Digital Dedicated Language Laboratory] for three reasons: (1)they did not get any training; (2) they were instructed not to try it, and (3) the new learning/teaching model does not conform to their ideas, and so they choose to go on with the conventional teaching practice."*
>
> (Benabdallah, 2008, as cited in Pixel, 2015, p. 430)

In order to conduct the present study, the researcher needed an access to the language lab. For that purpose, a request to the Dean's Office of the Faculty of Mechanical Engineering USTO-MB had been made. After a week period, the researcher received a positive reply that granted him permission for the full access and use of the language lab facility (see Appendix One).

Figure 26: The Language Lab at the Department of Mechanical Engineering

The language lab at the Department of Mechanical Engineering USTO-MB is a pure-software language lab which can hold theoretically an unlimited number of students' booths. The language lab system itself is a SANAKO Study1200. It is composed of twenty-five PCs interconnected via LAN and managed by a server functioning under OS XP Server 2008. Students' computers can be controlled through the teacher's main computer or the server using the SANAKO Study 1200 Tutor application which acts as a software console. This application allows the teacher to control, access, monitor, and manage the transfer of digital content to the whole classroom with simple mouse clicks. The teacher's computer is also equipped with a Pinnacle video digitising card and a Sony DVD/VHS player. These tools give the teacher additional flexibility in terms of manipulating materials from versatile digital and analog sources. Moreover, the SANAKO 1200 lab has huge amounts of features and many modes of instruction that allows both individual and small group interactions. Without any previous training, the researcher acknowledges that he had managed to a certain extent and with great difficulties to operate the basic functions of the system and adapt the available materials to the learning situation.

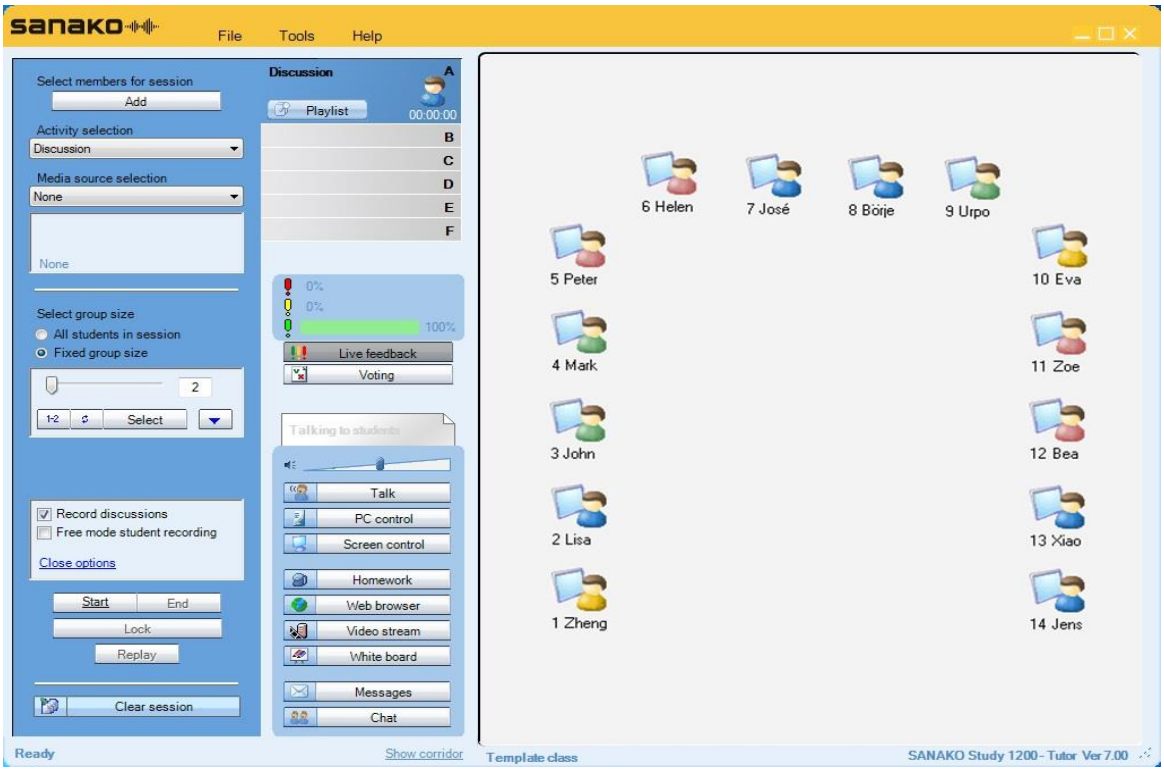


Figure 27: SANAKO Study 1200 Teacher's Interface (Source: SANAKO Study 1200 Version 6.10 User Guide, p. 12)

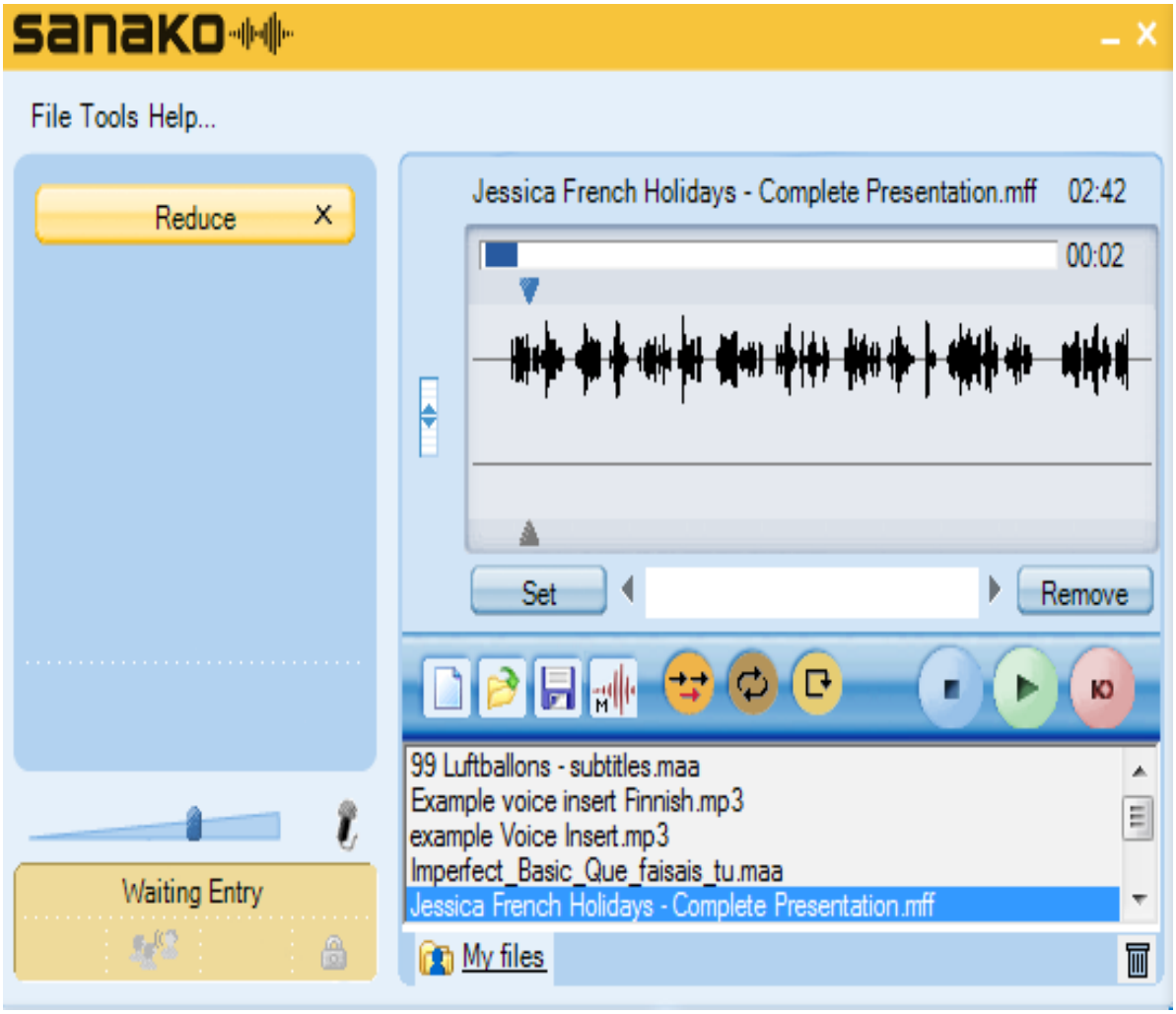


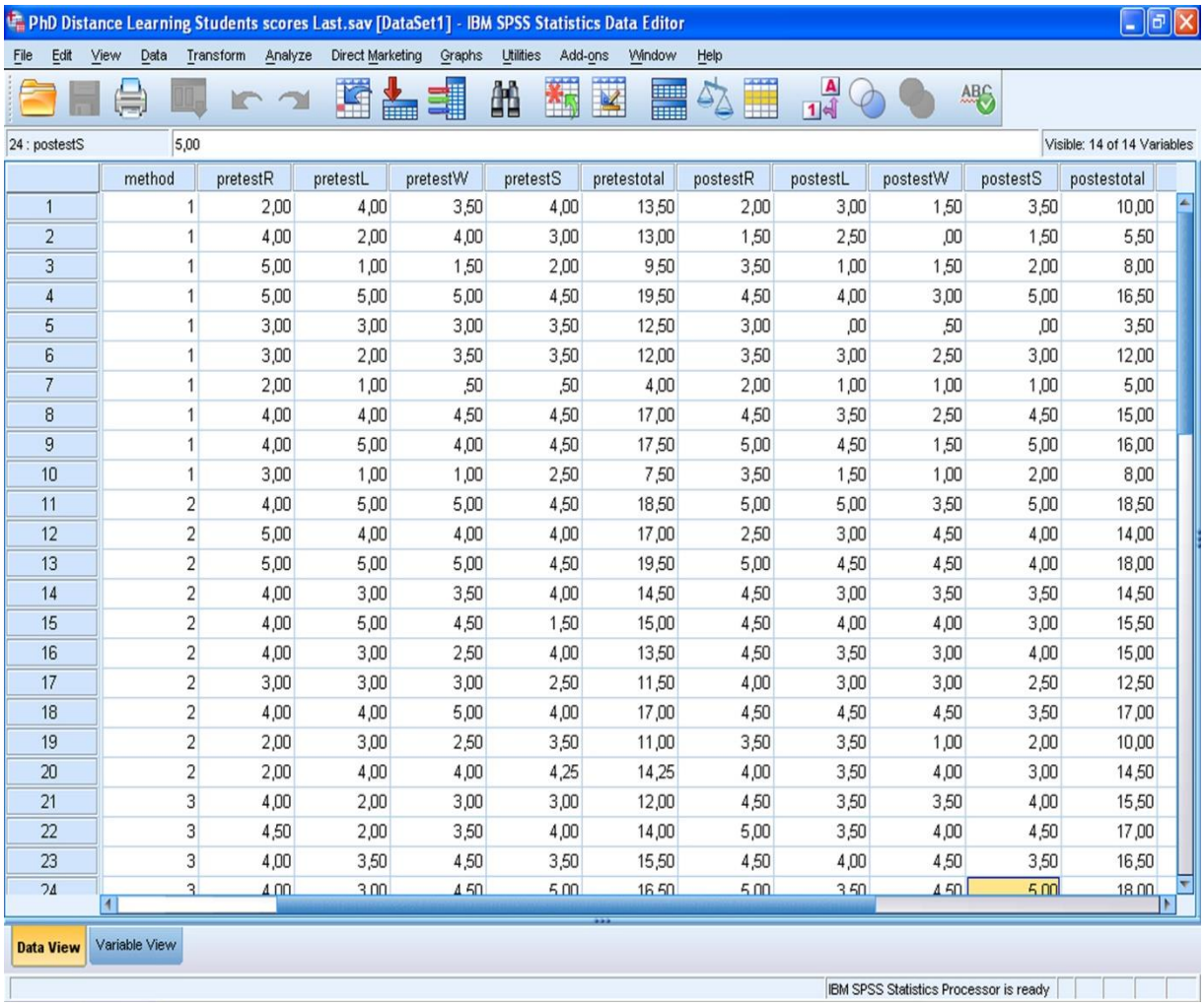
Figure 28: SANAKO Study 1200 Student's Interface (Source: SANAKO Study 1200 Version 6.10 User Guide, p. 113)

4.7 Data Analysis

Data analysis is one of the most crucial phases in any experimental research project. It is the phase in which answers to the research questions start taking shape. Data analysis refers to the interpretative process a researcher goes through in order to decipher and bring meaning the raw and inexpressive data gathered by employing logical and statistical means. In the present research, the quantitative data collected from both the pre- and post-tests were subject to a statistical analysis using the SPSS software. The latter will be generally presented in the following part.

4.7.1 Statistical Data Analysis with SPSS:

SPSS is the acronym for Statistical Package for Social Sciences. It is a windows-based statistical software suite that is widely used in social science for the description, organisation, examination, and analysis of numerical data. The software was originally developed in the late 1960's by three students from the university Standford : Norman H. Nie, Dale H. Bent, and C. Hadlai Hull. The earlier versions of SPSS were executed on the mainframe computers using commande-line. However, with the advancement of technology and the series of upgrades and refinements the software has undertaken, current versions of the program can easily be run on a personal computer with few clicks and can solve much more complex operations than the earlier versions.



	method	pretestR	pretestL	pretestW	pretestS	pretestotal	postestR	postestL	postestW	postestS	postestotal
1	1	2,00	4,00	3,50	4,00	13,50	2,00	3,00	1,50	3,50	10,00
2	1	4,00	2,00	4,00	3,00	13,00	1,50	2,50	,00	1,50	5,50
3	1	5,00	1,00	1,50	2,00	9,50	3,50	1,00	1,50	2,00	8,00
4	1	5,00	5,00	5,00	4,50	19,50	4,50	4,00	3,00	5,00	16,50
5	1	3,00	3,00	3,00	3,50	12,50	3,00	,00	,50	,00	3,50
6	1	3,00	2,00	3,50	3,50	12,00	3,50	3,00	2,50	3,00	12,00
7	1	2,00	1,00	,50	,50	4,00	2,00	1,00	1,00	1,00	5,00
8	1	4,00	4,00	4,50	4,50	17,00	4,50	3,50	2,50	4,50	15,00
9	1	4,00	5,00	4,00	4,50	17,50	5,00	4,50	1,50	5,00	16,00
10	1	3,00	1,00	1,00	2,50	7,50	3,50	1,50	1,00	2,00	8,00
11	2	4,00	5,00	5,00	4,50	18,50	5,00	5,00	3,50	5,00	18,50
12	2	5,00	4,00	4,00	4,00	17,00	2,50	3,00	4,50	4,00	14,00
13	2	5,00	5,00	5,00	4,50	19,50	5,00	4,50	4,50	4,00	18,00
14	2	4,00	3,00	3,50	4,00	14,50	4,50	3,00	3,50	3,50	14,50
15	2	4,00	5,00	4,50	1,50	15,00	4,50	4,00	4,00	3,00	15,50
16	2	4,00	3,00	2,50	4,00	13,50	4,50	3,50	3,00	4,00	15,00
17	2	3,00	3,00	3,00	2,50	11,50	4,00	3,00	3,00	2,50	12,50
18	2	4,00	4,00	5,00	4,00	17,00	4,50	4,50	4,50	3,50	17,00
19	2	2,00	3,00	2,50	3,50	11,00	3,50	3,50	1,00	2,00	10,00
20	2	2,00	4,00	4,00	4,25	14,25	4,00	3,50	4,00	3,00	14,50
21	3	4,00	2,00	3,00	3,00	12,00	4,50	3,50	3,50	4,00	15,50
22	3	4,50	2,00	3,50	4,00	14,00	5,00	3,50	4,00	4,50	17,00
23	3	4,00	3,50	4,50	3,50	15,50	4,50	4,00	4,50	3,50	16,50
24	3	4,00	3,00	4,50	5,00	16,50	5,00	3,50	4,50	5,00	18,00

Figure 29: SPSS Version 20 Graphical Interface

In the present study, different statistical tests were employed to check the validity of the hypotheses. Some of these tests are simple and could have been calculated manually by hand for example: the Mean. Other tests such as One-way ANOVA are arduous and necessitate the analysis of the data through the SPSS software. The One-way ANOVA test or the Analysis of Variance was not chosen at random. In similar research designs one may notice the application of the t-test. While the t-test is used to compare the means between two groups, One-way ANOVA should be applied when three or more groups are involved.

4.7.2 Analysis of the Pre- and Post-test Results

In order to test the first and second hypotheses of the present study, a deep statistical analysis was conducted using the SPSS software version 20. The data gained from the pre-test and post-test evaluation were analysed and then compared. The statistical comparison between the groups in terms of students' achievement scores was done by One-way ANOVA and Scheffé's post-hoc tests at a 0.05 level of significance. Before running the One-Way ANOVA test, it was necessary to check the underlying assumption of the homogeneity of variance. In other words, this means that we are going to make sure that students from all the three study groups have nearly the same English learning level at the beginning of the experiment.

	N	**Mean**	**Std. Deviation**	**Minimum**	**Maximum**
Traditional group	10	14,1750	2,98154	10,25	19,50
Distance learning group	10	14,0000	1,88930	11,00	17,00
Language lab group	10	13,0750	1,82593	10,00	15,50
Total	30	13,7500	2,26765	10,00	19,50

N: number of valid observations for the variable (number of participants)
Std. Deviation: Standard deviation

Table 6: Pre-test Mean Scores and Standard Deviation

Table 6 shows the results of the pre-test mean achievement scores for the three groups. The Traditional group, the Distance learning group, and the Language lab group obtained the mean scores of 14.17, 14.00, and 13.07 respectively. As one can notice, these means appear to be close to each others. However, we cannot confirm with reasonable certainty that the participants of three groups are homogeneous in terms of their achievements until the appropriate statistical method is conducted. Thus, the single analysis of variance or what is popularly known as One-way ANOVA was performed to determine whether there are any significant differences in the mean scores of the three groups.

	Sum of Squares	**Df**	**Mean Square**	**F**	**Sig.**
Inter-groups	6,988	2	3,494	,664	,523
Intra-groups	142,138	27	5,264		
Total	149,125	29			

* The mean difference is significant at the 0.05 level.
Df: Degree of freedom
F : Analysis of Variance or F-test
Sig. : Significance

Table 7: One-Way ANOVA Pre-test Results

The results of the One-Way ANOVA analysis in table 7 revealed the fact that there was no statistical significant difference between the pre-test scores of the three groups (sig = 0.52 > 0.05). Therefore, before the intervention, the three groups were homogeneous in their achievements which means that all participants had the same English level.

Hypothesis One: *Distance learning is an effective method in improving the Algerian mechanical engineering students' achievement scores*.

	N	Mean	Std. Deviation	Minimum	Maximum
Traditional group	10	7,7250	2,53161	3,50	11,50
Distance learning group	10	13,6250	1,61697	10,00	15,50
Language lab group	10	17,6000	1,05541	15,50	19,25
Total	30	12,9833	4,49134	3,50	19,25

Table 8: Post-test Mean Scores and Standard Deviation

After the intervention a noticeable difference in the mean scores of the three groups was perceived. The Traditional group, the Distance learning group and the Language lab group got a mean score of 7.72, 13.62, and 17.6 respectively (see table 8). Although there seems to be a difference in the mean scores of the three groups, no statistical significant difference can be acknowledged. Consequently, the One-way ANOVA was processed to probe the potential statistical difference between the three groups.

	Sum of Squares	Df	Mean Square	F	Sig.
Inter-groups	493,754	2	246,877	73,059	,000
Intra-groups	91,238	27	3,379		
Total	584,992	29			

* The mean difference is significant at the 0.05 level.

Table 9: One-Way ANOVA Post-test Results

The results of the One-way ANOVA analysis of the post-test computed at the 0.05 level of significance obtained the value of sig. = 0,000 (see table 9). This shows that there was a statistical significant difference between the three groups after the intervention (sig = 0.000 < 0.05).

After establishing a significant difference in the post-test achievement scores of the three groups, Scheffé's Post-Hoc test was chosen to determine the direction of the differences. Being able to determine the direction of the differences combined with the information obtained from table 8 concerning the means values of the three groups will allow us to classify the three methods applied from the least effective to the most effective method. The computational results of Scheffé's Post-Hoc test are presented in table 10.

(I) method	(J) method	Mean Difference (I-J)	Sig.
Traditional group	Distance learning group	-5,90000*	,000
	Language lab group	-9,87500*	,000
Distance learning group	Traditional group	5,90000*	,000
	Language lab group	-3,97500*	,000
Language lab group	Traditional group	9,87500*	,000
	Distance learning group	3,97500*	,000

* The mean difference is significant at the 0.05 level.

Table 10: Scheffé's Post-hoc Post-test Mean Scores

How to read the results from table 10: The positive or negative value of the mean difference (I-J) in table 10 determines the direction of the differences; positive value means that the direction of the difference is in favour of the former group. Negative value means the direction of the difference is in favour of the later group.

The results in table 10 indicate that the mean difference between the Traditional group and the Distance learning group was statistically significant in favour of the Distance learning group with an estimate value of -5.90. Moreover, a comparison between the Traditional group and the Language lab group showed a statistical significant difference in favour of the Language lab group with a mean difference score of -9.87. Significant difference was also found between the Distance learning group and the Language lab group in favour of the latter (Mean Difference = -3.97).

Since the Language lab group's statistical mean was the highest mean (17.60) followed by the Distance learning group's mean with (13.62) while the Traditional group's statistical mean came last (7.72) (see table 8), and from the above results related to the direction of the differences, it can be deduced that the Distance learning method is more effective than the traditional method and the Language Lab method is the most effective method amongst the three methods examined. Under these conditions, the null hypothesis[20] (H_0) is therefore rejected and the hypothesis (H_1) claiming that: 'Distance learning is an effective method in improving the Algerian mechanical engineering students' achievement scores' is accepted.

[20] The null hypothesis is the hypothesis the researcher attempts to reject. It generally refers to the statement that there is no relationship between the experimental and control groups. Thus, the null hypothesis for hypothesis one of the present study proposes that Distance learning is not an effective method in improving students' achievement scores.

Hypothesis Two: *Distance learning affects the development of EFL learners' four skills: listening, speaking, reading, and writing.*

		N	Mean	Std. Deviation	Minimum	Maximum
Post-test R	Traditional group	10	2,6000	,68920	1,50	3,50
	Distance learning group	10	3,8000	,67495	2,50	4,50
	Language lab group	10	4,7000	,25820	4,50	5,00
	Total	30	3,7000	1,03682	1,50	5,00
Post-test L	Traditional group	10	1,6250	1,02232	,50	3,00
	Distance learning group	10	3,3250	,44175	2,75	4,00
	Language lab group	10	4,5750	,58984	3,50	5,00
	Total	30	3,1750	1,41597	,50	5,00
Post-test W	Traditional group	10	1,5000	,94281	,00	3,00
	Distance learning group	10	3,2500	,95743	1,00	4,50
	Language lab group	10	3,8750	,46022	3,00	4,50
	Total	30	2,8750	1,29280	,00	4,50
Post-test S	Traditional group	10	2,0000	1,33333	,00	4,50
	Distance learning group	10	3,2500	,75462	2,00	4,00
	Language lab group	10	4,4500	,42164	3,50	5,00
	Total	30	3,2333	1,34858	,00	5,00

Table 11: Post-test LSRW Skills Mean Scores and Standard Deviation

Table 11 presents the mean results of the post-test achievement scores of the three study groups in their listening, speaking, reading, and writing skills. One can notice that the Language lab group gained the highest mean in all four language skills (L=4.57, S=4.45, R=4.70, W=3.87) followed by the Distance learning group (L=3.32, S=3.25, R=3.80, W=3.25) while the Traditional group received the lowest statistical mean (L=1.62, S=2.00, R=2.60, W=1.50). To determine whether there were any significant statistical differences in the post-test mean scores in the four skills, data were further analysed using the One-way ANOVA test. The results of the analysis are presented in the following table:

		Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**
Post-test R	Inter-groups	22,200	2	11,100	33,393	,000
	Intra-groups	8,975	27	,332		
	Total	31,175	29			
Post-test L	Inter-groups	43,850	2	21,925	41,415	,000
	Intra-groups	14,294	27	,529		
	Total	58,144	29			
Post-test W	Inter-groups	30,313	2	15,156	22,539	,000
	Intra-groups	18,156	27	,672		
	Total	48,469	29			
Post-test S	Inter-groups	30,017	2	15,008	17,832	,000
	Intra-groups	22,725	27	,842		
	Total	52,742	29			

* The mean difference is significant at the 0.05 level.

Table 12: One-Way ANOVA Post-test LSRW Skills Results

Table 12 represents the One-Way ANOVA test results for students' achievement scores in the four language skills after the intervention. The analysis of data reveals that when each language skill is taken individually to be compared with the same language skill measured in other groups statistical significant differences become noticeable. This statistical significant difference appeared in the all four language learning skills (Post-test R sig. = Post-test L sig. = Post-test W sig. = Post-test S sig. = $0.000 < 0.05$).

Based on the established statistical significant difference, Scheffé's Post-Hoc test was then employed to identify which language skills have been affected the most and in which study group. This identification was done by determining the direction of the mean differences. The results of this Scheffé's Post-Hoc analysis are exposed in table 13.

Dependent Variable	(I) method	(J) method	Mean Difference (I-J)	Sig.
Post-test R	Traditional group	Distance learning group	-1,20000*	,000
		Language lab group	-2,10000*	,000
	Distance learning group	Traditional group	1,20000*	,000
		Language lab group	-,90000*	,007
	Language lab group	Traditional group	2,10000*	,000
		Distance learning group	,90000*	,007
Post-test L	Traditional group	Distance learning group	-1,70000*	,000
		Language lab group	-2,95000*	,000
	Distance learning group	Traditional group	1,70000*	,000
		Language lab group	-1,25000*	003
	Language lab group	Traditional group	2,95000*	,000
		Distance learning group	1,25000*	003
Post-test W	Traditional group	Distance learning group	-1,75000*	,000
		Language lab group	-2,37500*	,000
	Distance learning group	Traditional group	1,75000*	,000
		Language lab group	,62500	,252
	Language lab group	Traditional group	2,37500*	,000
		Distance learning group	-,62500	,252
Post-test S	Traditional group	Distance learning group	-1,25000*	,019
		Language lab group	-2,45000*	,000
	Distance learning group	Traditional group	1,25000*	,019
		Language lab group	-1,20000*	,024
	Language lab group	Traditional group	2,45000*	,000
		Distance learning group	1,20000*	,024

* The mean difference is significant at the 0.05 level.

Table 13: Scheffé's Post-hoc Post-test LSRW Skills Mean Scores

The analysis of the results from table 13 indicates statistical significant differences between the experimental group (Language lab and the Distance learning groups) and the control group (traditional group) in all four LSRW language skills in favour of the experimental groups. However, the significant difference was in favour of the Language lab group when it was compared with the Distance learning group in all LSRW skills except in the writing skills in which the statistical significant difference was observed in favour of the Distance learning group (mean difference = -0.62).

Statistical significant differences had also been noticed between the Distance learning group and the control group in favour of the Distance learning group and in all four LSRW language skills. In other words, this means that the Distance learning method is more effective than the traditional method in improving students' four language skills. Therefore, the null hypothesis[21] (H_0) for the second research question is then rejected and the hypothesis (H_2) stating that Distance learning affects the development of EFL learners' four skills: listening, speaking, reading, and writing is accepted.

4.7.3 Analysis of the Questionnaire Results

At the end of the post-test, the paper-based questionnaire containing twelve items was administered to the participants in order to get insights into their opinions, attitudes, and preference towards the three implemented teaching methods including distance learning. The questionnaire (see Appendix Four) was divided into three major parts:

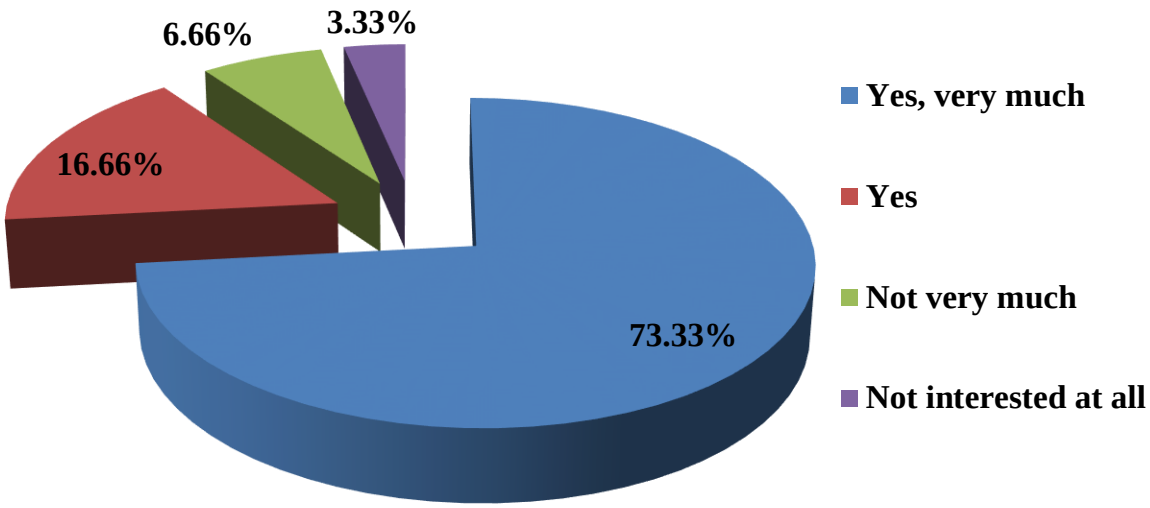
- Items 2, 3, 4, 5, and 6 deal with students' proficiency in using computer devices as well as their familiarity, purpose and frequency of use.
- Items 1, 8, and 9 aim at measuring students' attitudes towards learning English as well as the language course implemented.
- Items 7, 10, 11, and 12: seek to gather basic information about students' opinion and preferences in regard to the integration of distance learning and computer technology in English language learning.

[21] The null hypothesis for the second research question of the present study states that Distance learning does not affect the development of EFL learners' four LSRW skills

Question 1: *Do you enjoy learning English?*

Question N°1	Number	Percentage (%)
Yes, very much	22	73.33
Yes	5	16.66
Not very much	2	6.66
Not interested at all	1	3.33
Total	30	100

Table 14: Students' Attitudes towards learning English



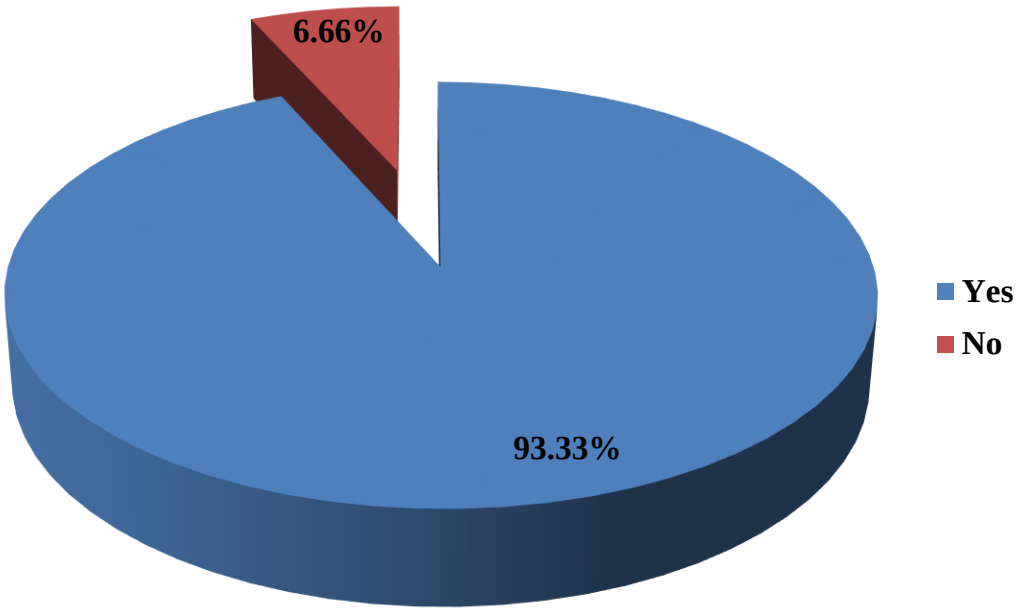
Graph 1: Students' Attitudes towards Learning English

The first question from the questionnaire aimed at measuring students' attitudes towards the English language learning in general. As it can be seen from table 14 and the graph above, 73.33% of the students enjoyed learning English very much, 16.66% answered the question with a simple yes, 6.66% did not enjoyed it very much, and only a single student (3.33%) was not interested at all in English. Overall, the vast majority of the students (around 90%) showed positive attitudes towards learning English.

Question 2: *Do you own a personal computer (PC)?*

Question N°2	Number	Percentage (%)
Yes	28	93.33
No	2	6.66
Total	30	100

Table 15: Students' Computer Ownership



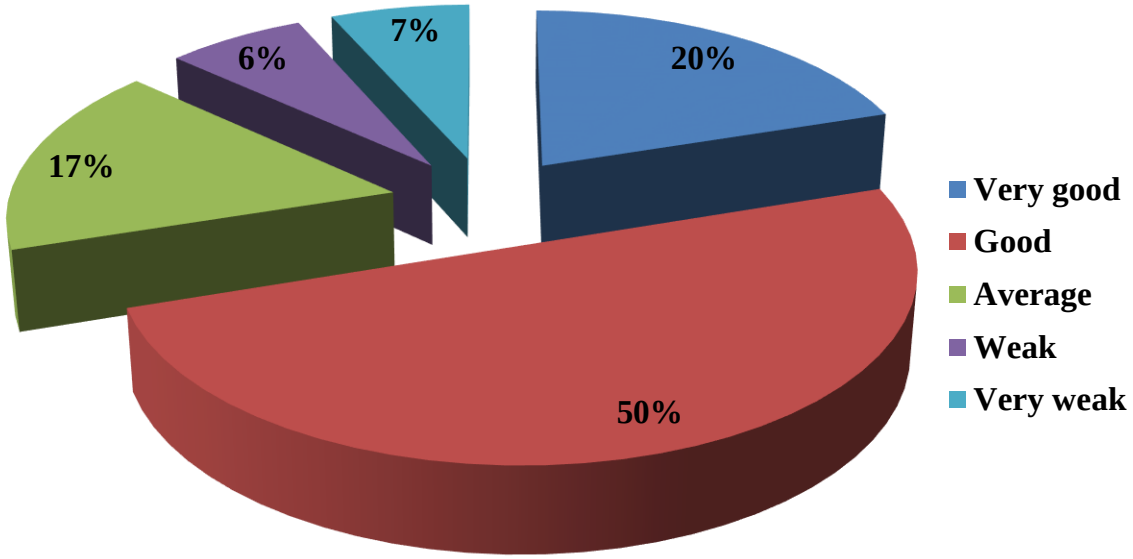
Graph 2: Students' Computer Ownership

The graph 2 and table 15 above indicate that almost all participants (93.33%) own a PC or at least a Smartphone. However, two participants (6.66%) denied the ownership of a computer or any kind of technological devices. This situation could mainly be caused by economic disadvantages some students face while pursuing their studies at the university level.

Question 3: *How would you rate your proficiency using computers?*

Question N°3	Number	Percentage (%)
Very good	6	20
Good	15	50
Average	5	16.66
Weak	2	6.66
Very weak	2	6.66
Total	30	100

Table 16: Students' Computer Proficiency



Graph 3: Students' Computer Proficiency

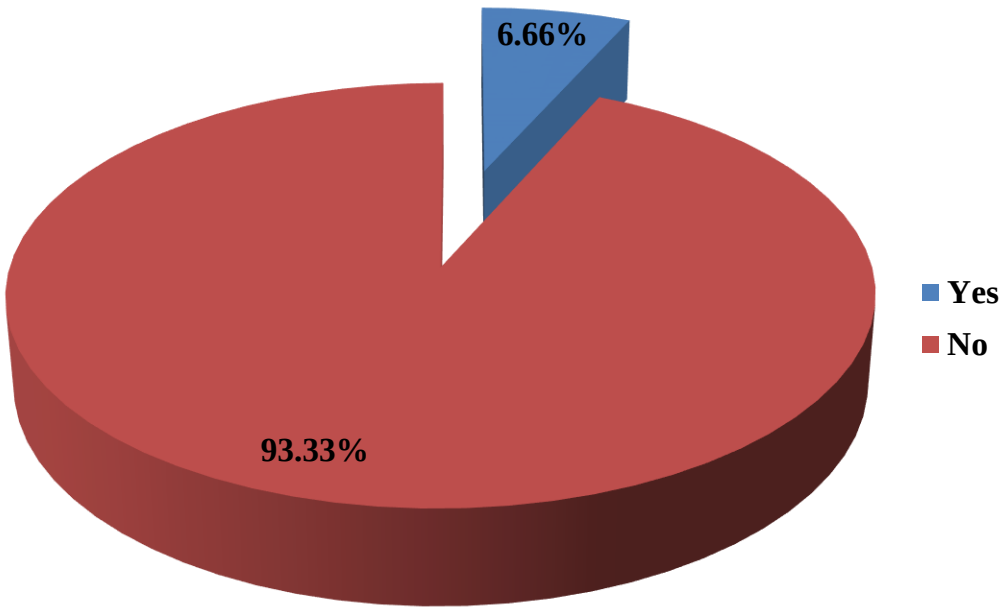
The rationale behind question 3 is to probe students' computer proficiency level. Results displayed in the graph and the table above revealed that half the respondents considered themselves good in using computers, six students (20%) found themselves having more control over technology, whereas four students (13.32%) rated their computer proficiency as either weak or very weak. Students' low computer proficiency level could be attributed to the lack of computer certifications as it can be noticed in the results of question 4. Additionally, students who do not own a computer device have less

opportunity to practice with technology, hence, they will have issues manipulating computer devices and their computer proficiency level will automatically be low.

Question 4: *Do you have any computer certificate/degree?*

Question N°4	Number	Percentage (%)
Yes	2	6.66
No	28	93.33
Total	30	100

Table 17: Students' Computer Certification



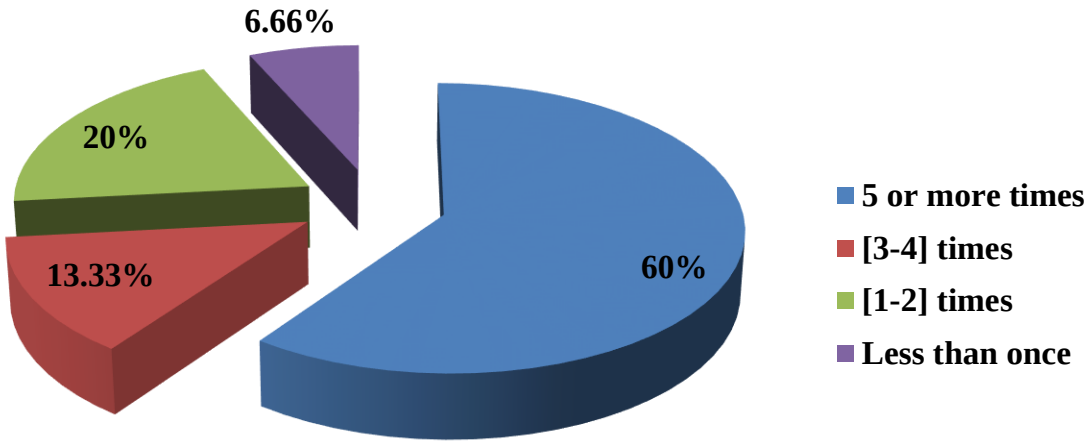
Graph 4: Students' Computer Certification

Data in the table and graph above shows that more than 93% of the sample claimed having no computer certification. Only two students (6.66%) mentioned that they had successfully passed the Office Certification in Microsoft Word and Excel.

Question 5: *How often do you use computers per week?*

Question N°5	Number	Percentage (%)
5 or more times	18	60
[3-4] times	4	13.33
[1-2] times	6	20
Less than once	2	6.66
Total	30	100

Table 18: Students' Frequency of Using Computers



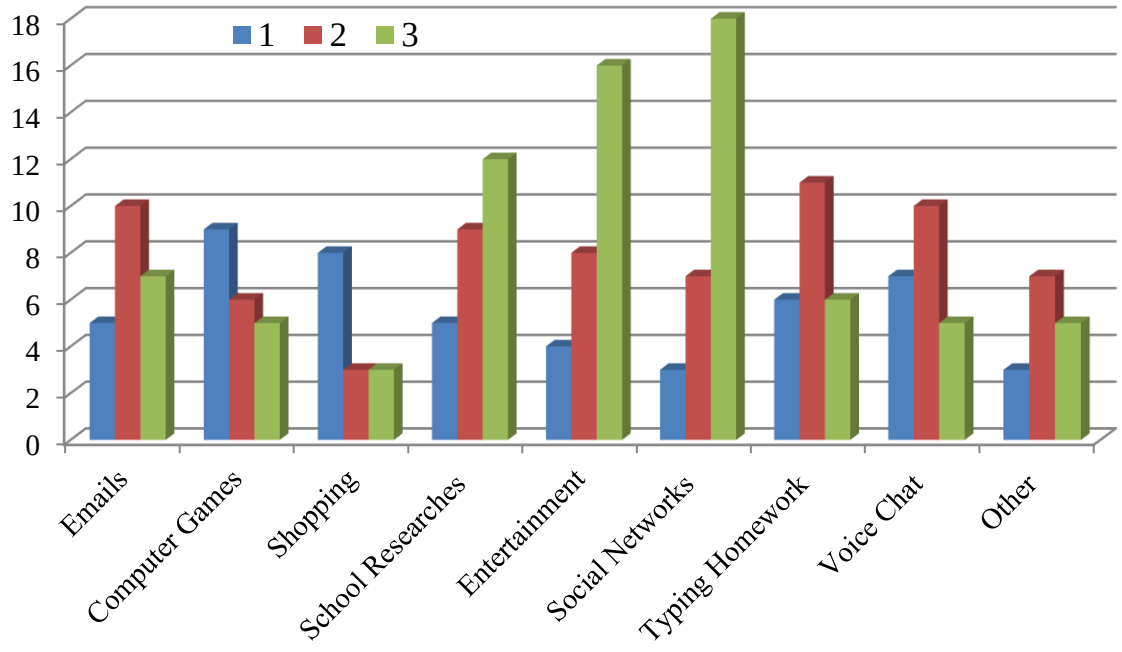
Graph 5: Students' Frequency of Using Computers

Students' answers to question 5 demonstrate that much more than half the participants use computers more than five times per week, 13.33% use it between three to four times per week, and 20% of the students mentioned that their use ranged between one and two times per week. Yet, the rest of the participants (6.66%) indicated a low frequency of computer use of less than one time per week. In other words, this means that the majority of students that participated in the present study are regular users of computer technology.

Question 6: *What do you use computers for?*

Question N°6	Percentage (%)		
	Never = 1	**Sometimes = 2**	**Often = 3**
Electronic mail	16.67	33.33	23.33
Computer Games	30	20	16.67
Online shopping	26.67	10	10
School researches	16.67	30	40
Entertainment	13.33	26.67	53.33
Social networks	10	23.33	60
Typing homework	20	36.67	20
Voice chat	23.33	33.33	16.67
Other	10	23.33	16.67

Table 19: Computer Usage in Order of Frequency



Graph 6: Computer Usage in Order of Frequency

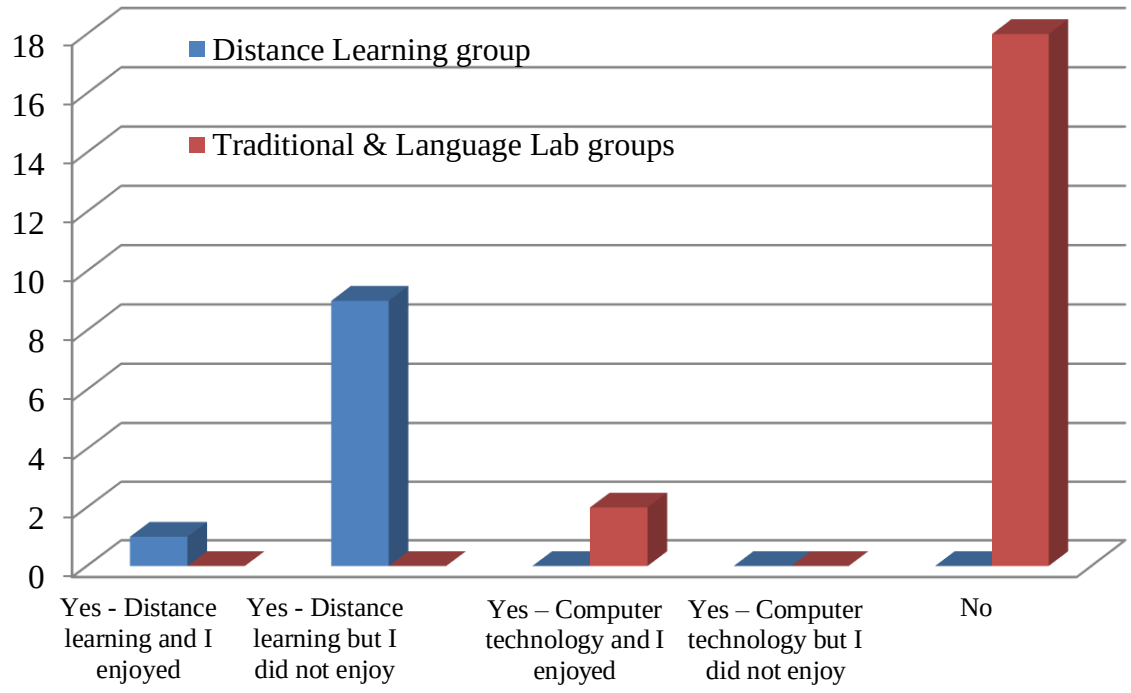
It is evident from the graphical representation in graph 6 that students use the computer for a variety of purposes and with different frequencies of use. Apparently,

computers are more often used for the purpose of social networking (60%), entertainment (53.33%) and school researches (40%).

Question 7: *Have you been taught English (before this course) in a distance learning environment or in a classroom where computer technology was used?*

Question N°7	**Traditional & Language Lab Groups**		**Distance Learning Group**	
Yes - Distance learning and I enjoyed	0	0%	1	3.33%
Yes - Distance learning but I did not enjoy	0	0%	9	30%
Yes – Computer technology and I enjoyed	2	6.66%	0	0%
Yes – Computer technology but I did not enjoy	0	0%	0	0%
No	18	60%	0	0%
Total	20	66.66%	10	33.33%
	30 = 100%			

Table 20: Computer Technology and Distance Learning in Previous English Language Classes



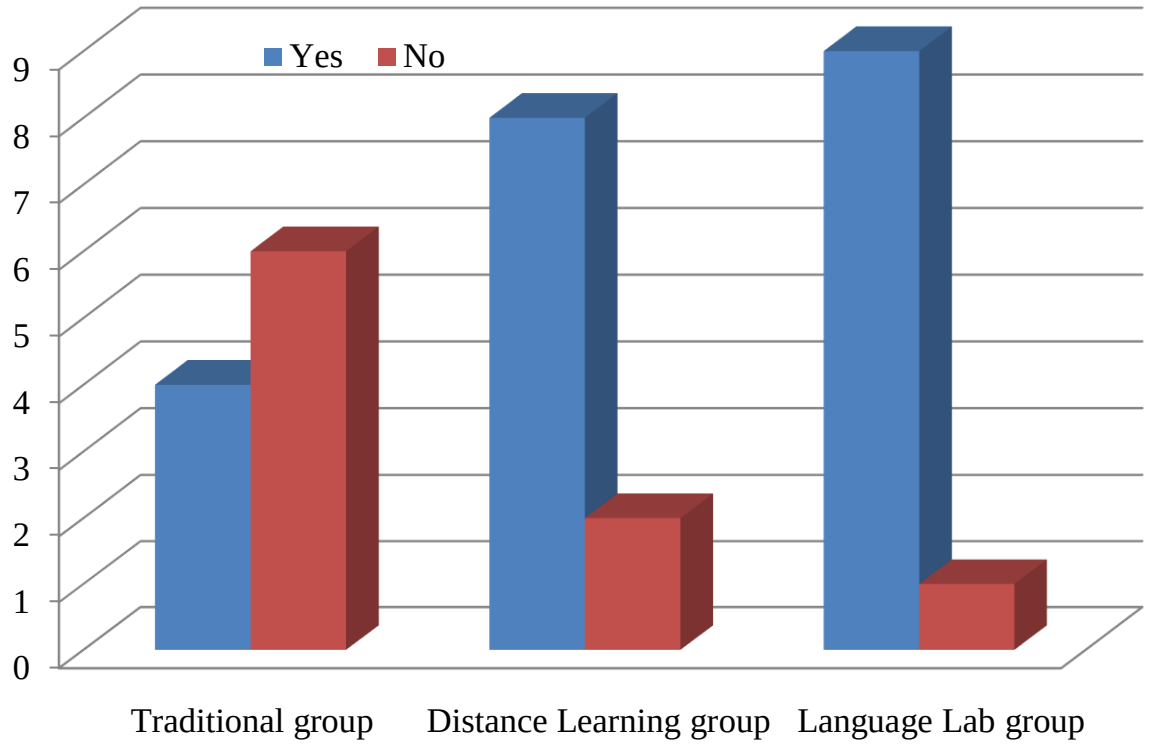
Graph 7: Computer Technology and Distance Learning in Previous English Language Classes

Question 7 aimed at discovering whether students had been taught in either technology-rich or distance English language learning environments as well as checking their attitudes towards these previous language learning experiences. By referring to graph 7 and table 20 results, it is obvious that more than half of the total participants (60%) had neither been taught in a distance language environment nor in classroom where computer technology was used. Only two students (6.66%) pointed out two private institutions in which they had previously experienced being taught in a classroom where new technologies were employed for instruction. The rest of the participants (10 students), and who all belong to the distance learning group, indicated that they had already participated in a distance learning environment as part of the mandatory classes required by the Algerian public university during the Covid-19 pandemic. However, the vast majority of these students (9 out of 10) mentioned that they did not enjoy the distance learning experience they had been through. The results of the current question lead one to presume that, in Algeria and as far as English language leaning is concerned, CALL and distance learning are still in their infancy stage and the traditional classrooms are still dominating the public universities.

Question 8: *Have you enjoyed the actual course?*

Question N°8	**Number / Percentage (%)**				**Total Number of Students**
	Yes		**No**		
Traditional group	4	13.33	6	20	10
Distance learning group	8	26.66	2	6.66	10
Language lab group	9	30	1	3.33	10
Total	21	70	9	30	30

Table 21: Students' Attitudes toward the Actual Course



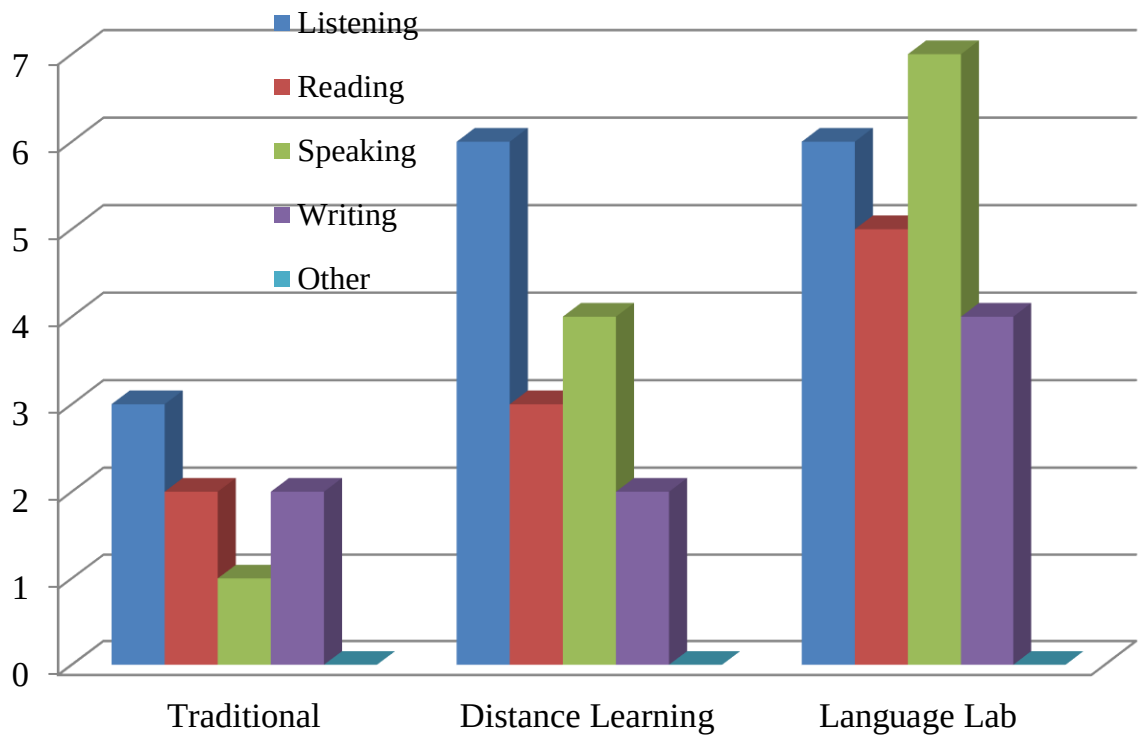
Graph 8: Students' Attitudes toward the Actual Course

The aim of question 8 was to assess students' attitudes towards the ESP course they enrolled in. Data from table 21 show that a high percentage (70% = the sum of 'Yes' answers for the three groups) of the participants enjoyed the ESP course while a minority (30%) did not enjoyed it much. When the results of the three study groups are compared to each other, graph 8 demonstrate that the Language lab group ranked at the top (30% of 'Yes' answers) and the Distance Learning group ranked second (26.66% of 'Yes' answers). Additionally, the Language Lab and Distance Learning groups significantly displayed higher positive attitudes (30% and 26.66% of 'Yes' answers respectively) towards the language lab and distance learning methods in contrast to the Traditional group who showed moderately negative attitudes towards the traditional method ('Yes'=13.33% and 'No'=20%).

Question 9: *What did you like best about the actual course?*

Question N°9	Percentage (%)			
	L	**S**	**R**	**W**
Traditional group	37.5	12.5	25	25
Distance learning group	75	50	37.5	25
Language lab group	75	87.5	62.5	50

Table 22: Students' Attitudes towards the LSRW Skills Activities



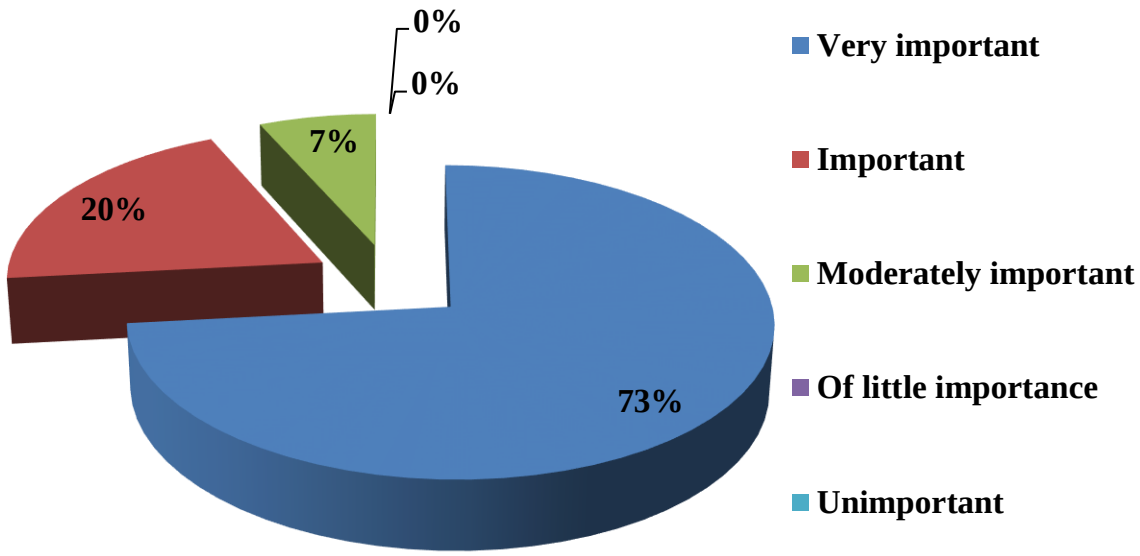
Graph 9: Students' Attitudes towards the LSRW Skills Activities

Graph 9 indicates that the participants of the three groups did not rank the four LSRW activities equally. The Language lab group liked the four language activities but preferred the speaking and listening parts more. Participants from the Distance Learning group favoured the listening skills activities whereas the Traditional group showed less interest in the four activities practiced during their classroom sessions.

Question 10: *Do you think new technologies are important in English language learning?*

Question N°10	Number	Percentage (%)
Very important	22	73.33
Important	6	20
Moderately important	2	6.66
Of little importance	0	0
Unimportant	0	0
Total	30	100

Table 23: Degree of Importance of New Technologies in English Language Learning



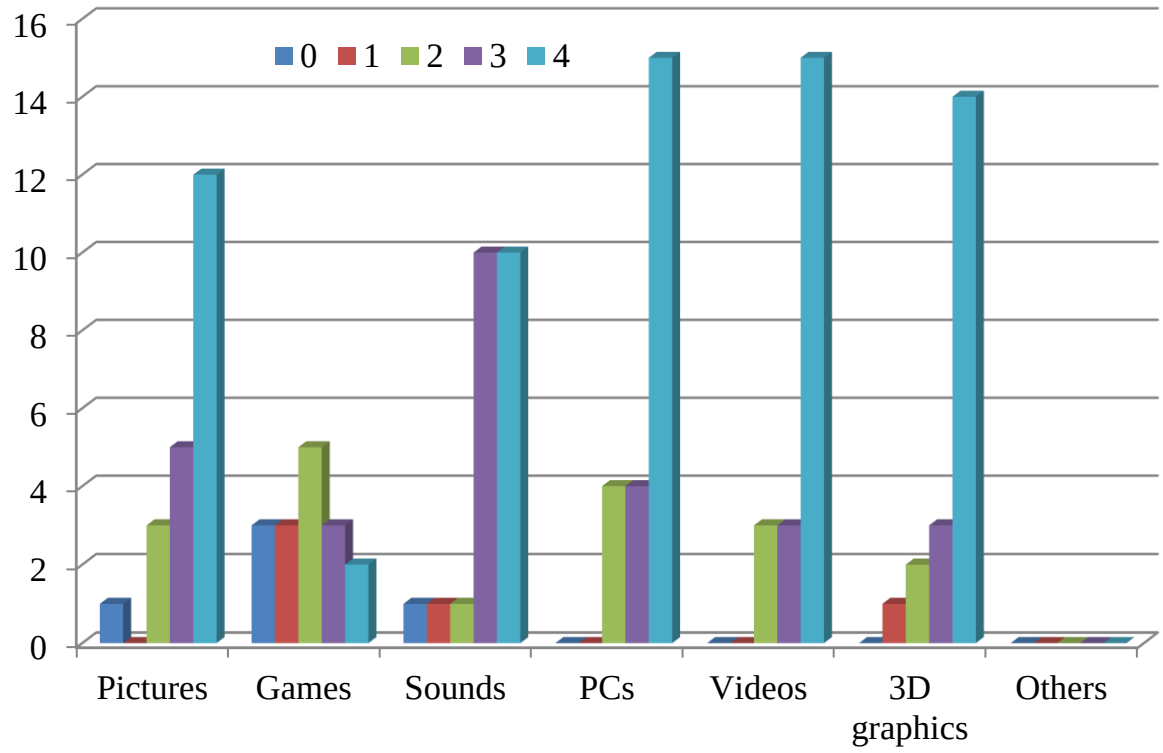
Graph 10: Degree of Importance of New Technologies in English Language Learning

Question 10 was designed to measure the degree of importance students give to the new technologies in relation to English language learning. A great majority of the respondents (73.33%) considered the new technologies as very important in learning English and 20% thought it was important while the rest (6.66%) believed it is moderately important. None of the participants reported little or no importance of modern technologies in learning English.

Question 11: *In your opinion, an enjoyable learning environment should include:*

Question N°11	Percentage (%)				
	0	**1**	**2**	**3**	**4**
Pictures	5	0	15	25	60
Games	15	15	25	15	10
Sounds	5	5	5	50	50
PCs	0	0	20	20	75
Videos	0	0	15	15	75
3D graphics	0	5	10	15	70
Others	0	0	0	0	0

Table 24: Elements of an Enjoyable Learning Environment



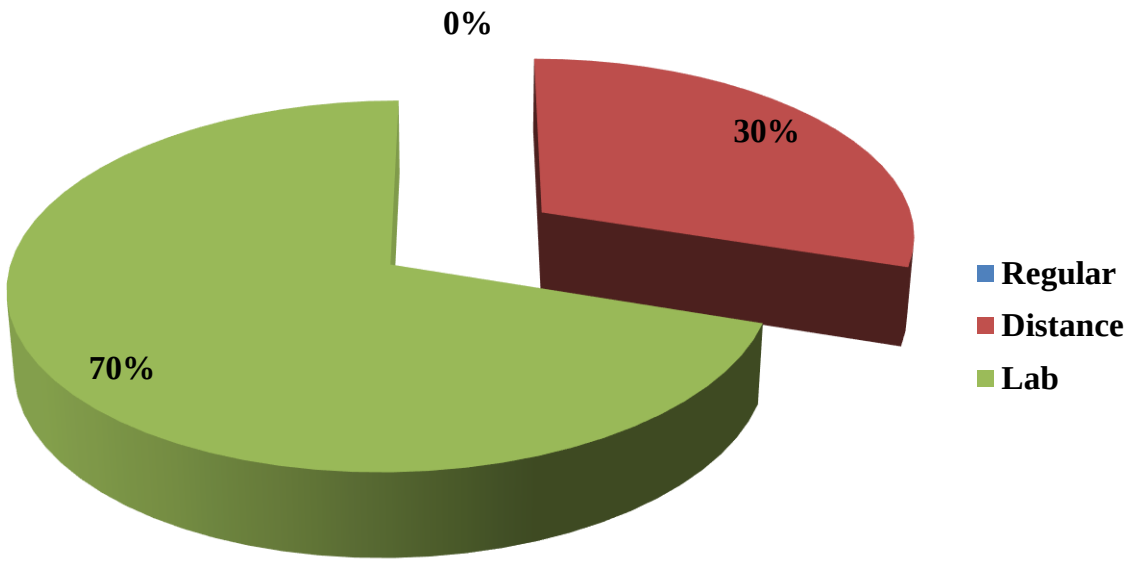
Graph 11: Elements of an Enjoyable Learning Environment

In question 11, students were asked to provide their opinion about what elements should additionally be included in a classical classroom to transform it into a more enjoyable learning environment. Results from graph 11 shows that an enjoyable learning environment, according to the participants, is a computer integrated-technology environment which makes use of different multimedia elements such as sounds, pictures, videos, and 3D graphical representations.

Question 12: *I prefer to be taught English*

Question N°12	Number	Percentage (%)
Regular	0	0
Distance	9	30
Lab	21	70
Total	30	100

Table 25: Students' Preferred Teaching Method



Graph 12: Students' Preferred Teaching Method

Proceeding to the last question which invited the participants to bring forth their mostly preferred teaching method, 70% of the students favoured the Language lab method and 30% preferred the distance learning method, while none of students (0%) preferred to be taught English using the regular method of instruction.

4.8 Discussion of the Results

The analysis of the questionnaire responses and the results from the statistical analysis presented in the previous section revealed that the integration of computer technology in teaching ESP can bring a fruitful educational contribution to the teaching of the four LSRW language skills. In this section we will first re-visit the research questions and then attempt to use them as a framework to discuss possible explanations for the study's findings.

For the present study, the three following research questions were raised:

1. What is the most effective method for improving the achievement scores of the Algerian mechanical engineering students?
2. Which language skills are mostly developed by the implemented teaching methods?
3. What are the attitudes of first year mechanical engineering students towards the implemented teaching methods?

In order to test the validity of the first and second hypotheses of the present study, a statistical method was followed. But before being able to test the validity of any hypothesis it was first necessary to check the homogeneity the three groups formed. The statistical analysis of students' pre-test mean achievement scores presented in table 6 indicated that the three groups of the study had very close mean values (Traditional group = 14.17, Distance learning group = 14.00, Language lab group = 13.07). However, that was not enough to confirm the homogeneity of the groups. The results of One-way ANOVA for the pre-test confirmed that there were no statistical significant differences between the three groups. Therefore, before the intervention, the groups were homogeneous in terms of their achievement scores.

After the implementation of the ESP course, the One-way ANOVA and Scheffé results of the post-test mean achievement scores showed statistical significant differences at 0.05 level[22] in favour of the experimental group. In other words, this means that the experimental group's improvement could be reasonably attributed to the presence of computer technology in the distance learning and Language lab teaching methods applied and if the experiment is to be repeated a hundred times there would be only a five percent chances that the results would be accidental. This finding came in line with most previous studies related to the effectiveness of CALL discussed in chapter one such as that of Bhatti (2013), Faid (2007), Hamouda (2008), Kim (2012), Kırkgöz (2011), Mohamadkhani et al. (2013) and Nachoua (2012) and in which experimental groups taught using computer technology demonstrated better language achievement than that of a control group who received the traditional method of instruction.

Additionally, a comparison between the study groups revealed that the Distance learning method appears to be more effective than the traditional method. This finding helped us to confirm our first hypothesis stating that distance learning is an effective method in improving the Algerian mechanical engineering students' achievement scores.

A linear interpolation between the current finding and students' answers to question 11 from the questionnaire leads one to attribute these results to the dual-coding theory proposed by Paivio (1971). According to this theory, memory and cognition are allocated in two separate regions of the human brain; one deals with verbal and textual information, the other processes nonverbal information such as visual inputs and surrounding sounds. Although the two regions are independent from each other, Paivio and Begg (1981) found that these regions still do intercommunicate and therefore, the information represented in one region can activate the other information stored in the other region of the brain.

Accordingly, using computer technology for presenting lessons in a multimedia-rich learning environment incorporating sounds, pictures, videos and 3D graphical representations facilitates the activation of the brain's verbal region. Consequently, it

[22] A significance level α of '0.05' is conventionally used in the social science research.

seems quite logical that the Distance learning group who received multimedia instruction using computer technology achieves better scores than the control group who had been taught using the conventional method in a regular classroom environment.

Moreover, participants' responses to question 8 of the questionnaire indicated that the Distance learning group showed higher positive attitudes towards the distance learning method ('Yes' = 26.66% 'No' = 6.66) in comparison to the traditional group which demonstrated moderately negative attitudes towards the classical method ('Yes' = 13.33% 'No' = 20%). These results suggest a bidirectional correlation between students' attitudes towards the distance learning method and their achievements scores. In other words, this means that students who have positive attitudes towards distance learning usually get higher scores and those who get higher scores are usually those students who have positive attitudes towards distance learning.

A further statistical comparison between the Language lab group and the Distance learning group revealed that the Language lab method is more effective than the distance learning method. In fact, the language lab method emerged as the most effective method among the three methods applied. These results were confirmed by reviewing responses to question 8 and 12 from the questionnaire and in which students expressed their positive attitudes and high preference towards the language lab method. A possible explanation for this result could mainly be related to the distance and interaction between the teacher and the learner during educational process.

On one hand, the teacher-students interaction for the distance learning group was primarily computer mediated involving asynchronous text-based exchanges via emails. Students of this group were encouraged to engage in self-paced learning and exercise more autonomy. Based on Moore's theory of transactional distance, the increase of learners' autonomy and the decrease of teacher-students interaction create a space of potential misunderstanding between the inputs of the teacher and those of the learners. This could be the reason why distance learning group had lower achievement scores than the language lab group. On the other hand, students of the Language lab group had the possibility to receive immediate feedback while interacting face-to-face with their

instructor and peers. Immediate feedback makes learning more meaningful and keeps students motivated which itself leads to more effective performance and better learning achievement.

In regards to the second research question posed in the present study, and which aimed at discovering which language skills are mostly developed by the implemented teaching methods, the analysis of One-way ANOVA and Scheffé post-test results of the LSRW skills disclosed statistical significant differences at 0.05 level in all LSRW skills in favour of the Distance learning group when compared to the Traditional group. However, statistical significant differences were discovered in favour of the Language lab group when compared to the Distance learning group in all LSRW skills except the writing skill in which the significant differences were in favour of the Distance learning group. From these results one can deduct the following: 1) the distance learning method is more effective than the traditional method in developing all four LSRW learning skills (this means the acceptance of hypothesis (H_2) stating that Distance learning affects the development of EFL learners' four skills) and 2) the language lab method is the most effective method among the three methods applied in improving the listening, speaking and reading skills.

Unlike the Traditional group who was taught with the regular chalk and talk method, students of the Distance learning group had the opportunity to employ computer technology during the learning process. Computers generally enhance learners' language proficiency and its various applications softwares contribute to a great extent to the development of the four language skills as they offer students the advantage of practicing each language skill separately. Students of the Distance learning group were allowed to use several application softwares that most typical computers come equipped with. Some of these applications include, for instance, a multimedia player and an audio recording software for the listening and the speaking skills, a word processing and a spell-checking software for the writing skill and a dictionary software for the reading comprehension skill. The advantage given by these applications combined with individualized practice and the authentic materials received could be the main reasons why students of the Distance learning group achieved better than the Traditional group in all four language skills.

As for the Language lab group, it seems quite reasonable for students of that group to significantly perform better than the other two groups in listening, speaking and reading skills since they had the advantage of practicing the four language skills using the Language lab Learning Management System (LMS) that contains more advanced and specifically designed applications softwares for the teaching and learning purposes. With respect to the writing skill, it is worth mentioning that the time allocated for the writing activity for the Language lab group was planned at the end of the lessons which on some occasions did not allow students a sufficient amount of time for writing practice. This could explain why the Language lab group showed a lower achievement scores in writing compared to the results obtained by the Distance learning group.

Furthermore, the third research question, which aimed at measuring the learners' attitudes towards the implemented teaching methods, was addressed based on the collection of data gathered from a paper-based twelve items questionnaire distributed immediately at the end of the experiment. The results of the first question from the questionnaire revealed that the majority of the participants (around 90%) have a positive attitude towards learning English in general. It has been generally maintained that a successful implementation of any particular innovative language education approach or method depends, to a great extent, on students' attitudes. Indeed, positive attitudes can raise students' motivation, interest and will to learn which most often results in a better learning achievement, whereas negative attitudes can decrease their motivation and cause them to lose interest and fail to progress in their learning.

Concerning students' attitudes towards their prior experience with distance learning, the results withdrawn from the analysis of question 7 indicated that a high percentage of students (90% = 9 out 10 students of the Distance learning group) who had previously been taught in a distance learning environment have developed negative attitudes towards the distance learning method they had been instructed with. This result is far from being an isolated case, many Algerian researchers have reported similar negative attitudes results in their distance or online learning-related studies (Benghalem, 2021; Khattala & Houichi, 2021; Boumekah & Debieche, 2021; Benadla & Hadji, 2021; Chadi & Chorfi, 2021; Hadjeris, 2021). In fact, students' first experience with distance

learning was during the Covid-19 pandemic. It was part of the emergency online mode of instruction adopted by the Algerian university as a temporary measure to save the academic year. However, this mode of instruction has proven to be unsuccessful due to the existence of many barriers such as the lack of teachers' experience and training, the lack of students' motivation, hardware and software issues, and the lack of internet accessibility (Hadjeris, 2021). Eventually, it was the failure of implementing an efficient online mode of instruction during the Covid-19 pandemic that has led students to develop negative attitudes towards distance learning.

Moreover, the analysis of students' responses to question 8 revealed overall positive attitudes among students of the three study groups towards the ESP course they had attended. This result is congruent with the main findings of a prior study with a larger scale sample of fifty students conducted by Izidi and Zitouni (2017) at the same Department of mechanical engineering and in which students' positive attitudes towards ESP had also been noticed. Additionally, and contrary to the negative attitudes students expressed towards their previous distance learning experience, students of the Language lab and the Distance learning groups expressed significantly positive attitudes towards the language lab and the distance learning methods respectively (this result, in part, confirm our third hypothesis which states that students have positive attitudes towards the implemented Distance learning method), whereas students of the Traditional group showed moderately negative attitudes towards the traditional method. A further comparison of these results with the ones obtained from the statistical comparison of three teaching methods applied in this study leads one to deduce a possible relationship between students attitudes and the teaching method. Students' attitudes are affected by the teaching methods used (Luntungan, 2012; Sugano & Mamolo, 2021). The more effective the teaching method, the higher positive attitudes will be expressed by the students.

Regarding the last question of the questionnaire, students were invited to provide their opinion concerning their preferred teaching method. The analysis of students' responses presented in graph 12 demonstrates that the majority of students (70%) favoured the Language lab method and the minority (30%) preferred the distance

learning method while none of the participants showed interest in being taught English using the regular method of instruction. This means that students at the Department of Mechanical Engineering are not satisfied with the EGP lessons received via the regular method and are looking for more effective and enjoyable alternatives to improve their English language skills. In fact, these students are demonstrating the willingness to cope with ESP lessons instructed in the language lab but they are still hesitant regarding the implementation of distance learning.

4.9 Limitations of the study

It is worth reminding that the present experimental study aims at evaluating the effectiveness of distance learning on students' achievement as well as measuring their attitudes towards the implemented methods. This study is far from claiming perfection, just like any other research, it has several limitations that should be acknowledged. The most obvious one is that of small groups and sample size. The sample contained a total of thirty students divided into three groups of ten students each. However, although the sample contained small groups, the overall total sample size was large enough to enable reaching a statistical significance.

Another limitation is related to the research instruments. In the present research, only quantitative instruments were used to collect the data for answering the research questions. Upcoming studies are proposed to apply additional qualitative instruments such as observations and interviews in order to produce in-depth analysis which itself may improve the reliability and validity of the results.

The research is further limited by timing and the duration of the intervention. It is worth mentioning that the experiment lasted ten weeks for all study groups. Nonetheless, not all groups were treated at the same point of time. The Traditional and the Language lab groups were part of a previous experiment conducted between the period of November 2nd, 2015 and January 7th, 2016 within the framework of our magister research project whereas the distance learning group experiment took place between October 10th, 2021 and December 18th, 2021. Accordingly, because not all the study subjects were available at the same point of time it was not possible to apply random

assignment to the entire sample; thus, this is another limitation of the current study. Further experimental research with a larger sample size and a longer treatment period are required in order to reach the generalisation of the findings to the overall EFL population.

4.10 Recommendations for Future Research

The results of the current study showed the effectiveness of asynchronous distance learning in improving the attitudes and achievements of the mechanical engineering students studying at the University of Science and Technology, Oran U.S.T.O-MB. The same research is recommended to be carried out at other departments and at different higher education levels across the Algerian universities in order to see whether or not the results obtained in this research will hold in similar institutional environments.

Similar researches do not have to be exclusively restricted to students' attitudes. Complementary studies that focus on the teachers' attitudes and the challenges they faced during their distance learning experience in the midst of the Covid-19 pandemic are also important as they would help gain additional and valuable insights that are not otherwise available through other sources. Further complementary studies should be conducted to explore the impact of synchronous distance learning and measure its effectiveness in comparison to the asynchronous mode of instruction. The use of social media platforms such as Facebook, Twitter, Instagram and WhatsApp is another area worth investigating in future research since the majority of the present study participants reported a high frequency use of social networks.

The internet quality in Algeria has been improved to a great extent for both fixed and mobile networks. The ADSL (Asymmetric Digital Subscriber Line) speed has been multiplied more than a hundred times. For the mobile network users, the 4G (Fourth Generation) of mobile telecommunication, which was launched in 2016 in Algeria, is still gaining coverage throughout the country and soon the 5G (Fifth Generation) will be released in the Algerian telecommunication market. As a future research perspective, we look forward to carry out research on the effectiveness of MALL and virtual worlds as these areas seem very promising in promoting collaborative and interactive learning.

4.11 Conclusion

The purpose of this chapter was to bring forth, with the help of the experimental study conducted, some logical answers to the following research questions: (1) What is the most effective method for improving the achievement scores of the Algerian mechanical engineering students?; (2) Which language skills are mostly affected by the implemented teaching methods?; and (3) What are the attitudes of first year mechanical engineering students towards distance learning?

In order to achieve these ends, quantitative data were collected using self-designed instruments. The statistical analysis of the data gathered confirmed the first two hypotheses of the present study and the analysis of the questionnaire results validated the third one. Consequently, it was found that the distance learning method is more effective than the traditional method in improving the first year mechanical engineering students' language achievement scores in all four LSRW language skills. In addition to their language achievement scores, students of the Distance learning groups expressed significantly positive attitudes towards the distance learning method while students of the Traditional group showed moderately negative attitudes towards the traditional method.

Although statistical significant differences were found between the three groups at 0.05 level of significance, the present study could have been exposed to some threats of validity. Thus, further experimental research with larger samples and additional research instrument should be conducted in order to generalize the findings.

General Conclusion

General Conclusion

Today, English has become the language of science and technology. Physicians, biologists, computer programmers, and engineers all have to be competent in English in order to keep up with the latest development in their field of specialisation. Mechanical engineering students are no exception. Indeed, they use English in their respective academic discipline for a variety of purposes. In many instances, they find themselves conducting bibliographical research, writing manuscripts, articles, and patents in English. Thus, their mastery of the English language is expected to be at least at the medium level. In reality, though, their language proficiency appears to be quite limited and this is mainly be due to the traditional method of teaching they had been receiving over the years which seems to be not very promising in achieving the desired results. Therefore, the implementation of modern teaching methodologies such as CALL and distance learning that involve computer technologies represents an interesting possible solution to help students overcome their language deficiencies and develop their four language skills.

Although the Ministry of Higher Education and Scientific Research has expressed a great interest in promoting the integration of modern technologies in teaching, many educators are still showing technophobic tendencies and techno-resistance towards the use of these innovations in the classrooms mainly due to the lack of computer training and exposure to the usage of technological devices. However, the emergence of the Covid-19 pandemic, particularly the introduction of the lockdown measures that was applied to reduce the spread of the virus and reduce the number of contaminations, has forced teachers to use technology and shift their instruction methodology from the traditional face-to-face teaching mode to distance learning.

The current study has attempted to measure the attitudes of first year mechanical engineering students towards distance learning and investigate the effectiveness of an asynchronous distance learning ESP course in improving students' academic achievement in the four language skills: listening, speaking, writing, and reading. In order to achieve this purpose, a comparative experimental design was adopted. Three

groups of students received the same ESP course presented through three different methods: (1) Traditional method; (2) Distance learning method (delivered via email); (3) Language laboratory method. The researcher has used a computerised self-designed pre-test and post-test to measure students' achievement before and after the intervention. In addition to the tests, a questionnaire aiming to gather general information concerning students' opinions, attitudes, and preferences was administered at the end of the experience. The data collected was subject to a deep statistical analysis using SPSS version 20. The analysis the data yielded the following results:

- The One-way ANOVA and Scheffé analysis of the post-test mean achievement scores revealed statistical significant difference at 0.05 level in favour of the experimental groups. This means that the methods that integrate computer technologies are more effective than the traditional method of instruction. In addition to that, the same statistical analysis has also proved that the distance learning method is more effective than the traditional method.
- Using modern technologies for presenting lessons in a multimedia-rich learning environment -incorporating sounds, pictures, videos and 3D graphical representations- facilitates students understanding of the subject matter and improves verbal memory recall.
- The Distance learning group showed higher positive attitudes towards the distance learning method in contrast with the Traditional group who demonstrated moderately negative attitudes towards the classical method
- The biangulation of the questionnaire responses with students' scores indicated a bidirectional correlation between students' attitudes towards distance learning and their achievements scores. In other words, that this means that students who have positive attitudes towards distance learning usually get higher scores and those who get a higher scores are usually those students who have a positive attitudes towards distance learning.
- A deeper data analysis using Scheffé post-hoc test revealed that the Language lab method is the most effective method among the three methods applied. This result was backed up by the results obtained from the questionnaire and in which high

positive attitudes and preference towards the language lab method were expressed.

- The One-way ANOVA test of the four skills revealed statistical significant difference at 0.05 level in all LSRW skills in favour of the experimental groups. In other words, this means that the teaching methods that are integrated with computer technologies are more effective than the traditional method in improving all four language skills.
- The Scheffé post-hoc criterion for significance applied on the LSRW skills indicated that: (1) the language lab method is the most effective method in improving the listening, speaking and the reading skills, (2) the distance learning method is more effective than the traditional method in improving all four LSRW skills.
- High interest in learning English in general was expressed by the mechanical engineering students. However, their attitudes towards their prior distance learning experience were highly negative.
- Despite the negative attitudes expressed toward their prior distance learning experience, mechanical engineering students showed high positive attitudes towards the asynchronous distance learning ESP course they received. Positive attitudes had also been noticed toward the distance learning method whereas moderately negative attitudes had been shown toward the traditional method of teaching.
- Concerning students' preferred teaching method, mechanical engineering students preferred to be taught with the distance learning method rather than the traditional method but they highly favoured the language lab method over the three methods applied.

All in all, we can conclude that the mechanical engineering students have overall positive attitudes towards the distance learning method and the method has proven to be effective in improving students' language achievements in the four language skills. In addition to that, the mechanical engineering students are not satisfied with EGP lessons taught via the regular method and are looking for more effective and enjoyable alternatives to improve their English language skills. In fact, the students are

demonstrating the willingness to cope with ESP lessons instructed in the language lab but they are still hesitant regarding the implementation of distance learning.

Moreover, the researcher wants to draw attention to the fact that although the Language lab method has proven to be the most effective teaching method among the ones applied, a Language lab should not be seen as a panacea for all language learning deficiencies. The Language lab itself is not a magic wand that is supposed to do all the necessary tasks by a simple mouse click, but rather a tool like any other that needs to be put in the hands of a trained educator in order to achieve the desired outcomes. Therefore, we suggest that teachers and technical staffs training should be taken into consideration before any future Language lab, CALL or distance learning implementations.

APPENDICES

Appendix One
Language Laboratory Authorisation for Use

République Algérienne Démocratique et Populaire
Ministère de l'Enseignement Supérieur et de la Recherche Scientifique
Université des Sciences et de la Technologie « Mohammed Boudiaf »
Faculté de Génie Mécanique

• Oran le 29 Octobre 2015

Réf. :56/CD/FGM/USTO-MB/2015

Autorisation

Monsieur Izidi Redouane est inscrit en deuxième année Magister, faculté des lettres, des langues et des arts, département des langues Anglo-Saxonnes. Dans le cadre de son mémoire de magister, il mène une étude sur l'influence des méthodes d'enseignement de l'anglais technique sur l'efficacité de l'enseignement, cas des étudiants de première année génie mécanique. L'étude vise trois méthodes d'enseignement, la méthode classique, la méthode utilisant les moyens multimédia et l'utilisation du laboratoire de langues.

A cet effet, monsieur Izidi Redouane est autorisé à mener sont étude au sein de notre faculté. Cette autorisation inclue l'exploitation du laboratoire de langues de la faculté.

Le Doyen

Appendix Two
Course Registration Request Form (English Version)

Last name :
First name :
Date of birtth :
Section :
Group :
Tel N° :
Email :
Facebook :
English proficiency :
☐ Beginner ☐ Intermediate ☐Advanced

Signature

Registration Request Form

Last name :
First name :
Date of birtth :
Section :
Group :
Tel N° :
Email :
Facebook :
English proficiency :
☐ Beginner ☐ Intermediate ☐Advanced

Signature

Registration Request Form

Last name :
First name :
Date of birtth :
Section :
Group :
Tel N° :
Email :
Facebook :
English proficiency :
☐ Beginner ☐ Intermediate ☐Advanced

Signature

Appendix Three
Course Registration Request Form (French Version)

Fiche d'inscription

Nom :
Prénom :
Date de naissance :
Section :
Groupe :
N° Tel :
Email :
Facebook :
Niveau de langue :
☐Débutant ☐ Intermédiaire ☐ Avancé

Signature

Fiche d'inscription

Nom :
Prénom :
Date de naissance :
Section :
Groupe :
N° Tel :
Email :
Facebook :
Niveau de langue :
☐Débutant ☐ Intermédiaire ☐ Avancé

Signature

Fiche d'inscription

Nom :
Prénom :
Date de naissance :
Section :
Groupe :
N° Tel :
Email :
Facebook :
Niveau de langue :
☐Débutant ☐ Intermédiaire ☐ Avancé

Signature

Appendix Four
The Questionnaire (English Version)

First name :
Family name :
Section:
Group :

Questionnaire

Students' attitudes towards computer technology and distance language learning

Note: In this questionnaire Personal Computers (PCs) and Smartphones are used interchangeably.

Dear Student,

I am doing research in teaching English for specific purposes (ESP), I am very interested in your opinion and attitudes towards computer technology and distance language learning. Please, answer the following questions:

1- Do you enjoy learning English?
☐ Yes, Very much ☐ Yes ☐ Not very much ☐ Not interested at all

2- Do you own a personal computer (PC)?
☐ Yes ☐ No

3- How would you rate your proficiency using computers?
☐ Very Weak ☐ Weak ☐ Average ☐ Good ☐ Very good

4- Do you have any Computer Certificate/Degree?
☐ Yes ☐ No If "YES" then mention detail:

5- How often do you use computers per week?
☐ Less than once ☐ [1-2] times ☐ [3-4] times ☐ 5 or more times

6- What do you use computers for? Please indicate your frequency of use
Never = 1 Sometimes = 2 Often = 3

[1 2 3] Electronic mail	[1 2 3] School researches	[1 2 3] Typing homework
[1 2 3] Computer Games	[1 2 3] Entertainment (e.g. music, film, magazines)	[1 2 3] Voice chat
[1 2 3] Online shopping	[1 2 3] Social networks (facebook, twitter)	[1 2 3] Other ……

7- Have you been taught English (before this course) in a distance learning environment or in a classroom where computer technology was used?
☐ Yes - Distance learning and I enjoyed ☐ Yes – Computer technology and I enjoyed ☐ No
☐ Yes - Distance learning but I did not enjoy …(Institution's name: ……..…..) ☐ Yes – Computer technology but I did not (Institution's name: ……..…..)

8- Have you enjoyed the actual course?
☐ Yes ☐ No

9- What did you like best about the actual course?
☐ Listening activity ☐ Reading activity ☐ Speaking activity ☐ Writing activity ☐ Other ……..

10- Do you think new technologies are important in English language learning?
☐ Very important ☐ Important ☐ Moderately important ☐ Of little importance ☐ Unimportant

11- In your opinion, an enjoyable learning environment should include: Please indicate the degree of importance: Unimportant = 0 Of little importance = 1 Moderately important = 2 Importance = 3 Very important = 4

[0 1 2 3 4] Videos	[0 1 2 3 4] Sounds	[0 1 2 3 4] Pictures
[0 1 2 3 4] 3D graphics	[0 1 2 3 4] Personal computers (PC)	[0 1 2 3 4] Games
[0 1 2 3 4] Other ……		

12- I prefer to be taught English:
☐ Using the regular/traditional method.
☐ In a language laboratory where each student is equipped with his own personal computer.
☐ Using the distance learning method.

Thank you

Appendix Five
The Questionnaire (Arabic Version)

استمارة

الإسم :
اللقب :
قسم Section:
مجموعة Groupe :

سلوك الطلبة نحو تعلم اللغة الإنجليزية بمساعدة تكنولوجيات الحاسوب وطريقة التعلم عن بعد
ملاحظة: في هذه الإستمارة يمكن للهاتف الذكي أن يحل مكان جهاز الكمبيوتر الشخصي (PC)

أعزّائي الطلبة،
نحن بصدد إنجاز بحث حول تدريس اللغة الإنجليزية لأغراض محدّدة .نحن جدّ مهتمين برأيك و موقفك تجاه تعلم اللغة الإنجليزية بمساعدة تكنولوجيا الحاسوب وطريقة التعلم عن بعد. من فضلك أجب على الأسئلة التالية :

1- هل تستمتع بتعلم اللغة الإنجليزية ؟
☐نعم، كثيرا ☐نعم ☐لا، ليس كثيرا ☐ليست مهتما على الإطلاق

2- هل تملك جهاز كمبيوتر شخصي (PC) ؟
☐نعم ☐لا

3- كيف تقيم كفاءتك في استخدام أجهزة الكمبيوتر
☐ضعيف جدا ☐ضعيف ☐متوسط ☐جيّد ☐جيّد جدّا

4- هل لديك أيّ شهادة دراسيّة أو كفاءة مهنية في مجال الحاسوب ؟
☐نعم ☐لا إذا أجبت بنعم، فأذكر تفاصيل الشهادة.....

5- كم مرّة تستخدم فيها جهاز الكمبيوتر في الأسبوع ؟
☐أقل من مرّة واحدة ☐ [1-2] مرّة ☐[3-4] مرّة ☐ مرّات أو أكثر

6- لأيّ غرض تستعمل جهاز الكمبيوتر؟ الرّجاء الإشارة إلى تردد (عدد مرّات) إستخدامك للجهاز من [1-3]
أبدا =1 أحيانا =2 غالبا =3 ضع دائرة على الإجابة الصّحيحة

[1 2 3] كتابة الواجبات المنزلية [1 2 3] الأبحاث المدرسية [1 2 3] البريد إلكتروني
[1 2 3] المحادثة الصوتية [1 2 3] تسلية و ترفيه (مثال: موسيقى، أفلام، مجلات) [1 2 3] العاب الكمبيوتر
[1 2 3] أغراض أخرى..... [1 2 3] الشبكات الاجتماعية (الفيسبوك , تويتر) [1 2 3] التسوق عبر الانترنت

7- هل سبق لك وأن درّست (قبل هذه الدورة) في قسم للغة الإنجليزية باستخدام تكنولوجيا الحاسوب أو بتقنية التعلّم عن بعد ؟
☐نعم بطريقة التعليم عن بعد وكانت الدراسة ممتعة ☐نعم بمساعدة تكنولوجيا الحاسوب وكانت الدراسة ممتعة ☐لا
☐نعم بطريقة التعليم عن بعد وكانت الدراسة غير ممتعة ☐نعم بمساعدة تكنولوجيا الحاسوب وكانت الدراسة غير ممتعة
(اسم المؤسّسة .....) (اسم المؤسّسة .....)

8- هل وجدت الدورة الدراسية الحالية ممتعة ؟
☐ نعم ☐ لا

9- ما هو أكثر نشاط أحببته في هذه الدورة الدراسية ؟
☐نشاط الاستماع ☐نشاط القراءة ☐نشاط المحادثة ☐ نشاط الكتابة ☐ نشاط آخر .....

10- هل تعتقد أن التكنولوجيات الحديثة مهمة في تعلم اللغة الإنجليزية ؟
☐مهم جدا ☐مهم ☐مهم إلى حد ما ☐قليل الأهمية ☐غير مهم على الإطلاق

11- في رأيك، البيئة التعليمية الممتعة ينبغي لها أن تشتمل على :الرّجاء الإشارة إلى درجة الأهمية :
غير مهمّة على الإطلاق =0 قليل الأهمية =1 مهمّة إلى حد ما =2 مهمّة =3 مهمّة جدا =4

[0 1 2 3 4] صور [0 1 2 3 4] أصوات [0 1 2 3 4] فيديو
[0 1 2 3 4] ألعاب [0 1 2 3 4] أجهزة كمبيوتر(PC) [0 1 2 3 4] رسومات ثلاثية الأبعاد
[0 1 2 3 4] أشياء أخرى.....

12- أفضّل أن أدرّس اللغة الإنجليزية:
☐باستخدام الطّريقة العاديّة/التقليدية
☐في مختبر اللغة أين يتم تزويد كل طالب بجهاز كمبيوتر خاص (PC)
☐باستخدام طريقة التعليم عن بعد

شكرا

Appendix Six
The Pre-test

Reading Comprehension :

Developing countries are investing in telephone development so as to improve the service in the capital and between the capital and other towns. Large amounts of money are being spent on such programmes, and for good reasons. the problem, however, is that there is an unfair distribution of telephone investments in those countries. They invest more in large towns and less in smaller villages. So, vilagers have fewer opportunities to speak to nearby villages or to their district town.

The main function of village telephones is to allow villagers to be in touch with the market town and district officials. It is a two-way communication; it allows the local nurse, or teacher, to make a request to their superiors as well as to receive instructions. it allows the farmer to enquire about the price on the market or ask whether the fertiliser has arrived. A single community phone may be adequate for years, and may be used only three or four times a day, but it still could however change the life of the villagers.

Questions:

1. Why are developing countries investing in telephone development?
2. Why are villagers given fewer opportunities to get in touch with the nearby villages or their district town?
3. What is the main function of village telephones?
4. In what ways is a telephone useful to a farmer?

Listening Comprehension

Listen to the audio passages and then choose the correct answer accordingly:

1) What will Emma have in her sandwich?

A	 
B	 
C	 

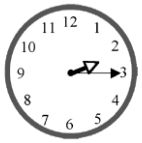
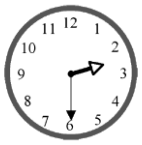
2) Which activity will the family do this year?

A	
B	
C	

3) Who's the text message from?

A	
B	
C	

4) What time does the film begin?

A	
B	
C	

5) Which photo are they looking at?

A	
B	
C	

Written Expression

A) Arrange the words to make affirmative sentences. Place time expressions at the end of the sentences. *Example:* go / now / home / will / I → I will go home now.

give / the present / tomorrow / we / him / will → ……

your / work / does / father / where →

……

by / comes / to / bus / school / she →

……

grade / are / in / you / which →

……

father / in / works / a / bank / her →

……

B) Put spaces in the right places:

myalarmclockringsathalfpastsevenandigetupfiveminuteslaterfirstigotothebathroomwhereiwashmyselfandbrushmyteeththenigotothekitchentohavebreakfastieattoastwithcheeseandidrinkcoldmilkafterbreakfastigetreadyforschoolileavemyhouseateightoclockandcatchthebusatquarterpastittakestwentyminutestogettoschool

Speaking

Listen to the audio passages and respond orally :

1-Hello, my name is Julia. What's your name?

.....

What's your date, of birth?

…….

2-I am going to ask some questions, please answer in full sentences:

3-Can you spell (your name)?

.....

4-Where do you come from ?

.....

5-Are you married?

.....

6-Tell me about your best friend.

.....

7-What is your favorite drink?

.....

8-What time do you usually get up in the morning?

.....

9-What do you usually do in the afternoon ?

.....

10-Tell me about your hobbies ?

.....

Thank you very much. It's been a pleasure talking to you.

Appendix Seven
The Post-test

Reading Comprehension

Fill in the gap using the words in the box below:

1- ..... energy = mechanical energy in the form of movement.
2- ..... energy = the form of energy that shines, and can be seen
3- ..... energy= energy that results in an increase in temperature
4- ……are metal discs which fit between the head of a bolt or a nut and the components being bolted together.
5- Most screw heads are designed to be screwed in using a ……
6- …….means permanently joining two pieces of material by heating the joint between them.
7- …….is a mixture of oxygen (0_2) and a gas fuel.
8- A wheel with teeth (or cogs) is called a……..
9- ..……. are used to transmit drive from one shaft to another across a distance.

Gears are changes by a person in …… gearbox

thermal – screwdriver – dark – oxyfuel – kinetic – gear – chains – manual – light – spanner – allen key – welding – rivet gun – shielding gas – automatic – washers – strain

Listening Comprehension

Listen to the audio passages and then choose the correct answer accordingly :

1-

- Useful energy
- Waste energy
- Potential energy

2-

- Clockwise
- Anticlockwise
- The opposite direction of clock hands

3-

- Rivet guns
- Rivets
- Screw anchors

4-

- Oxygas
- Oxyfuel
- Acetylene fuel

5-

- True
- False

6-

- driveshaft (input shaft)
- output-shaft
- idler

7-

- connecting rods and a crankshaft
- camshaft
- a stroke

8-

- flywheel
- a gear
- a piston

9-

- bolts
- rivets
- nuts

10-

- The machine efficient
- The machine inefficient

Written Expression

Complete the extract from a technical document about welding using the words in the box. You will need to use some words twice. Look at A to help you.

molten – weld zone – dissimilar material – residual stress – welded together – weld pool – discontinuities – fuse – base metal.

It is possible for components made of different metals to be (1) .... For instance, steel can be welded to copper and to brass. However, it is much more difficult to weld components made of two (2) .... than it is to weld those made of the same (3) .... While there is no difficulty in melting two different metals and mixing them together in a (4) ..... state, problems occur once the hot, liquid metal forming the (5) .... starts to cool. As this process takes place, the two metals will not necessarily (6) ..... properly. Once the joint has cooled, this can result in (7) ..... , such as cracks, at the heart of the (8) .... In addition, as the metals contract at different rates (due to different coefficients of thermal expansion), powerful (9) .... can build up, not only in the joint, but also in the wider (10) .... near the joint.

Speaking

Listen to the audio passages and respond orally:

1-Hello, my name is James. What's your name?

……

2- Okey, I am going to ask you some questions, please answer in full sentences:

3- Can you spell the word. "Engine"?

…….

4-Nuts are usually screwed on, by turning them clockwise. Explain the word clockwise. What does it mean?

…….

5- Can energy be destroyed ?

…….

6-How do you pronounce this gear ratio ? (5:1)

……

7-Compare Soldering to welding in terms of joint strength.

…….

8-What are spring washers used for?

…….

9-In petrol internal combustion engines, what is the role of a spark plug?

……..

10-Thank you very much. It's been a pleasure talking to you.

Annexes

Annex One
Definitions of Statistical Key Terms

An **experimental design** is the logical construction of an experiment to test hypothesis in which the researcher either controls or manipulates one or more variable.

Independent variable: In an experimental design, the independent variable may be either a treatment variable or a classification variable.

Dependent variable: In experimental design, a dependent variable is the response to the different levels of independent variables. This is also called response variable.

(Bajpai, 2010, p. 338)

Level of significance: The probability of type I, or alpha (α), error is called the level of significance of a test. Ordinarily the investigator adopts, perhaps rather than arbitrary, a particular level of significance. It is a common convention to adopt level of significance of either 0.05 or 0.01. if the probability is equal to or less than 0.05 of asserting that there is a difference between two means, for examples, when such no difference exists, then the difference is said to be significant at 0.05, or 5 per cent, level of less. Here the chances are 5 in 100, or less, that the difference could result when the treatment applied is having no effect. If the probability is 0.01, or less, the difference is said to be significant at 0.01, or 1 per cent level. The 0.05 and 0.01 probability level are descriptive of our degree of confidence that a real difference exists, or that the observed difference is not due to the caprice of sampling. Usually in evaluating an experimental result, it is necessary to determine the probabilities with a high degree of accuracy. For most practical purposes it is sufficient to designate the probability as $p \leq 0.05$, or $p \leq 0.01$, or possibly $p \leq 0.001$ if the results is highly significant.

(Ferguson, 1966, p. 164)

Annex Two
Statistical Formulas and Calculation Methods

The Arithmetic Mean

The arithmetic mean (AM) of a set of observations is their sum, divided by the number of observations. It is generally denoted by $\bar{x}$ or AM. Population mean is denoted by μ. Therefore,

$$\overline{\boldsymbol{x}} = \frac{\sum \boldsymbol{x_i}}{\boldsymbol{n}}$$

Sample mean

(Bajpai, 2010, p. 67)

The Standard Deviation

The standard deviation is the square root of the sum of square deviations of various values from their arithmetic mean divided by the sample size minus one. Population standard deviation is generally denoted by the small Greek letter σ (read as sigma) and sample standard deviation is denoted by s.

The greater the standard deviation, the greater the magnitude of the values from their mean; smaller the standard deviation, greater the uniformity in the observation. The formula for the calculation of standard deviation is:

$$(\boldsymbol{s}) = \sqrt{\frac{\sum_{\boldsymbol{i}=1}^{\boldsymbol{n}} (\boldsymbol{X} - \overline{\boldsymbol{X}})^2}{\boldsymbol{n-1}}}$$

Sample standard deviation

Where $\bar{x}$ is the sample arithmetic mean, n the sample size, and x_i the ith value of the variable x.

The Variance

Variance is the square of standard deviation. Sample variation is the sum of squared deviations of various values from their arithmetic mean divided by the sample size minus one.

$$\left(s^2\right) = \frac{\sum_{i=1}^{n}(X - \bar{X})^2}{n - 1}$$

Sample variance

(Bajpai, 2010, pp. 128-129)

Analysis of variance (ANOVA)

Analysis of variance or ANOVA is a technique of testing hypotheses about the significant difference in several population means. This technique was developed by R. A. Fisher. The main purpose of analysis of variance is to detect the difference among various population means based on the information gathered from the sample (sample means) of the respective populations.

Analysis of variance is also based on some assumptions. Each population should have a normal distribution with equal variances. For example, if there are *n* populations, variances of each population, that is, $\sigma_1^2 = \sigma_2^2 = \sigma_3^2 = \cdots = \sigma_n^2$. Each sample taken from the population should be randomly drawn and should be independent of each other.

In analysis of variance, the total variation in the sample data can be on account of two components, namely, **variance between the samples and variances within the samples**. Variance between samples is attributed to the difference among the sample means. This variance is due to some assignable causes. Variance within the samples is the difference due to chance or experimental errors. For the sake of clarity, the techniques of analysis of variance can be broadly classified into one-way classification and two way classification.

ANOVA is based on the following assumptions:

- Samples are drawn from normally distributed populations.
- Samples are randomly drawn from populations and are independent of each other.
- Populations from which samples are drawn have equal variances.

Completely randomized design (One-Way ANOVA)

Completely randomized design (One-Way ANOVA) contains only on independent variable, with two or more treatment levels or classifications. In this case of only two treatment levels or classifications, the design would be the sale as that used for hypothesis testing for two populations (t-test). When there is a case of three of more classification levels, analysis of variance is used to analyze the data.

Suppose a researcher wants to test the stress levels of employees in three different organizations. For conducting this research, he has prepared a questionnaire with a five-point rating scale with 1 being the minimum score and 5 being the maximum score. The researcher could have used the z-test of t-test for two populations if there had been only two populations. In this case, there are three populations, so there is no score of using z-test or t-test for testing the hypotheses. In this case, one-way analysis of variance technique can be effectively used to analyze the data. One-way analysis of variance can be also be used very effectively in the case of comparison among sample means taken from more than two populations.

Supposed if k samples are being analyzed by a researcher, then the null and alternative hypotheses can be set as bellow:

$$H_0: \mu_1 = \mu_2 = \mu_3 = \mu_{1k}$$

The alternative hypothesis can be set as bellow:

$$H_0: \text{Not all } \mu_j \text{ s are equal } (j = 1, 2, 3, \ldots, k)$$

The null hypothesis indicates that all population means for all levels of treatments are equal. If one population mean is different from another, the null hypothesis is rejected and the alternative hypothesis is accepted.

In one-way analysis of variance, testing of hypothesis is carried out by partitioning the total variation of the data in two parts. **The first part is the variance between the samples and the second part is the variance within the samples**. The variance between the samples can be attributed to treatment effects and variance within the samples can be attributed to experimental errors. As part of this process, the total sum of squares can be divided into two additive and independent parts as shown in Figure 12.1: SST (total sum of squares) = SSC (sum of squares between columns) + SSE (sum of squares within samples)

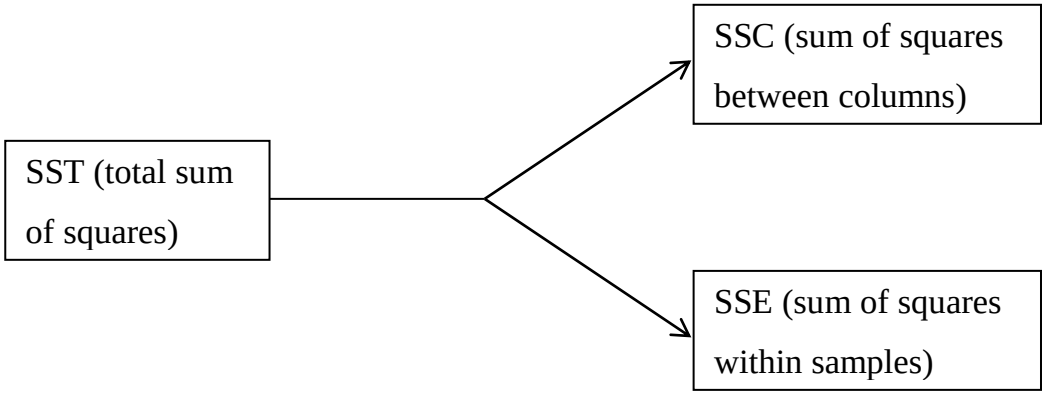


Figure 12.1: Partitioning the total sum of squares of the variation for completely randomised design (one-way ANOVA)

I- Steps in Calculating SST (Total Sum of Squares) and Mean Squares in One-Way Analysis of Variance

As discussed above, the total sum of squares can be partitioned in two parts: sum of squares between columns and sum of squares within samples. So, there are two steps in calculating *SST* (total sum of squares) in one-way analysis of variance, in terms of calculating sum of squares between columns and sum of squares within samples. Let us say that the observations obtained for *k* independent samples is based on one-criterion classification and can be arranged as shown in the table 12.3 below:

Observations	**Numbers of samples**					
	1	*2*	*3*	*J*	…	*k*
1	X_{11}	X_{12}	X_{13}	X_{1j}	…	X_{1k}
2	X_{21}	X_{22}	X_{23}	X_{2j}	…	X_{2k}
3	X_{31}	X_{32}	X_{33}	X_{3j}	…	X_{3k}
.	.	.	.	.	.	.
.	.	.	.	.	.	.
.	.	.	.	.	.	.
I	X_{i1}	X_{i2}	X_{i3}	X_{ij}	…	X_{ik}
.	.	.	.	.	.	.
.	.	.	.	.	.	.
.	.	.	.	.	.	.
N	X_{n1}	X_{n2}	X_{n3}	X_{nj}	…	X_{nk}
Sum	T_1	T_2	T_3	T_j	…	T_k
A.M.	$\bar{X}_1$	$\bar{X}_2$	$\bar{X}_3$	$\bar{X}_j$	…	$\bar{X}_k$

Table 12.3: Observations obtained for *k* independent samples based on one-criterion classification.

Where

$$T = \sum_{j=1}^{k} T_j$$

$$\bar{x}_i = \frac{1}{n}\sum_{i=1}^{n} x_{i1} \text{ and } \bar{\bar{x}} = \frac{1}{nk}\sum_{j=1}^{k} \bar{x}_j = \frac{1}{n}\sum_{i=1}^{n}\sum_{j=1}^{k} i_j$$

1. (Calculate variance between columns (samples): This is usually referred to as **sum of squares between samples** and is usually denoted by *SSC*. The variance between columns measures the difference between the samples mean of each group and the grand mean. **Grand mean** is the **over-all mean** and can be obtained by adding all the individual observations of the columns and then dividing this total by the total number of observations. The procedure of calculating the variance between the samples is as below:

(a) In the first step, we need to calculate the mean of each sample. From table 12.3, the means are $\bar{x}_1, \bar{x}_2, \ldots, \bar{x}_k$.

(b) Next, the grand mean is calculated. The grand mean is calculated as

$$\bar{\bar{x}} = \frac{1}{n}\sum_{i=1}^{n}\sum_{j=1}^{k} xij$$

(c) In step 3, the difference between the mean of each sample and grand mea is calculated, that is, we calculate $\bar{x}_1 - \bar{\bar{x}},\ \bar{x}_2 - \bar{\bar{x}} \ldots \bar{x}_k - \bar{\bar{x}}$.

(d) In step 4, we multiply each of these by the number of observations in the coresponding sample, square each of these deviations and add them. This will give the sum of the squares between samples.

(e) In the last step, the total obtained in Step 4 is divided by the degrees of freedom. The degrees of freedom is one less than the total number of samples. If there are *k* samples, the degrees of freedom will be *v = k – 1*. When the sum of squres obtained in Step 4 is divided by the number of degrees of freedom, the result is called mean square (MSC) and is an alternative term for sample variance.

$$\sum_{j=1}^{k} n_j(\bar{x}_j - \bar{\bar{x}})^2$$

SSC (sum of squares between columns)

where k is the number of groups being compared, n_j the number of observations in Group *j*, $\bar{x}_j$ the sample mean of Group *j*, and $\bar{\bar{x}}$ the grand mean. And

$$\frac{SSC}{k-1}$$

MSC (mean square)

Where SSC is the sum of squares between columns and k – 1 the degrees of freedom (number of samples – 1)

2. Calculate variance within columns (samples) : this is usaully refered to as the sum squares within samples. The variance within columns (samples) measures the difference within the samples (intra-sample difference) due to chance. This is usually denoted by SSE. The procedure of calculating the variance within the samples is as below :

(a) In calculating the variance within samples, the first step is to calculate the mean of each sample. From table 12.3 this is $\bar{x}_1, \bar{x}_2, \ldots, \bar{x}_k$.

(b) Second step is to calculate the deviation of each observation in *k* samples from the mean values of the respective samples.

(c) As a third step, square all the deviations obtained in Step 2 and calculate the total of all these squared deviations.

(d) As the last step, divide the total squared deviations obtained in Step 3 by the degrees of freedom and obtain the mean square. The number of degrees of freedom can be calculated as the difference between the number of observations and the number of samples. If there are *n* observations and *k* samples then the degrees of freedom is

$v = n - k$

$$\sum_{n=1}^{n}\sum_{j=1}^{k}(x_{ij} - \bar{x})^2$$

SSE (sum of squares within samples)

Where x_{ij} is the *i*th observation in Group *j*, $\bar{x}_j$ the sample mean of Group *j*, *k* the number of groups being compared, and *n* the total number of observations in all the groups. And

$$\frac{SSE}{n-k}$$

MSE (mean square)

Where SSE is the sum of squres within columns and $n - k$ the degrees of freedom (total number of observations – number of samples)

3. Calculate total sum of squares : the total vatiation is equal to the sum of the squared difference between each observation (sample value) and the grand mean $\bar{\bar{x}}$. this is often reffered to as SST (total sum of squares). So, the total sum of squares can be calculated as below :

SST (total sum of squares) = SSC (sum of squares between columns) + SSE (sum of squres within samples)

$$\sum_{i=1}^{n}\sum_{j=1}^{k}\left(x_{ij} - \bar{\bar{x}}\right)^2 = \sum_{j=1}^{k} n_j - \bar{\bar{x}})^2 + \sum_{i=1}^{n}\sum_{j=1}^{k}(x_{ij} - \bar{x}_j)^2$$

$$\sum_{i=1}^{n}\sum_{j=1}^{k}(x_{ij}-\bar{\bar{x}})^2$$

SST (total sum of squares)

Where x_{ij} is the ith observation in Group j, $\bar{\bar{x}}$ the grand mean, k the number of groups being compared, and n the total number of observations in all groups. And

$$\frac{SST}{n-1}$$

MST (mean square)

Where SST is the totoal sum of squares and

n – 1 the degrees of freddom (number of observations – 1).

II- Applying the F-Test statistic

As discussed, ANOVA can be computed with three sums of squares : SSC (sum of squares between columns) SSE (sum of squres within samples), and SST (total sum of squares).

F is the ratio of two variances. In case of ANOVA, *F* value is obtained by dividing the treatment variance (MSC) by the error variance (MSE). So in case of ANOVA, *F* value is calculated as below :

$$F=\frac{MSC}{MSE}$$

Where MSC is the mean square column and MSE the mean square error.

The *F* test statistic follows *F* distrubtion with $k-1$ degrees if freedom corresponding to MSC in the numerator and $n-k$ degrees of freedom corresponding to MSE in the denominator. The null hypothesis is rejected if the calculated value of *F* is greater than the upper-tail critical value F_U with $k-1$ degrees of freedom in the numerator and $n-k$ degrees of freedom in the denominator. For a given level of significance α, the rules of acceptance or rejection of the null hypothesis are shown below :

For a given level of signifiance α, the rules of acceptance or rejection of the null hypothesis

Reject H_0, if calculated $F>F_U$ (Upper tail value of *F*),

otherwhise do not reject H_0.

Figure 12.2 exhibits the rejection and non-rejection region (acceptance) when using ANOVA to test the null hypothesis.

III- The ANOVA summary :

The results of ANOVA is ussually presented in an ANOVA table (shown in Table 12.4). the entries in the table consist of SSC (sum of squares between columns), SSE (sum of squares within samples) and SST (total sum of squares) ; corresponding degrees of freedom

$k - 1$, $n - k$ and , $n - 1$; MSC (mean squre column) and MSE (mean square error) ; and F value.

When using software programs such as MS Excel, Minitlab, and SPSS, the summary table also includes the p value. The p value allows a researcher to make inferences directly without taking help from the critical values of the F distribution.

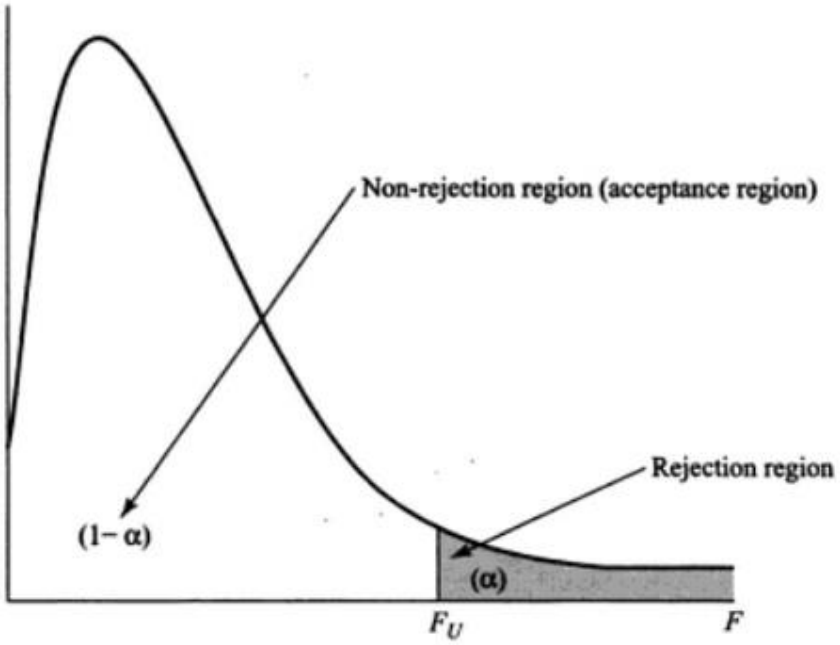


Figure 12.2: Rejection and non-rejection region (acceptance region) when using ANOVA to test null hypothesis)

Source of variation	*Sum of squares*	*Degrees of freedom*	*Mean squares*	*F Value*
Between columns (treatment)	SSC	$k-1$	$MSC = \frac{SSC}{k-1}$	$F = \frac{MSC}{MSE}$
Within columns (error)	SSE	$n-k$	$MSE = \frac{SSE}{n-k}$	
Total	SST	$n-1$		

Table 12.4: ANOVA Summary table

(Bajpai, 2010, pp. 309-314)

Scheffé's Method of Multiple Comparaisons

If the null hypothesis of the ANOVA is rejected, it beciles necessary to identify which one (or more) of the population means differs from the rest, i.e we need to make *simulataneous* inferences about the entire "family" of differences between the treatment means. Earlier we explained why it is not appropriate in ANOVA to apply the t-test to all pairs of samples means *individually*, the most important reason being the problem of compounding the Type I error on the test. An approach which avoids this problem and accomodates samples of unequal size is **Sheffé's method of multiple comparaisons**.

Sheffé's method enables us to identify which pairs of means differ from one another. The method produces a range of values to which the *absolute differences* of all the pairs of sample means (called contrasts) can be compraired. If the value of a contrast falls *beyond* the limit of the ciritical range produced by the method, then the corresponding population means *differ* significantly from each other. The **critical range** is set up as follows:

$$\text{Critical range} = \sqrt{(\boldsymbol{r-1})\boldsymbol{F^{\alpha}_{r-1\,;\,N-r}}}\ .\boldsymbol{\sigma}$$

$$\text{where } \sigma = \sqrt{\left(\frac{1}{n_p} + \frac{1}{n_q}\right) MSE}$$

(Honert, 1999, p. 39)

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