... ZAOULI N°11, Vol. 1, Septembre 2025, pp. 822-858 ISSN : 2788-9343

Soumission : **01/03/2025** **Acceptation : 05/07/2025** **Publication** : **15/09/2025**

The Impact of the Sanako Study 1200 Language Laboratory on ESP Learners' Performance in the Four Macro Language Skills

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Abstract

This study aims to investigate the impact of the Sanako Study 1200 language laboratory on English for Specific Purposes (ESP) students' academic achievement in the four language skills: Listening, Speaking, Reading, and Writing (LSRW). Grounded in a quantitative pre-test–post-test experimental design, the research compared the language academic achievement of three instructional methods: the traditional method, the Conventional Multimedia Language Laboratory (CMLL) method, and the Sanako Study 1200 *laboratory method. Thirty first-year students from the Department of Mechanical Engineering at the University of Science and Technology – Mohamed Boudiaf, Oran, were randomly assigned to three groups, all of whom received identical ESP course content. Data were collected through computerized pre- and post-tests measuring students' performance in the four macro language skills. Results of the One-Way ANOVA and Scheffé's post-hoc analysis computed at*

the 0.05 significance level revealed statistically significant differences in favor of the Sanako Study 1200 Lab group across all four LSRW skills when compared with the traditional group, and across all skills except writing when compared with the CMLL group.

Keywords: *English for Specific Purposes (ESP); language laboratory; language skills; Sanako Study 1200, technical English.*

L'impact du laboratoire de langues Sanako Study 1200 sur les performances des apprenants en anglais spécialisé dans les quatre compétences linguistiques macro

Résumé

Cette étude vise à examiner l'impact du laboratoire de langues Sanako Study 1200 sur les résultats scolaires des étudiants en anglais à des fins spécifiques (ESP) dans les quatre compétences linguistiques : compréhension orale, expression orale, compréhension écrite et expression écrite (LSRW). S'appuyant sur un protocole expérimental quantitatif pré-test/post-test, la recherche a comparé les résultats scolaires en langues de trois méthodes d'enseignement : la méthode traditionnelle, la méthode du laboratoire de langues multimédia conventionnel (CMLL) et la méthode du laboratoire Sanako Study 1200. Trente étudiants de première année du département de génie mécanique de l'Université des sciences et technologies - Mohamed Boudiaf, Oran, ont été répartis au hasard en trois groupes, qui ont tous reçu un contenu de cours ESP identique. Les données ont été collectées à l'aide de pré-tests et de post-tests informatisés mesurant les performances des étudiants dans les quatre macro-compétences linguistiques. Les résultats de l'analyse ANOVA à un facteur et de l'analyse post-hoc de Scheffé, calculés à un niveau de signification de 0,05, ont révélé des différences statistiquement significatives en faveur du groupe Sanako Study 1200 Lab dans les quatre compétences LSRW par rapport au groupe traditionnel, et dans toutes les compétences sauf l'écriture par rapport au groupe CMLL.

Mots-clés *: anglais à des fins spécifiques (ESP) ; laboratoire de langues ; compétences linguistiques ; Sanako Study 1200, anglais technique.*

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Introduction

One among the most prominent technological innovations of the previous century is the computer. The extent of its reach is evident in nearly every domain of modern life, ranging from commercial transactions and transportation to healthcare and entertainment industry. Undoubtedly, no civilised man can dispute the profound role this remarkable innovation has played in shaping the structure and progression of contemporary society.

In the educational domain, particularly in the field of English as a Foreign Language (EFL) instruction, a significant number of educators in developing countries exhibit resistance to the integration of computer technology within their teaching practice. Consequently, they predominantly adhere to the conventional "chalk-and-talk" method, which, despite its long-standing application, has demonstrably fallen short in delivering the intended pedagogical outcomes.

In the Algerian context, the situation reflects a comparable pattern. Although the Ministry of Higher Education and Scientific Research has recently introduced several reforms aimed at modernizing pedagogical practices—most notably through the installation of language laboratories in numerous higher education institutions across the country—these initiatives have largely fallen short of their intended goals. A significant proportion of these laboratories remain either non-functional or inaccessible to both teachers and students. This disconnect between policy implementation and practical utility raises serious concerns regarding the

impact of such heavy-duty infrastructural investments on the Algerian ESP learners, particularly for those studying in the technical fields. To the best of the researcher's knowledge, scholarly studies concerning the integration of computer technologies in foreign language learning within the Algerian educational context remain significantly underexplored. More precisely, there exists a notable lack of empirical comparative research evaluating the effectiveness of the language laboratories in developing either students' language academic achievement or their English language skills. Addressing this empirical gap constituted a primary motivation for conducting the present investigation.

This research is designed to evaluate the impact of the Sanako Study 1200 language laboratory on enhancing the academic ESP language proficiency of the mechanical engineering students. To achieve this objective, a comparative empirical approach was adopted, based on the understanding that it offers the most appropriate and scientifically rigorous method for objectively evaluating this impact.

The comparative analysis was carried out on the English language achievement scores of three groups of students who received the same intensive ESP course delivered through three distinct instructional methods: (1) the traditional method; (2) the CMLL method, a blended instructional method combining the traditional teaching method with multimedia tools; and (3) the Sanako Study 1200 Lab method.

The experiment was performed in the digital language laboratory facility housed within the Department of Mechanical Engineering at the University of Mohamed Boudiaf, Oran. Despite being acquired in 2012, the facility

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had remained non-operational since its installation. The initial challenge involved restoring the facility to operational status, followed by an attempt to evaluate its potential impact. The present study is framed around the following research questions:

1) What is the impact of the Sanako Study 1200 language laboratory on the English language achievement scores of the ESP students?
2) To what extent does the Sanako Study 1200 Lab impact the various language skills of ESP students?

The following hypotheses are proposed as tentative answers to the research questions outlined above:

- H1: The use of the Sanako Study 1200 Lab is more effective than the traditional method in enhancing the academic language achievement of ESP students.
- H2: The Sanako Study 1200 Lab has an effect on the development of ESP students' four language skills: listening, speaking, reading, and writing.

1. Language laboratory

The language laboratory represents one of the earliest and most widely recognized technological innovations in the field of language learning. According to Hocking (1967), the term "*language laboratory*" was first coined in the 1930s by Ralph Waltz. Since then, the concept has evolved considerably, in both form and function, resulting in a wide range of designations that reflect its pedagogical and technological development. As Alexander (2007) highlights, language laboratories have been referred to by numerous names including: 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 or labs, world media and cultural centers, language acquisition centers, and language and computer laboratories.

According to Roby (2004), the first language laboratory appeared in 1908 at the University of Grenoble in France. However, it was not until the 1950s and 1960s that the language laboratories became widely adopted, largely as a result of the emergence of the audio-lingual approach—a language teaching method emphasizing intensive listening, repetition, and speaking practice as the foundation of language acquisition.

Hayes (1968) defines the language laboratory as a specialized instructional environment—often a classroom or designated facility—equipped with technological resources designed to enhance the effectiveness of language teaching and learning beyond what is typically achievable in a traditional classroom setting. In a related view, Lorge (1964) describes the language laboratory as an auxiliary teaching aid, comparable to the blackboard in its visual reinforcement function, but primarily aimed at strengthening learners' auditory experiences during classroom instruction.

From a more contemporary perspective, Richards and Schmidt (2013) offer an expanded definition of the language laboratory in the *Longman Dictionary of Language Teaching and Applied Linguistics*. They describe it 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

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> and follow language programmes either individually or in groups, and the teacher can listen to each student's performance." (Richards & Schmidt, 2013, 318)

As Roby (2004) observes, earlier generations of language laboratories operated on tape-based systems, using analog equipment such as cassette recorders. However, Hélot (1989) notes that these installations have gradually been replaced by digital systems, "in which computers and multimedia interfaces now form the core components of student booths, thereby enabling more interactive, autonomous, and technologically enhanced modes of language learning.

2. Classification of Language Laboratories

According to Hutchinson and Hutchinson (1970), language laboratories can be broadly categorized into three main types: the Audio Passive (AP) laboratory, the Audio Active (AA) laboratory, and the Audio Active Comparative (AAC) laboratory, also referred to as the listen-respond-compare model.

2.1. AP Language Laboratory:

The AP laboratory represents the most basic configuration of language laboratories technology. In this system, the instructor transmits instructional materials to student booths via an audio wiring system. Students are permitted to listen to and repeat the target language inputs; however, they lack the capability to record or replay their own responses. With the subsequent development of the Audio Active model, this type of laboratory has largely fallen into disuse.

3.2. Audio Active (AA) Language Laboratory: The AA laboratory introduces significant enhancements over its predecessor by equipping each student booth with a microphone and an audio recorder. This enables learners not only to listen and repeat language input but also to record their own speech and review it for self-assessment. A further pedagogical advancement is the instructor's ability to monitor individual students and provide targeted feedback or corrections in real time.

2.3. Audio Active Comparative (AAC) Language Laboratory:

The AAC laboratory represents a more sophisticated and technologically advanced model. Through the use of a dual-channel tape recorder, students can simultaneously listen to pre-recorded material while recording their own responses during designated pauses. This type of laboratory promotes autonomous learning by encouraging students to engage in individualized practice within a self-access framework.

In a more recent taxonomy, Singh (2013) proposed a broader classification comprising seven distinct categories: Conventional Laboratory, Lingua Phone Laboratory, Computer-Assisted Language Laboratory (CALL), Dial Access Laboratory, Mobile Laboratory, Wireless Laboratory, and Portable Laboratory.

2.4. The Conventional Language Laboratory:

The Conventional Language Laboratory consists of a standard classroom supplemented with a tape recorder and audio cassettes. Instructional material is played by the teacher via a loudspeaker, and students engage in passive listening activities. This model closely resembles the AP

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laboratory described by Hutchinson and Hutchinson (1970), but with reduced technological support, as it typically lacks individual headphones or dedicated booths.

2.5. The Lingua Phone Language Laboratory:

Also referred to as the AA laboratory, the Lingua Phone Laboratory shares the features previously described in the AA model of Hutchinson and Hutchinson (1970), offering capabilities for both listening and speaking practice.

2.6. The Computer-Assisted Language Laboratory (CALL):

The CALL laboratory represents one of the most technologically advanced configurations currently available. Both instructor and student workstations are equipped with personal computers and headsets connected via a Local Area Network (LAN). This digital infrastructure enables the instantaneous distribution of multimodal instructional materials—including text, images, audio, and video—at the click of a button. Due to its versatility and wide range of applications, the CALL laboratory supports the development of all four language skills: listening, speaking, reading, and writing.

2.7. The Dial Access Language Laboratory:

This now-outdated laboratory model was once favored in institutional settings where a large number of students required access to multiple language programs. The system allows the first student who selects a specific audio track to initiate playback. However, if another student selects the same material shortly afterward, they must wait until the

complete audio cycle is finished before accessing the content from the beginning.

2.8. The Mobile Language Laboratory:

The Mobile Language Laboratory offers a flexible and portable solution for institutions lacking dedicated space for a permanent laboratory. Typically consisting of a mobile cart containing essential equipment—such as headsets, laptops, and instructional materials—it allows any ordinary classroom to be temporarily transformed into a functional language laboratory. Despite its convenience, it remains relatively cumbersome and time-consuming to set up and transport.

2.9. The Wireless Language Laboratory:

In this configuration, traditional wired connections between the teacher console and student booths are replaced by a wireless radio communication system. Singh (2013) notes that early versions of wireless laboratories were limited by the absence of intercom functionality. However, recent innovations, such as the Labear Wireless Laboratory, have incorporated two-way communication through Wi-Fi connectivity, significantly enhancing instructional interactivity.

2.10. The Portable Language Laboratory:

Designed for deployment in regions with limited infrastructure, the Portable Language Laboratory comprises a set of tablet devices housed in a weather-resistant trolley. The system is powered by rechargeable batteries or portable generators and includes built-in Wi-Fi functionality to facilitate real-time student–teacher interaction. This model is

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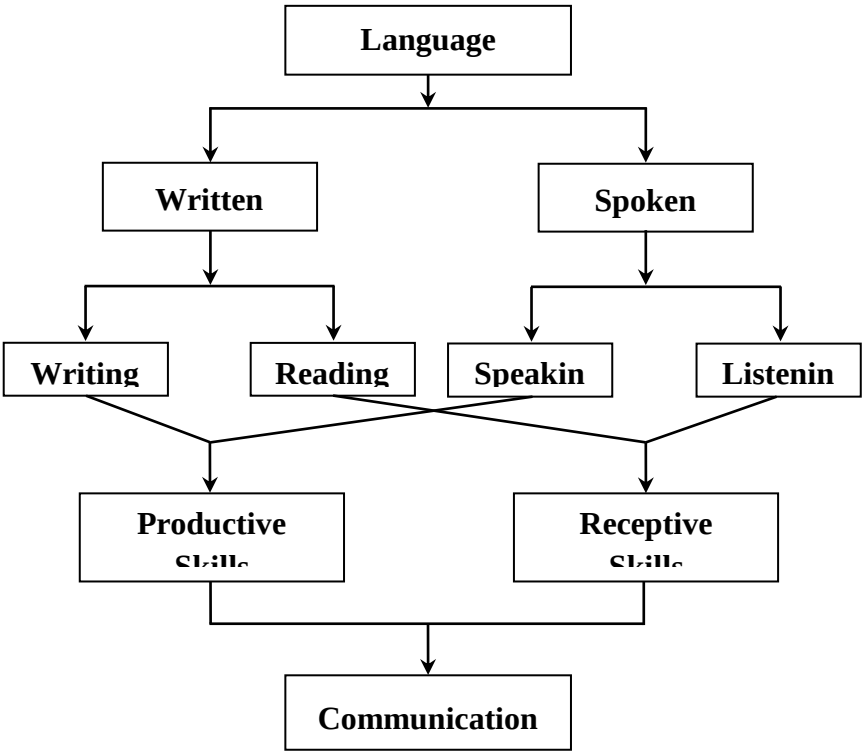
particularly well-suited for remote or economically disadvantaged educational environments.

3. Language Skills

When acquiring a language, learners must develop the four essential macro skills: listening, speaking, reading, and writing. In the case of a first language, children typically acquire these skills in a natural sequence: first listening, then speaking, followed by reading, and finally writing. However, for EFL learners, all four skills must be explicitly taught and mastered to attain full language proficiency. In ESP classes, one skill may be prioritized over the others depending on the teaching approach, course objectives, and learners' specific needs (Derradji, 1995). This prioritization, however, does not imply that the four skills operate in isolation; rather, they are interdependent and complementary, as illustrated in the diagram below:

Figure 1: The Four Macro Language Skills Interrelationship. (adapted from Robinett, 1978)



Language can be expressed in two primary forms: spoken and written. The spoken mode encompasses listening and speaking, while the written mode includes reading and writing. Moreover, speaking and writing are considered

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productive skills because they involve the active generation of language, whereas listening and reading are classified as receptive skills, as they involve decoding and interpreting incoming information.

3.1 Receptive Skills:

Receptive skills refer to the processes through which learners derive meaning from written or spoken texts. According to Harmer (2001), these skills involve the interpretation of language input, specifically listening and reading. Although each skill employs different modes of communication and instructional strategies, both rely heavily on the learner's prior knowledge to construct meaning.

Understanding a text, whether heard or read, requires the activation of what is known as schematic knowledge, or schema. These are mental frameworks based on familiar situations that help individuals anticipate and interpret the content of a discourse during communication (Cook, 1989). For example, when reading a newspaper article or listening to a familiar story, individuals rely on their background knowledge and experience to interpret the information presented. Research on reading and listening comprehension has shown that specific words, discourse patterns, and contextual clues can trigger this background knowledge, enabling learners to recognize and process information more efficiently. This highlights that language proficiency alone is insufficient for full comprehension. Rather, contextual and cultural knowledge, stored in the form of mental schemata, plays a vital role in interpreting discourse. Learners who can activate and apply their prior

knowledge are better equipped to engage with and understand both spoken and written texts.

3.2 Productive Skills:

Writing and speaking are referred to as productive skills because they involve the active use of language to produce spoken or written output. Although both serve the purpose of communication, they differ in several important ways.

Writing is typically more structured and less spontaneous than speaking, as writers usually have more time to plan, reflect on, and revise their messages. Speaking, by contrast, tends to be more immediate, fluid, and often less organized (Harmer, 2001). Brown (2001) outlines several key distinctions between speaking and writing:

- **Permanence:** Spoken language is temporary and must be processed in real time. In contrast, written texts are permanent; they can be revisited and reviewed multiple times.
- **Production Time:** Writers generally have more time to plan, revise, and refine their messages before presenting them to an audience. Speakers, however, must generate and deliver their message almost instantly in order to sustain a conversation.
- **Distance:** The physical and contextual gap between writer and reader is usually greater than that between speaker and listener. In face-to-face spoken communication, this gap is minimised through the shared context. In writing, however, the absence of direct interaction requires the writer to communicate clearly and precisely to bridge this distance.
- **Orthography vs. Suprasegmentals:** Spoken language benefits from suprasegmental features such as

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intonation, stress, pitch, volume, and pauses to convey meaning. Writers, however, are limited to the tools of orthography— such as punctuation, formatting, and word choice—to achieve the same effect.

- **Complexity:** In terms of syntax, writing tends to be more complex than speech. Spoken language often relies on shorter clauses linked by coordination, whereas written language features longer, more subordinate constructions.
- **Vocabulary:** Writing typically employs a broader and more sophisticated vocabulary, including a higher proportion of low-frequency words, whereas spoken language tends to rely on high-frequency, everyday terms.
- **Formality:** Written language is generally more formal than spoken communication, largely due to the social and cultural contexts in which writing typically occurs.

4. Materials and Methods

4.1. Sample description:

The current research draws its sample from first-year undergraduate students enrolled in the Department of Mechanical Engineering at the University of Sciences and Technology – Mohamed Boudiaf, USTO-MB. A total of thirty students participated in the study, comprising sixteen males and fourteen females, all native Arabic speakers aged between eighteen and twenty. Participation was entirely voluntary. The participants were randomly assigned to one of three instructional groups, each consisting of ten students:

the CMLL group and the Sanako Study 1200 Lab group (both serving as experimental groups), and the traditional group serving as the control.

4.2. Data Collection Instruments:

In order to effectively address the research objectives, the study made use of two distinct computerised evaluation instruments for data collection. These consisted of a pre-test, administered prior to the instructional intervention, and a post-test, conducted upon its completion.

4.2.1 The Pre-test:

The research methodology employed in this study necessitated the formation of homogeneous groups based on participants' initial English proficiency. To ensure this, the researcher developed a customised, computer-based English for General Purposes (EGP) placement test, comprising four sections, each designed to evaluate a distinct language skill.

In the reading comprehension section, participants were instructed to read a given text and respond to open-ended questions using a word processing software. The listening comprehension section required them to listen to short audio excerpts produced by native speakers of English, followed by multiple-choice questions designed to assess their understanding of the content.

The writing section evaluated students' fundamental writing skills through various tasks, including sentence reordering, paragraph correction, and punctuation exercises. Finally, the speaking section was conducted via a computer-mediated dialogue using a speech synthesiser technology. Students engaged in a structured question-and-answer

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exchange, and their spoken responses were recorded for subsequent analysis.

4.2.2 The Post-test:

Immediately following the experimental intervention, a self-developed, computerised post-test was administered to evaluate participants' English language proficiency across the four fundamental LSRW skills. While the structure and question formats mirrored those of the pre-test, the content differed. Unlike the pre-test, which assessed general English proficiency, the post-test was specifically designed to measure learners' assimilation of technical English related to the content covered in the ESP course.

4.3 Research Materials

4.3.1. The CMLL:

The instruction for the first experimental group was delivered in a technologically enhanced, media-rich environment, in which a traditional classroom was systematically transformed into a quasi-CMLL. This transformation was guided by the aim of integrating multimodal input—comprising visual, auditory, and audiovisual materials—into the instructional process.

The converted classroom was equipped with a range of technological tools designed to support dynamic and interactive language learning. A laptop computer served as the central control device for instructional delivery, enabling the presentation of digital content, language exercises, and multimedia resources. To ensure high-quality audio output, a Universal Serial Bus (USB) speaker was connected to the laptop, allowing the clear and effective playback of spoken

language input, pronunciation models, and other auditory stimuli essential for listening comprehension activities. In addition, an Acer X1161P data projector was used to display visual content on the classroom wall, thereby enhancing learners' engagement with images, videos, and textual materials.

This setup allowed the instructor to present integrated multimedia lessons, that combined text, images, audio, and video in real time, thereby simulating— to a reasonable degree— the affordances of a fully equipped multimedia language laboratory. While the laboratory did not include individual learner booths or networked systems typical of advanced multimedia labs, the arrangement nevertheless provided a quasi-conventional language laboratory environment, sufficiently equipped to support experimental instructional activities and to distinguish the treatment group from the traditional control group.

4.3.2. The Sanako Study 1200 Lab

The implementation of the Sanako Study 1200 language laboratory within the Department of Mechanical Engineering at USTO-MB was conceived as part of a broader institutional initiative to equip the faculty with innovative pedagogical tools aimed at enhancing students' proficiency in foreign language learning. However, despite its installation in 2012, the facility has remained non-functional since its inception. Strikingly, both instructors and students have reported being entirely unaware of its existence.

The Sanako Study 1200 Lab is a pure software-based system, theoretically capable of supporting an unlimited number of students. The configuration in use consists of twenty-five desktop Personal Computers (PCs)

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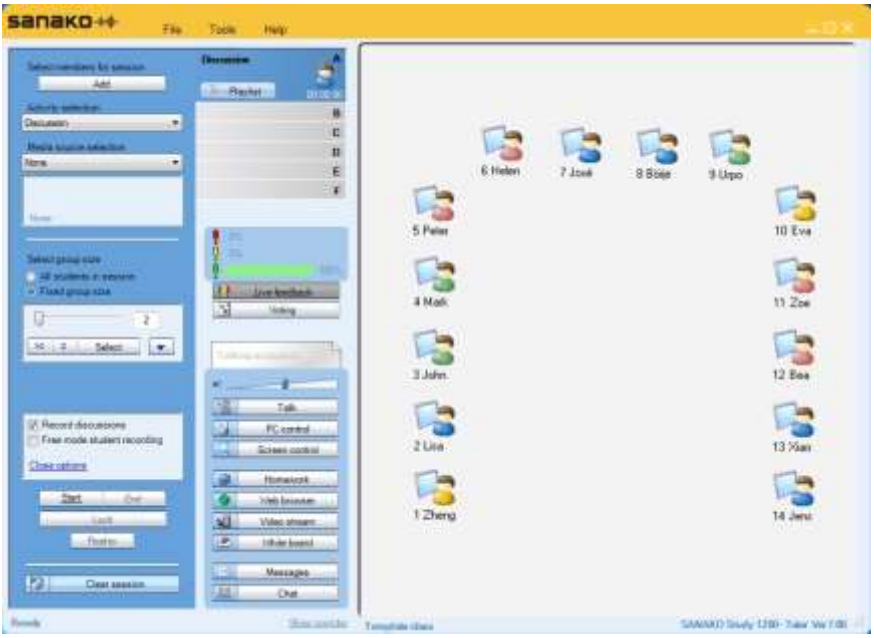
interconnected via a LAN and managed by a central server operating on Windows Server 2008. Student booths function as clients and are controlled through the Sanako Study 1200 Tutor application (see Fig. 2), which serves as a comprehensive software console. This application enables the instructor to control, access, monitor, and manage the distribution of digital content across the classroom environment with minimal effort.

Figure 2: SANAKO Study 1200 Teacher's Interface

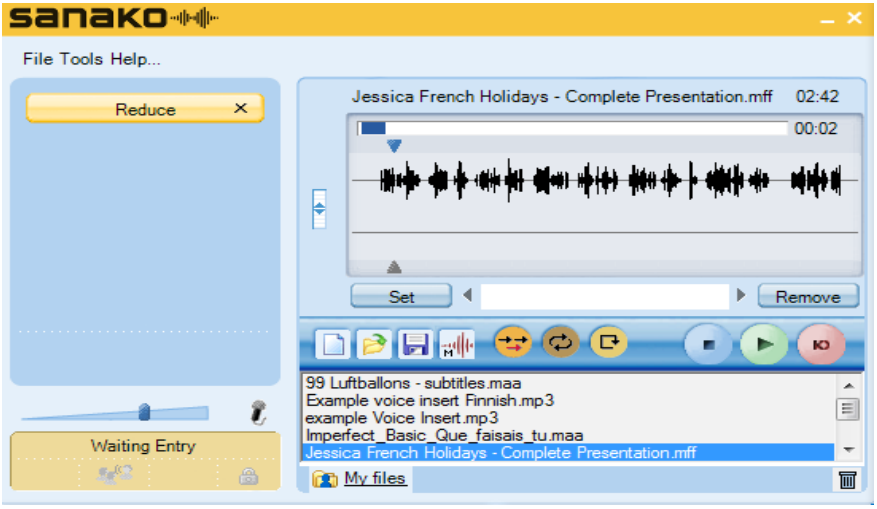


Source: SANAKO Study 1200 Version 6.10 User Guide, p. 12

Additionally, the instructor's main server is equipped with a Pinnacle digitising card and a Sony DVD/VHS player, thereby enhancing the system's flexibility by enabling the integration and manipulation of instructional materials from various analog sources.

On the student side, the Sanako Study 1200 Lab interface provides a streamlined and responsive environment for engaging with instructional materials, participating in exercises, and receiving real-time feedback (see Fig. 3). The interface is designed to support a range of language learning activities, including listening comprehension, pronunciation practice, oral repetition, and interactive quizzes. It allows students to work either independently or collaboratively, depending on the instructional mode selected by the instructor.

Figure 3: SANAKO Study 1200 Student's Interface (



Source: SANAKO Study 1200 Version 6.10 User Guide, p. 113

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Furthermore, the Sanako Study 1200 Lab offers a wide range of features and multiple instructional modes that facilitate both individual and small-group interaction. Despite having received no prior training, the researcher was nevertheless able—albeit with considerable difficulty—to operate the system's basic functions and adapt the available materials to the instructional context.

45.4. Method

The methodology underlying the present study was quantitative in nature, following a comparative experimental pre-test–post-test design. This methodological approach was deliberately selected for its capacity to generate numerical data suitable for statistical analysis, thereby enhancing the objectivity and accuracy of the findings compared to those typically obtained through qualitative methods.

At the beginning of the experiment, all participants completed a computerised pre-test administered within the Sanako Study 1200 Lab. Over a ten-week period, all students received an ESP course with identical content, delivered by the same instructor but through different instructional methods. The control group was taught using the conventional teaching method; the CMLL group received instruction that supplemented traditional methods with integrated multimedia components, including auditory, visual, and video materials; while the third group was taught exclusively via the Sanako Study 1200 system.

Following the completion of the instructional period, all students completed a computerised post-test, once again

administered in the Sanako Study 1200 Lab. The resulting data were subsequently analysed using the Statistical Package for the Social Sciences (SPSS).

5. Results and Discussion

To test the hypotheses of the present study, a comprehensive statistical analysis was conducted using the SPSS software. The data obtained from both the pre-test and post-test evaluations were systematically analyzed and subsequently compared. Differences in achievement scores between groups were examined using a simple analysis of variance (commonly referred to as One-Way ANOVA) followed by Scheffé's post-hoc tests, with a significance threshold of 0.05. Prior to conducting the One-Way ANOVA test, it was necessary to check the underlying assumption of the homogeneity of variance.

Table 1. Pre-test Mean Scores and Standard Deviation

	N	Mean	Std. Deviation	Minimum	Maximum
Traditional group	10	14,2140	2,9785	9	18,25
CMLL group	10	13,9500	1,85561	9,75	15,75
Sanako Study 1200 Lab group	10	13,7250	1,80224	8,75	14,25
Total	30	13,9630	2,20703	8,75	18,25

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

Table 1 presents the mean pre-test achievement scores for the three groups. The Traditional group, the CMLL group, and the Sanako Study 1200 Lab group obtained mean scores of 14.21, 13.95, and 13.72, respectively. Although these mean values appear to be relatively close to one another, it cannot be conclusively determined that the participants across the groups are homogeneous in terms of their achievement levels without applying the appropriate statistical test. Accordingly, the One-way ANOVA was conducted to determine whether statistically significant differences existed among the mean scores of the three groups.

Table 2. One-Way ANOVA Pre-test Results

	Sum of Squares	Df	Mean Square	F	Sig.
Inter-groups	1,1977	2	0,5989	,1155	,891
Intra-groups	140,0940	27	5,1857		
Total	141,2917	29			

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

The results of the One-Way ANOVA pre-test analysis demonstrate that the level of significance exceeds the

conventional alpha threshold of 0.05 (sig=0.89>0.05). This finding indicates that the observed differences in mean pre-test scores among the three groups were not statistically significant. Accordingly, it can be concluded that, prior to the intervention, the groups were homogeneous with respect to their general English language achievement scores.

Hypothesis H1: The use of the Sanako Study 1200 Lab is more effective than the traditional method in enhancing the academic language achievement of ESP students.

Table 3. Post-test Mean Scores and Standard Deviation

	N	Mean	Std. Deviation	Minimum	Maximum
Traditional group	10	7,2035	2,12383	4,50	12,50
CMLL group	10	13,8442	1,53786	11,00	16,50
Sanako Study 1200 Lab group	10	18,1050	1,10452	16,25	18,5
Total	30	13,0509	4,82900	4,50	18,5

Following the post-test interventions, noticeable differences in the mean scores of the three groups was observed. Specifically, the Traditional group, the CMLL group and the Sanako Study 1200 Lab group obtained mean scores of 7.20, 13.84, and 18.10, respectively. Despite these apparent differences, their statistical significance required

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verification through further analysis. Consequently, a One-Way ANOVA was conducted to determine whether the differences among the groups were statistically significant.

Table 4. One-Way ANOVA Post-test Results

	Sum of Squares	**Df**	**Mean Square**	**F**	**Sig.**
Inter-groups	603,530	2	301,770	111,770	,000
Intra-groups	72,870	27	2,700		
Total	676,400	29			

* The mean difference is significant at the 0.05 level.

The results of the One-Way ANOVA on the post-test scores yielded a p-value of 0.000, which is below the established significance threshold of 0.05. This indicates that a statistically significant difference existed among the three groups following the intervention (sig = 0.000 < 0.05). Since the One-Way ANOVA only indicates the presence of a statistically significant difference without specifying the locus of the difference, the subsequent step involved conducting a Scheffé's Post-Hoc test to identify the direction of these differences. The comprehensive results of this analysis are presented in Table 5.

Table 5. Scheffé's Post-hoc Post-test Mean Scores

(I) method	(J) method	Mean Difference (I-J)	Sig.
Traditional group	CMLL group	-6,6410*	,000
	Sanako Study 1200 Lab group	-10,9020*	,000
CMLL group	Traditional group	6,6410*	,000
	Sanako Study 1200 Lab group	-4,2610*	,000
Sanako Study 1200 Lab group	Traditional group	10,9020*	,000
	CMLL group	4,2610*	,000

* The mean difference is significant at the 0.05 level.

The results in Table 5 indicate that the mean difference between the Traditional group and the CMLL group was statistically significant, favoring the CMLL group, with an estimated mean difference of 6.64. Moreover, comparison between the Traditional group and the Sanako Study 1200 Lab group showed a statistically significant difference in favor of the Sanako Study 1200 Lab group, with a mean difference of 10.90. A significant difference was also observed between the CMLL group and the Sanako Study 1200 Lab group, favoring the latter (Mean Difference = 4.26).

Considering that the Sanako Study 1200 Lab group achieved the highest mean score (18.10), followed by the CMLL group (13.84), while the Traditional group recorded the lowest mean score (7.20) (see Table 3), it can be concluded that the Sanako Study 1200 Lab method is the

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most effective among the instructional methods evaluated. As a result, the null hypothesis (H10), which posits no statistically significant differences among the instructional methods, is rejected, and the alternative hypothesis (H1), asserting that the Sanako Study 1200 Lab is more effective than the traditional method in enhancing the academic language achievement of ESP students, is therefore accepted.

These results highlight the pedagogical superiority of language laboratories in general, and the Sanako Study 1200 Lab in particular, over the traditional chalk-and-talk method of teaching—a finding that is in line with several prior related studies in the field (Benmadani, 2014; Kiliçkaya, 2005, Meddour, 2006, Tonekaboni et al., 2015).

A possible explanation for superior effectiveness of the Sanako Study 1200 Laboratory is that participants in this group had access to resources and opportunities not available to the other two groups. Each student was equipped with a PC and a comprehensive set of instructional tools, including electronic dictionaries, multilingual translation software, and relevant applications. Furthermore, lessons began with a 15-minute period dedicated to exploration and individualised practice. This combination of interactive content and a self-paced learning environment appears to have enhanced student engagement and promoted greater learner autonomy and responsibility.

Hypothesis H2: The Sanako Study 1200 Lab has an effect on the development of ESP students' four language skills.

Table 6. Post-test LSRW Skills Mean Scores and Standard Deviation

		N	Mean	Std. Deviation	Minimum	Maximum
Post-test R	Traditional group	10	2,6000	,68920	1,50	3,50
	CMLL group	10	3,8000	,67495	2,50	4,50
	Sanako Study 1200 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
	CMLL group	10	3,3250	,44175	2,75	4,00
	Sanako Study 1200 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
	CMLL group	10	3,2500	,95743	1,00	4,50
	Sanako Study 1200 Lab group	10	3,8750	,46022	3,00	4,50

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	Total	30	2,8750	1,29280	,00	4,50
Post-test S	Traditional group	10	2,0000	1,33333	,00	4,50
	CMLL group	10	3,2500	,75462	2,00	4,00
	Sanako Study 1200 Lab group	10	4,4500	,42164	3,50	5,00
	Total	30	3,2333	1,34858	,00	5,00

Table 6 displays the mean and standard deviation results of the post-test achievement scores for the three groups—Traditional, CMLL, and Sanako Study 1200 Lab—across the four language skills of listening, speaking, reading, and writing, as measured after the intervention period. The data indicate that participants in the Sanako Study 1200 Lab group achieved the highest mean scores (Listening = 4.57, Speaking = 4.45, Reading = 4.70, Writing = 3.87), followed by those in the CMLL group (Listening = 3.32, Speaking = 3.25, Reading = 3.80, Writing = 3.25). In contrast, the Traditional group recorded the lowest mean scores (Listening = 1.62, Speaking = 2.00, Reading = 2.60, Writing = 1.50). To determine whether the observed differences among the groups in the post-test mean scores across the four language skills were statistically significant, the One-Way ANOVA was conducted. The results of this analysis are presented in Table 7.

Table 7. One-Way ANOVA Post-test LSRW Skills Results

		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 7 reveals that, when each language skill is analysed individually, the post-test mean scores of the three study

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groups show statistically significant differences in all LSRW skills (sig Post-test L = sig Post-test R = sig Post-test S = sig Post-test W = 0.000 < 0.05). In light of the established statistically significant differences, Scheffé's Post-Hoc test was subsequently conducted to ascertain the specific direction of the mean differences. The outcomes of this Post-Hoc analysis are exposed in Table 8.

Table 8. Scheffé's Post-hoc Post-test LSRW Skills Mean Scores

Dependent Variable	(I) method	(J) method	Mean Difference (I-J)	Sig.
Post-test R	Traditional group	CMLL group	-1,20000*	,000
		Sanako Study 1200 Lab group	-2,10000*	,000
	CMLL group	Traditional group	1,20000*	,000
		Sanako Study 1200 Lab group	-,90000*	,007
	Sanako Study 1200 Lab group	Traditional group	2,10000*	,000
		CMLL group	,90000*	,007
Post-test L	Traditional group	CMLL group	-1,70000*	,000
		Sanako	-2,95000*	,000

		Study 1200 Lab group		
	CMLL lab group	Traditional group	1,70000*	,000
		Sanako Study 1200 Lab group	-1,25000*	003
	Sanako Study 1200 Lab group	Traditional group	2,95000*	,000
		CMLL group	1,25000*	003
Post-test W	Traditional group	CMLL group	-1,75000*	,000
		Sanako Study 1200 Lab group	-2,37500*	,000
	CMLL lab group	Traditional group	1,75000*	,000
		Sanako Study 1200 Lab group	-,62500	,252
	Sanako Study 1200 Lab group	Traditional group	2,37500*	,000
		CMLL group	,62500	,252
Post-test S	Traditional group	CMLL group	-1,25000*	,019
		Sanako Study 1200 Lab group	-2,45000*	,000
	CMLL group	Traditional group	1,25000*	,019

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		Sanako Study 1200 Lab group	-1,20000*	,024
	Sanako Study 1200 Lab group	Traditional group	2,45000*	,000
		CMLL group	1,20000*	,024

* The mean difference is significant at the 0.05 level.

The analysis of the results presented in table 8 indicates statistically significant differences between the CMLL group and the control group across all four LSRW language skills in favour of the CMLL group. Moreover, when the Sanako Study 1200 Lab group was compared with the CMLL group, the statistical significant difference was in favour of the Sanako Study 1200 Lab group in all LSRW skills except writing, where the statistically significant differences were in the direction of the CMLL group (mean difference = -0.62).

Statistically significant differences were also observed between the Sanako Study 1200 Lab group and the control group across all four LSRW skills, in favor of the Sanako Study 1200 Lab group. These findings suggest that the use of the Sanako Study 1200 Lab is more effective than the traditional method in improving students' four language skills. Accordingly, the null hypothesis (H20) assuming that the Sanako Study 1200 Lab has no statistically significant effect on the development of ESP students' four language skills is rejected, and the alternative hypothesis (H2) is accepted.

Regarding the writing skill, it is worth noting that the time allocated for writing activities for the Sanako Study

1200 Lab group was scheduled at the end of the lessons, which on some occasions, did not provide students with sufficient time for practice. This could explain why students in the Sanako Study 1200 Lab group demonstrated lower achievement scores in writing compared to those in the CMLL group.

Conclusion

The findings of this investigation provide robust empirical evidence of the impact of the Sanako Study 1200 Lab on enhancing ESP students' language achievement, particularly within the context of technical higher education. Students exposed to the language laboratory-based instruction through the Sanako Study 1200 Lab achieved significantly higher achievement scores in the post-test than their peers taught using traditional or CMLL methods. This superiority can be attributed to the interactive features of the Sanako Study 1200 Lab—such as real-time feedback, individualised practice, self-paced learning, and multimodal exposure—which collectively foster deeper engagement and greater learner autonomy.

Moreover, the analysis revealed that the Sanako Study 1200 Lab enhanced all four macro language skills—listening, speaking, reading, and writing— although the writing skill showed slightly lower gains compared to the CMLL method. This discrepancy is attributed to limited practice time rather than any inherent limitation of the language laboratory system itself.

From an institutional and pedagogical perspective, these results underscore the need for the activation and systematic

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utilisation of existing, yet often underused, language laboratories across the Algerian universities. The study highlights the urgent need for teacher training programs focused on the integration of Computer-Assisted Language Learning (CALL), curriculum redesign aligned with modern technological tools, and sustained administrative support to ensure the long-term functionality of the language laboratories.

Such measures, if successfully implemented, can elevate the quality of English language learning in technical disciplines, foster learner independence, and align the Algerian higher education with contemporary global standards in language pedagogy and digital learning.

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