

# Developing an Effective ESP Curriculum Integrating CALL

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**Abstract.** This study introduces a compilation of the eight-year trial at a Japanese technical college involving an effective CALL training program for EFL learners to meet ESP curriculum goals: to develop global engineers who can work in the real-world environment and exchange ideas globally. According to the survey based on needs research, e-Learning software such as voice recognition software had been introduced and its effective usage discussed. As e-Learning materials were deemed a passive learning method, a Text to Speech (TTS) system was introduced to resolve this issue. Training using TTS systems was conducted in various settings, including metacognitive strategies and autonomous learning, such that students could more actively engage in the training. As one element of the subsequent development of an effective ESP curriculum, an original overseas training program and near-infrared spectroscopy (NIRS) were also introduced and applied to evaluate the effectiveness of e-Learning systems.

**Keywords:** CALL, curriculum development, e-Learning system, voice recognition, TTS, overseas training program, NIRS.

## 1 Introduction

Concerning the globalization and internationalization of our society, development of English communication skills was crucial for EFL teaching in Japan. However, Japanese engineering students' English skills were declining and far from achieving English debating or presentation levels. Therefore, designing and developing effective courses and curricula to meet ELF goals for acquiring communication skill has been a critical need.

In the field of educational technology, Attitude-Treatment Interaction (ATI) is an important element in planning to develop an effective curriculum. [1] As ATI's concept and theoretical framework suggest that instructional strategies' effectiveness for individuals depends upon their specific abilities and optimal learning is achieved when the curriculum matches the learner's aptitude, the most suitable training had to be applied to the less motivated EFL learners. [2-3]

In addition, English for Specific Purposes (ESP), which is designed to meet specific learner needs, is another essential element of an effective curriculum. [4-5] According to ATI and ESP development methods, the present study conducted needs

analysis-based research to identify the area of training upon which the curriculum concentrated. The survey revealed that in a situation where one observed declining English skills and lack of student motivation, the integration of CALL training in EFL programs had gained much attention. [6-7] Moreover, the importance of interactivity within an e-Learning community of instructors and learners had been emphasized to increase learners' motivation. To follow this trend, e-Learning software such as voice recognition has been integrated into EFL classes since 2006.

## 2 Comprehensive Overview of Integrating CALL

Concerning integration of CALL into ESP curriculum performed in the past years, the process could be summarized into several stages based on the TTS systems and methods applied toward different categories of EFL learners. Below Table 1 describes the comprehensive overview of each CALL training program integrated into the curriculum based on each phase of study which details are explained later.

**Table 1.** Transition of curriculums during each phase of application of CALL

(a) Curriculum during Phase 1

	Required Course	Class Division	Content	CALL
Freshman	English 1	Based on the degree of academic achievement	Composition	Communication 911* Database 3000* Speak!* & metacognitive strategies (* = trial program)
Sophomore	English 2	Mixed level	Reading	

(b) Curriculum during Phase 2 & 3

	Required Course	Class Division	Content	CALL
Freshman	Freshman English	Based on the degree of academic achievement	Reading & e-Learning	Speak! & autonomous learning approach & original overseas training program** (** = elective program)
Sophomore	Sophomore English	Based on the degree of academic achievement	Reading & e-Learning	

(c) Curriculum during Phase 4 & 5 (Note: Phase 5 was applied to selective classes only)

	Required Course	Class Division	Content	CALL
Freshman	English 1 & 2	Based on the degree of academic achievement	Reading & e-Learning	Speak! & autonomous learning approach & original overseas training program** & online lesson** (** = elective program)
Sophomore	English 3 & 4	Based on the degree of academic achievement	Reading & e-Learning	
Junior	Comprehensive English 1 & 2	Mixed level	Technical English	
Senior	Comprehensive English 3 & 4	Mixed level	TOIEC	

### 3 Phase 1: Pilot Study of Integrating CALL

Before CALL could be officially integrated into the curriculum, the e-Learning material and its effectiveness had to be evaluated to determine whether it would be useful for both EFL learners and teachers. Further, as the effectiveness of the curriculum using e-Learning materials should be consistent with ATI and ESP, three types of e-Learning software were used in the trial for observing and evaluating the effects of the software.

The initial software, “English Communication 911[Obunsha (2004)],” was introduced in 2004 and was used in a pilot program intended to improve students’ communication skills through digital methods. The computer gave students several phrases to practice, and by evaluating students’ pronunciations and providing feedback, it enabled students to develop listening and speaking skills. [8]

The second trial software, “Database 3000 [Kiriharashoten (2004)],” was installed in 2005 and allowed more upper level students to access the software simultaneously. It also provided an environment wherein students could learn English at their own preferred time and location in the school. [9-10]

The third trial software, “Speak! [Lighthouse (2005)],” was the initial voice recognition software using a Text to Speech (TTS) system. EFL learners read the text aloud, listened to their pronunciation, and responded to the TTS system’s individualized feedback immediately, and the system enabled them to monitor their training progress [Fig. 1 & 2].

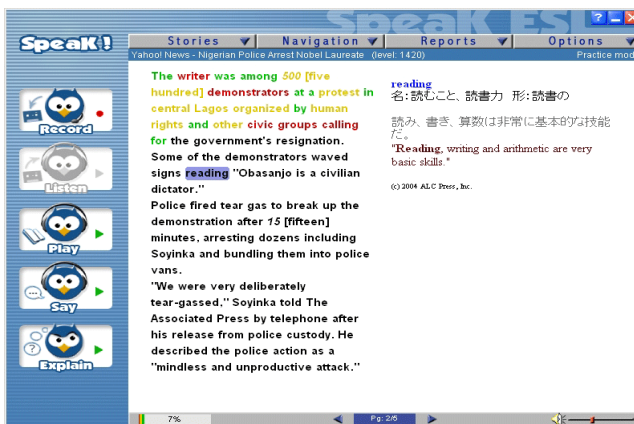


Fig. 1. Sample of Speak! - Text insertion

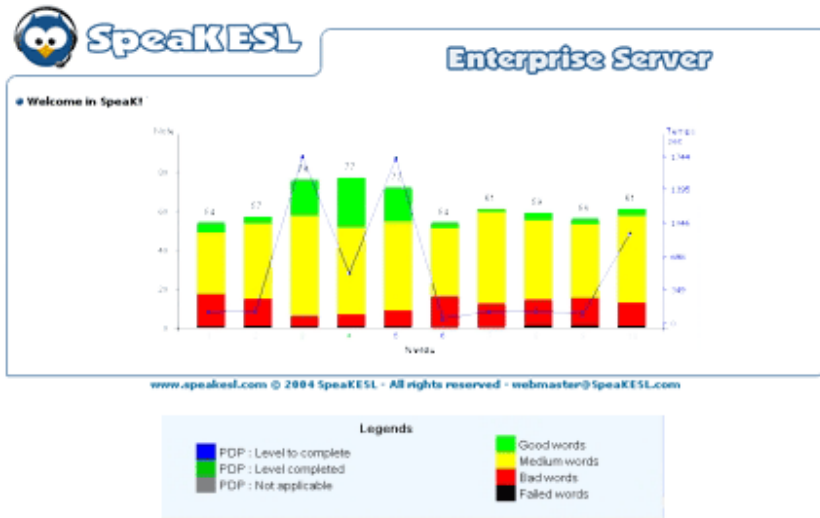


Fig. 2. Sample of SpeaK! - Progress monitoring

During this trial, to solve the concern that e-Learning systems make EFL learners passive, metacognitive strategies such as self-monitoring were applied. By this method, students observed themselves objectively and recognized their weaknesses so that they could concentrate on areas that needed improvement. Further, as students' learning was video recorded and fed back as part of their evaluation, they could visually understand the areas that need to be concentrated to improve their skills. [11]

Although each trial software produced certain benefits and progress in English skill development, the TTS system using "SpeaK!" produced better learning outcomes; therefore, it was selected for integration into the CALL training program in future ESP curricula.

## 4 Phase 2: Developing a CALL-Based Curriculum

Although it could be observed that increasing of skills from the tests of the three e-Learning software programs during the two year trail period, such as progress in EFL learners' skills and improvement in the EFL curriculum along with the effect of metacognitive strategies, criticism remained that training using e-Learning materials provided a very passive type of learning. Therefore, to overcome this issue, enhance the curriculum's effectiveness, and achieve higher goals by using the TTS system, "SpeaK!" was fully integrated into the curriculum with additional improvements. [12]

Because the TTS system enabled EFL learners to create their own content and simply insert any text of their choice and the students could self-select their English lesson contents and modify them to meet their interests, they exhibited active participation and involvement in the training. Further, to gain greater effects from the

e-Learning program, the training was conducted in various settings, such as team teaching by Japanese and English native EFL teachers, peer evaluation, and group work, so that the students could engage even more actively in the training. [13]

As students became familiar with the software and the progress of TTS system's application was continually observed, to explore the potential for further integration of the TTS system, an autonomous learning approach was applied combining additional tasks for students to improve their presentation skills.[14] This objective sought to overcome the criticism that e-Learning still involved largely passive training by creating and introducing an interactive environment so that the students could improve their English skills by applying them pragmatically.

Within this program, EFL learners developed their content using the TTS system and introduced their content as a presentation activity in class, and their classmates evaluated the presentation. This autonomous learning-based presentation activity using the TTS system improved the EFL learners' responsibility and students gained interactive skills with teachers and classmates, which were not possible during the initial TTS system trial period. The criticism of passive learning often results from observing low motivation to participate in the training program. But with this presentation method, students could interact with the audience in their own field of interest and maintain a higher level of motivation throughout the curriculum. [15][Fig. 3 & 4]



**Fig. 3.** Curriculum scene using Speak! training



**Fig. 4.** Integrating Speak! along with presentation scene

## 5 Phase 3: Subsequent Development

In 2008, as a part of the subsequent development of an effective ESP curriculum, an original overseas training program was developed and adopted to train engineering students to improve specific English skills in their fields of interest, giving them the opportunity to think about their future work options in the global market and become global engineers.[16] Though many colleges had their own overseas program, most of which were limited to language training and even outsourced to third party training companies, the focus was on not only improving students' language skills but also engineering students to create their individual vision and direction, which will motivate them to realize the need to study English and understand the international environment.

The program was conducted five times. It included training sessions on topics such as visiting overseas companies related to the students' engineering fields, discussion with Japanese engineers working in the global market, and participating in lectures given onsite. Through personal conversations with workers in the companies, the students could not only gain international knowledge but also realize the importance of learning English and developing English communication skills. As this overseas training program provided a real-world environment where students could practice their knowledge and skills, students could exercise their skills learned through the TTS system training and evaluate their achievement. Moreover, as motivation was, as always, an important element in students' persistence in the English training program, interaction with people abroad and developing familiarity with the real-world environment significantly affected their attitude toward involvement in the training.[Fig.5]



Fig. 5. Lecture by the engineer of Microsoft at Redmond Campus

## 6 Phase 4: Pilot Study of Integrating HCI-Based CALL

Although the overseas training program was developed for EFL learners to practice their English skills in the real world, it also served as a means to evaluate the results of the e-Learning program. As the students had to interact with people other than teachers and colleagues for the first time, it was also important to evaluate the program's effectiveness to identify areas for future development of the curriculum and usage of a TTS system and e-Learning materials.

The development of ESP curricula using a TTS system had been recognized in previous training programs, but the overseas training program provided a certain impact and reflection point regarding the integration of CALL. Moreover, to increase the students' English skills, additional training for use in the real world, Human-Computer Interaction (HCI) became an important element for focus and analysis; therefore, we added improvement of communication skills in a live environment as an objective in developing a curriculum using a TTS system for training. [17]

To address the HCI concerns and improve EFL learners' communication skills, a special trial course was designed by combining the TTS system with an online English lessons called "ONE'S WORD ONLINE" [ONE'S WORD, INC. (2010)] which was a training system having a live overseas instructor over Skype. The instructors were chosen in the Philippines to minimize the impact of the time lag between the instructors and learners in Japan. Using this system, students could communicate with instructors and improve their interaction and correspondence skills. In addition, TTS systems involving movies were introduced to facilitate students' development of an active learning attitude in the overseas training program.

This combination using the TTS system, online English lessons and movies enabled students planning to participate in study abroad programs to create their own digital content to improve their knowledge in their field while becoming more actively involved in the training and discussing it with overseas instructors. Often, movies depict the natural circumstances of everyday life; therefore, students developed the TTS content by using their favorite movie scripts to build their communication skills.[18][Fig. 6]



**Fig. 6.** Training scene using online English lesson "ONE'S WORD ONLINE"

From this training, it could be said that, HCI is a key factor in developing and integrating CALL into an e-Learning curriculum. With this analysis and subsequent improvement of the curriculum, students could actively participate in gaining knowledge in their field of interest while improving their communication skills with a live instructor, thus effectively preparing to use their skills in the real-world environment when visiting overseas. The improved curriculum increased student motivation and attention in the e-Learning program; as a result, students who participated in the overseas training program scored significantly higher scores on their TOEIC Test. [Table 2]

**Table 2.** Result of t-test

	N : Participants of overseas training program	Mean	SD	t-test (two-tailed)
Pre Test	10	67.8	17.55	4.995**
Post Test	10	77.4	12.87	

\*\*(p = 0.001)

## 7 Phase 5: Applying NIRS to Course Design

Although the effectiveness of various teaching methods and materials has improved, an assessment based on traditional paper and pencil tests has revealed its limitations. Recently brain activity has become subject to monitoring by technologically innovative instruments. These technologies provide data that reveals the results of teaching and learning; therefore, a few researchers have noted that these data can be utilized to assess the effectiveness of EFL teaching in Japan. With this newly developed technology, the present study examined the effectiveness of analysis using Near-Infrared Spectroscopy (NIRS) for EFL listening training from the perspective of brain science to propose a well-matched combination of listening materials and training methods for EFL learners. [19]

The present study used NIRS to analyze the amount of blood flow in the brain while learners were learning English. It then examined the relationship between brain activities and learning outcomes to identify the most effective combinations of learners' characteristics and English conversational skills teaching materials.

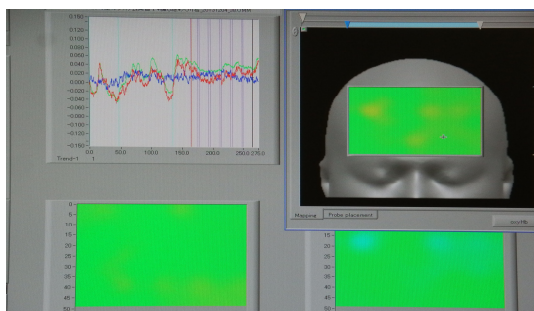
NIRS is widely recognized as a practical non-invasive optical technique to detect the hemoglobin density dynamics response during functional activation of the cerebral cortex. The primary application of NIRS to the human body uses the fact that the transmission and absorption of NIR light in human body tissues contains information about changes in hemoglobin concentration. When a specific area of the brain is activated, the localized blood volume in that area quickly changes.

The greater the amount of blood flow, the hemoglobin oxygenation increases; measuring the amount of blood can thus indicate the state of brain activation caused by differences among teaching materials. This experimental technique indicated the well-matched combination of listening materials and training for EFL learners. As these new technologies could improve the accuracy of the evaluation of CALL integration effectiveness, such technologies have further potential for improving e-Learning methods and curriculum development. [Fig. 7 & 8]





**Fig. 7.** Experimental using NIRS



**Fig. 8.** Data of experimental evaluation

## 8 Conclusion

Through this study, various curricula integrating CALL have been developed and evaluated during the past eight years. Each curriculum achieved certain goals for EFL learners to gain knowledge and develop English communication skills to support their future in becoming global engineers who could actively participate in the real-world environment. However, though CALL is not criticized to the extent that it was in the past as a passive type of learning, recent developments in evaluation methods, such as NIRS, have revealed areas for improvement remain in achieving higher goals and better results for the students.

Concerning TTS systems for CALL, technology has improved, and many new functions have been added to make learning easier. Further, the digital environment has become much more accessible than before; EFL learners can communicate with people around the world using free software and many more e-Learning materials for English study are now available.

However, the availability of more options does not mean that CALL integration alone can achieve optimal effectiveness. From an educational technology standpoint, as consideration of ATI and ESP is critical in developing an effective curriculum, teachers' involvement cannot be overlooked.

Previous studies [12-15] have made it increasingly obvious that even though EFL learners could achieve certain goals from the TTS system itself, the results are insufficiently effective to gain practical English skills for application in a real-life environment. Therefore, it is suggested that teachers should test and evaluate the effectiveness of e-Learning material, add an interactive approach and methods, and provide a live environment with HCI elements so that the EFL learners gain not only knowledge but also practical experience in using English skills in a real-world environment. In addition, with recent scientific and technological evaluation approaches such as NIRS and digital evaluation provided in addition to traditional test results, these outputs could be used to develop even more effective curricula.

Even after combining these elements, areas of improvement in content and methods remain for achieving higher goals through active involvement with teachers. Such involvement is not an easy task for teachers as they will have to keep up with constantly evolving e-Learning technology and evaluation methods, and challenges always arise when developing new curricula. However, as past studies have revealed HCI to be an important element when integrating CALL, teachers should always consider the effectiveness of the interaction between students and e-Learning materials as well as the application of new technologies in order to organize and utilize the available resources to develop the most effective curricula for EFL learners.

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