

# *The Effectiveness of Online Dynamic Assessment in Enhancing Listening Comprehension Skills of Engineering Students*



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## **ABSTRACT**

This study investigated the effectiveness of Online Dynamic Assessment in improving listening comprehension skills of engineering students. The study employed two instruments: Listening Comprehension Skills Checklist; and Listening comprehension Skills Test. The checklist was intended to determine the most important listening comprehension skills required for engineering students. Hence, it was administered to a sample (n=30) that included 10 engineering students, 10 in-service engineers and 10 staff members of English as a Foreign Language and English for Specific Purposes. This study adopted the pre/post-test one group quasi-experimental design. The proposed program was applied on a sample of 16 students at the second year of the College of Engineering and Technology, Arab Academy for Science Technology and Maritime Transport. The program lasted for 9 weeks. Then to measure its effectiveness, subjects' mean ranks on the pre-program administration of listening comprehension skills test were compared with their mean ranks on the post-program administration of the same test. The results indicated a significant improvement in engineering students' listening comprehension skills. This improvement can be interpreted in the favour of the effectiveness of the online dynamic assessment proposed program.

**KEYWORDS:** Online Dynamic Assessment, Interventionist Dynamic Assessment, Listening Comprehension Skills, English for Engineering

## المخلص

هدفت الدراسة الحالية إلى الكشف عن فعالية التقييم الديناميكي باستخدام الإنترنت في تنمية مهارات الفهم الإستماعي لدي طلاب كلية الهندسة. و استخدمت الدراسة الأدوات التالية: بطاقة تحليل مهارات الفهم الإستماعي و إختبار الفهم الإستماعي. و استخدمت الدراسة بطاقة تحليل مهارات الفهم الإستماعي لتحديد مهارات الفهم الإستماعي اللازمة لطلاب كلية الهندسة. و استخدمت الدراسة المنهج شبه التجريبي ، كما استخدمت التصميم التجريبي ذو المجموعة الواحدة، و تكونت عينة الدراسة من ١٦ طالب بالسنة الدراسية الثانية من كلية الهندسة بالأكاديمية العربية للعلوم و التكنولوجيا و النقل البحري. و تم تطبيق البرنامج المقترح علي عينة الدراسة لمدة ٩ أسابيع. و أشارت نتائج الدراسة الي فعالية البرنامج المقترح في تنمية مهارات الفهم الإستماعي لدي طلاب كلية الهندسة.

## **1. INTRODUCTION**

English language is an essential medium of communication in the area of engineering. More specifically, needs analysis studies affirm the significance of listening comprehension skills for engineering students (Al-Tamimi & Shuib, 2010; Şahan, coban & Topkaya, 2016; Sattar, Zahid, Mahmood, Tahir & Ali, 2011; Sanmugam, 2013; Tinh, 2015; Venkatraman & Prema, 2007). These skills are crucial for communicating effectively and properly in the current globalized work market; likewise, they are needed for getting access to updated information presented in English (Tardy, 2004). In spite of this importance, engineering students encounter difficulties when dealing with listening comprehension tasks. In addition, there is some sort of deficiency in teachers' perceptions and the teaching methods they adopt for developing listening comprehension.

Current studies in the field of EFL, such as Heidar and Afghari (2015); Poehner, zhang, and Lu (2015); Ashraf, Motallebzadeh, and Ghazizadeh (2016), affirm the effectiveness of online dynamic assessment in language classes, yet it is still in its infancy. Therefore, studies on this area will add to the area of EFL teaching and learning in numerous ways. It will provide educators with the pedagogical practices and guidelines to incorporate online dynamic assessment in teaching listening comprehension and to discover the problematic areas in the skill.

### **1.1 CONTEXT OF THE PROBLEM**

The close contact of the researcher with the engineering students through her work as an ESP instructor since 2009 and ESP academic coordinator since 2014 in the College of Engineering and Technology at the Arab Academy for Science, Technology and Maritime Transport (AASTMT), has enabled her to become aware of the status and importance of English in the area of Engineering. For such a group of learners English is an essential medium of communication. To prove the significance of the current study, the researcher reviewed related literature (e.g. Al-Tamimi & Shuib, 2010; Şahan et al., 2016; Sanmugam, 2013; Sattar et al., 2011; Tinh, 2015; Venkatraman & Prema, 2007) that indicates the following:

- Engineering graduates' low proficiency in English minimizes their opportunities to join the work market.
- Engineering students' proficiency in listening comprehension enables them to understand lectures in which English is the medium of instruction.
- Listening comprehension skills are demanded for engineers as it is the predominant part of communication at workplace.
- Mastering listening comprehension skills ensures precision and saves time.

- There is a scarce body of empirical research related to the Egyptian context done to reveal the linguistic needs of engineering students, and methods for improving listening comprehension skills.

Furthermore, the examination of the materials of the existing ESP course presented at the College of Engineering and Technology at AASTMT and the informal interviews conducted with a sample of ESP specialists in the institute of language studies at AASTMT -as a part of the pilot study- indicate the following:

- The material presents only audio tracks and ignores other beneficial mediums like videos.
- The audio tracks are accented and do not match students' proficiency levels.
- The current material does not cater for all the listening comprehension skills required for engineering students.
- The teaching techniques employed are incapable of developing listening comprehension skills.
- The adopted materials and teaching methods affect students' perceptions of listening comprehension negatively.
- Students' poor performance in listening comprehension skills is owing to the insufficiency of the material and teaching methods as asserted by the pilot study.

## **1.2 STATEMENT OF THE PROBLEM**

In the light of the above discussion, the problem of the present study is represented in the weakness of engineering students at AASTMT in listening comprehension skills, in addition to the insufficiency and the inappropriateness of the materials and teaching techniques which are intended for these skills. This problem can be stated in the following research question:

"What is the effectiveness of a computerized dynamic assessment based program in developing English listening comprehension skills of engineering students?"

This major research question is subdivided into the following:

- 1) What are the listening comprehension skills needed for engineering students?
- 2) What are the characteristics of the proposed computerized dynamic assessment program?
- 3) How effective is the proposed computerized dynamic assessment based program in developing listening comprehension skills of engineering students?

## **1.3 HYPOTHESIS OF THE STUDY**

The hypothesis of the study states that there are statistically significant differences between the mean ranks of the experimental group on the pre-program administration of (overall) listening comprehension skills test and

their mean ranks on the post-program administration of the same test in favor of the latter.

#### **1.4 SIGNIFICANCE OF THE STUDY**

1. The current study attempts to cater for listening comprehension needs of Egyptian engineering students to cope with the requirements of the current globalized work market.
2. The study introduces ESP instructors and curriculum developers to a way that takes students' differences in consideration while developing listening comprehension skills.
3. The proposed program provides a technology-based model in teaching specialized and tailored English language listening comprehension programs, particularly in Egypt.
4. The present study proposes a list of mediational prompts that can be integrated in online Dynamic Assessment procedures to scaffold listening comprehension skills required for engineering students.
5. The proposed online dynamic assessment program can serve as a model to be followed when designing listening comprehension programs for students of other majors (i.e. Tourism, Maritime, Medicine, Pharmacy and Basic Science).
6. The current study can contribute to expanding research related to employing online dynamic assessment in EFL and ESP.

#### **1.5 DELIMITATIONS OF THE STUDY**

Since it was beyond the limits of a single study to consider a wide range of factors, the current study was confined to:

- EFL listening comprehension skills required for engineering students
- Using some authentic audios / videos related to the engineering context.
- A list of mediational prompts (proposed by the researcher) that can be used for developing listening comprehension skills: strategy hint, listen again, listen to a part, listen to a part with subtitles, listen to different parts added together, eliminate options, examples of the word in other sentences, note taking, and the correct answer and explanation.
- A limited duration for applying the proposed program within nine weeks in Fall semester, 2016/2017.
- A sample of one experimental group (n=16) drawn randomly from second year students enrolled in the College of Engineering and Technology at AASTMT, Port Said branch.

## **2. REVIEW OF LITERATURE**

### **2.1 Listening Comprehension**

In most methodology manuals listening and listening comprehension are synonymous. This view of listening is based on the assumption that, "the main function of listening in second language learning is to facilitate

understanding of spoken discourse" (Richards, 2008, p.3). So, it can be elicited that the general purpose of listening is to comprehend a message.

According to Caldwell (2008, p.4), comprehension is an unobservable process which is extremely complicated and includes different aspects. So, he defines listening comprehension as "the process of simultaneously extracting and constructing meaning through interaction with oral language." Similarly, Amin, Ali and Amin (2011, p.13) define listening comprehension as "a complex process in which listeners have the ability to use information in the auditory text to guess meaning of new items; predict outcomes; understand meaning; find the specific facts, or information; and determine the central thought represented in the text."

Listening comprehension is considered as the queen of communication skills because the better listeners understand what they hear; the better they communicate (Adrian, 2002). Moreover, listening is the most frequently used language skill in the classroom; researchers estimate that students listen twice as much language as they speak, four times as much as they read, and five times as much as they write (Celce-Murcia & Olshtain, 2000). Additionally, listening comprehension contributes significantly to academic success (Alderson, 2005; Brown, 2001; Jeon, 2007; Lin, 2002).

A basic feature of listening comprehension is that it is a complex skill. Coordinating sounds, vocabulary, grammatical structures, and background knowledge involve a great deal of mental processes on the part of the listener (Alderson, 2005). Listening involves bottom-up processing in which listeners attend to the data in the incoming speech signals as well as top-down processing in which the listeners utilize prior knowledge and expectations to guide the process of understanding. This simultaneous bottom-up and top-down processing takes place at different levels of cognitive organization, phonological, grammatical, lexical, and propositional discourse (Rost, 2005).

## 2.2 Online Dynamic Assessment

Recently, there has been a growing interest in teaching listening. "This interest is influenced by studies conducted in foreign language acquisition, discourse analysis, cognitive processing theory and language learner strategies"(Amin, 2012, p.17). Hence, several teaching strategies and techniques related to listening comprehension skills instruction emerged. Among the recent trends in this area is online dynamic assessment. It not only enables instructors to understand the process of listening, but also gives priority to learner's individual needs and competences.

Dynamic Assessment (DA) integrates assessment and instruction into a seamless, unified activity aimed at promoting learner's development through appropriate forms of mediation that are sensitive to the individual's (or in some cases a group's) current abilities (Lantolf & Poehner, 2004). In so doing, enhances learners' knowledge and enables teachers to promote learners' intellectual development in various

educational settings (Lantolf & Poehner, 2004; Poehner 2005; Duvall, 2008; Ableeva, 2008). In other words, contrary to traditional assessment that focuses on already matured abilities, "DA promotes functions that are maturing" in the Zone of Proximal Development (ZPD) and "foregrounds future development" (Lantolf & Poehner, 2004, p. 54).

The primary characteristic of DA that differentiates it from other forms of traditional assessment is the component of mediation in the assessment. In DA, learners receive feedback from the mediator during assessment which includes scaffolding techniques to assist the learner to accomplish a task.

The integration of technology, in the form of computerized applications, has been recently exposed to DA. Computers are intended to take charge of the mediators' responsibilities, so that a greater number of learners and abilities are assessed in a single DA procedure (Jacobs, 2001; Summers, 2008; Tzuriel & Shamir, 2002). Employing computers breaks the boundaries of time, space, and distance. Computerized (online) dynamic assessment mostly follows an interventionist model with mediation offered from a menu of predetermined clues, hints, and leading questions selected in a lock-step fashion (moving from the most implicit to the most explicit) by the computer (Poehner, 2008). Moreover, computer assisted devices can facilitate the social process necessary for development, when human mediators are not accessible (Teo, 2012).

Discussions about listening instruction have emphasized the role of online/computerized dynamic assessment based instruction in developing listening comprehension skills as follows:

Poehner et al. (2015) designed online multiple-choice tests of L2 reading and listening comprehension that leverage the principle that mediation is indispensable for diagnosing development. The listening test was administered to 68 students and the reading test to 82 students recruited from a third-semester Chinese language course at a North American university. The findings indicated that students benefited from mediation generally. They concluded that online dynamic assessment assists learners and teachers in identifying specific dimensions of L2 comprehension where difficulties and where future efforts might focus.

The study of Heidar and Afghari (2015) concentrated on a web-based inquiry in the synchronous computer-mediated communication (SCMC) via Web 2.0 technologies of Talk and Write and Skype. It investigated EFL learners' listening comprehension progress through dynamic assessment (DA). Sixty adult EFL learners at upper-intermediate level were randomly assigned to the control and experimental groups. The participants in the experimental group were involved in dynamic assessment in synchronous computer-mediated communication for seven weeks. The findings revealed that, through interactions in the ZPD, DA in synchronous computer-mediated communication is capable of exploring not only the actual level of



learners' listening ability but also to diagnose and assess the potential level of their listening development.

Wang (2015) studied whether dynamic assessment can promote the integration of listening comprehension assessment and instruction; while at the same time enhance students' listening skills. Five second-year English majors from a technical college in an underdeveloped area of a coastal province in China took part in the study. The assessment adopted the cake format. An analysis of the data from the researcher's notes, students' notes, students' verbal reports and reflective reports revealed that dynamic assessment can provide both the researcher and the participants a better understanding of problems related to listening.

Ashraf et al. (2016) investigated the impact of electronic-based DA on the listening skill of Iranian EFL learners. To achieve this goal, a group of 40 female EFL upper-intermediate students from two language institutes were selected as the participants of the study. Participants were divided in two groups: control group (N=20) and experimental group (n=20). The learners in the experimental group were exposed to DA through virtual electronic-based classroom and the learners in the control group were exposed to DA in a physical language classroom. The findings affirmed that electronic based DA was more effective than classroom based DA in developing students' listening comprehension skills.

### **3. METHODOLOGY**

The study proceeded in two phases: the first adopted a descriptive/qualitative methodology, whereas the second adopted a quasi-experimental/ quantitative methodology. The descriptive methodology was devoted to analyzing engineering students' needs of listening comprehension skills and for designing the program. The sample (n=30) included 10 engineering students that were selected randomly from the College of Engineering and Technology Fourth year students, 10 in-service engineers and 10 EFL and ESP staff members from different universities.

#### **3.1 DESIGN**

The quasi-experimental methodology was employed to assess the effectiveness of the proposed program. The design utilized in this study was the pre/post-test one group quasi-experimental design. The proposed program was applied on a sample of 16 students at the second year of the College of Engineering and Technology, AASTMT. The sample of this phase included subjects from Architectural Engineering and Environmental Design department, who were enrolled in English for Specific purposes course in Fall semester, 2016/2017.

#### **3.2 PROCEDURES OF THE STUDY**

The one experimental group was exposed to the online dynamic assessment proposed program. The experimental group's mean ranks on the pre-program administration of listening comprehension skills test were

compared with their mean ranks on the post-program administration of the same test to measure the effectiveness of the proposed program. In addition, students' mean ranks in the post-program administration of the test were compared to the mean ranks of the follow-up administration of the same test to measure the continuity of the effectiveness of the program. Then, their scores were analyzed statistically.

### **3.3 INSTRUMENTS OF THE STUDY**

To achieve the aim of the present study, two instruments were employed. These instruments are as follows:

1. Listening Comprehension Skills Checklist (LCSC) (Prepared by the researcher). The checklist was used to identify the most important listening comprehension skills required for engineering students. The checklist was validated by jurors, then administered to engineering students, engineers, specialists in ESP, and specialists in curricula and English language instruction for data gathering.
2. Listening Comprehension Skills Test (LCST) which was administered pre and post the proposed program. The test was intended to assess the effectiveness of the proposed program.

### **3.4 OVERVIEW OF THE PROPOSED PROGRAM**

English Listening Comprehension for Engineering (ELCE) is a web-based application (designed by the researcher) that provides a set of eight engineering audio and video tracks; every track is accompanied by a group of multiple choice questions (with five distractors) that cater for listening comprehension skills targeted by the current study. Each item is accompanied by a set of mediational prompts (hints) graduated from implicit to explicit. In this way, resultant diagnoses include not only whether learners answered correctly (their actual score) but also the amount of support they required (mediated score) during the test. ELCE creates student's profile, i.e. it keeps record of student's performance per track. The student profile includes the initial score (gained independently) in the Non-dynamic Assessment Phase, the number of hints used per question, and the number of hints used per track. The student profile provides the teacher with an insight into students' performance, progress, and sources of difficulties.

## **4. RESULTS AND DISCUSSION**

The descriptive phase which was conducted in the present work aimed to identify the listening comprehension skills required for engineering students in Egypt. Hence, this section answers the first sub-question of the present study: What are the listening comprehension skills needed for engineering students? Analysing the results gained from the checklist revealed that listening comprehension skills required for engineering students in Egypt are:

1. Identifying the meaning of technical and non-technical terms from context.
2. Identifying the main idea of an engineering discourse.
3. Identifying specific information and details of an engineering discourse.
4. Making inferences related to engineering contexts.
5. Inferring relationships among the different parts of an engineering discourse (e.g. cause, effect, conclusion, comparisons, results, etc.)
6. Responding to engineering discourses (e.g. formulating opinions and judgments, collecting evidence to defend opinions and judgments).

Analyzing listening comprehension skills, which were specified as required for engineering students, shows that these skills belong to top-down processing model. This model aims mainly at constructing meaning and comprehending the message. This result is reasonable, as the specified skills cater for the global purpose of listening comprehension as viewed in engineering context. This view considers listening as a crucial component for constructing meaning that fosters communication.

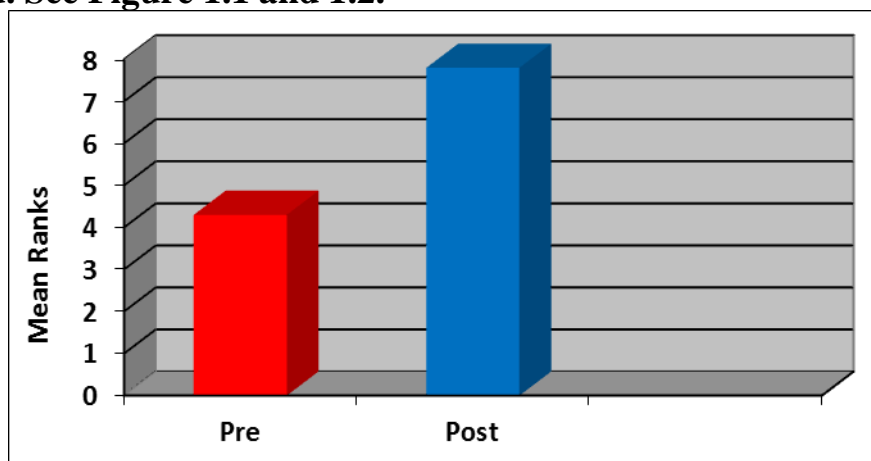
The treatment phase aimed to investigate the effectiveness of the online dynamic assessment proposed program on developing engineering students' listening comprehension skills. The hypothesis of the study will be the base for discussing the results of this section. The hypothesis states that there are statistically significant differences between the mean ranks of the experimental group on the pre-program administration of (overall) listening comprehension skills test and their mean ranks on the post-program administration of the same test in favor of the latter. In order to verify this hypothesis, the one related sample Wilcoxon Signed-rank Test (Statistical Package for the Social Sciences SPSS, version 20) was conducted to evaluate the differences between the mean ranks of the experimental group on the pre-program administration of the listening comprehension skills test and their mean ranks on the post-program administration of the same test. The results were as follows:

**Table 1.1**

*Results of Pre and Post-program Administration of (overall) Listening Comprehension Skills Test*

EFL listening Comprehension Skills for Engineers	Ranks	N	Mean Rank	Sum of Ranks	Z	Significance
Total Mark	Negative Ranks	15	8	120	-3.4	0.01
	Positive Ranks	0	0	0		
	Ties	1	-	-		
	Total	16	-	-		

Results in Table 4.2 show that the "Z" value , -3.4, is significant at 0.01, which indicates that there are statistically significant differences between the mean ranks of the study sample on the pre-program and the post-program administration of (overall) listening comprehension skills test in favor of the post-program administration. Thus, the hypothesis is confirmed. See Figure 1.1 and 1.2.



*Figure 1.1. The Sample's Mean Ranks on Pre and Post-program Administration of (overall) Listening Comprehension Skills Test.*

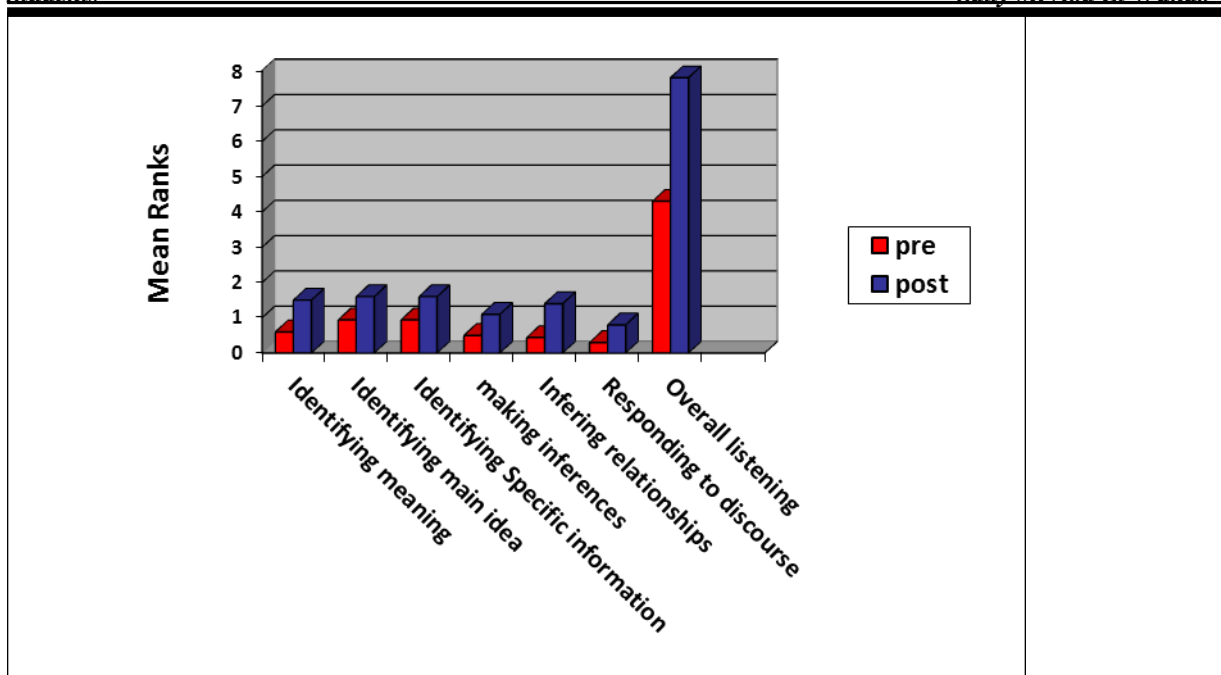


Figure 1.2. Pre and post-program sample's mean ranks on listening comprehension skills test.

The data presented in Table 1.1, Figure 1.1. and 1.2. indicate a significant improvement in engineering students' listening comprehension skills. This improvement can be interpreted in the favour of the effectiveness of the online dynamic assessment proposed program. The results are of significant importance owing to the initiative of the study in applying online dynamic assessment in ESP context. These results are consistent with Teo (2012), Thouèsny and Bradley (2014), Modarisi and Alavi (2014), Li and Li (2015), Wang and Chin (2016), Yakışıkı and Shakır (2017), Mathew, Al-Mahrooqi and Denman (2017), Ableeva (2010), Alavi, kaivanpanah and Shabani (2012), Birjandi and Azad (2014), Poehner et al. (2015), Wang (2015), Heidar and Afghari (2015), and Ashraf et al. (2016).

To calculate the total effect size of the online dynamic assessment proposed program on developing listening comprehension skills of engineering students, the following formula was used (Hassan, 2011, p.280):

$$4(T1)$$

$$r_{prb} = \frac{\quad}{n(n+1)} - 1$$

$$n(n+1)$$

Where:

**Effect Size Descriptors**

- $r_{prb}$  is the effect size value
- T1 is the sum of positive ranks
- n is the total number of the sample pairs
- Small effect size:  $r < 0,4$
- Medium effect size:  $0,4 \leq r < 0,7$
- Large effect size:  $0,7 \leq r < 0,9$
- Very large effect size:  $r \geq 0,9$

Table 4.9

*The Total Effect Size "rprb" of the C-DA Proposed Program on Listening Comprehension Skills of Engineering Students*

Independent Variable	Dependent Variable	"rprb" Value	Effect Size
C-DA based Program	Identifying the meaning of technical and non-technical terms from context	0.93	Very Large Effect
	Identifying the main idea of an engineering discourse	0.82	Large Effect
	Identifying specific information and details of an engineering discourse	1	Very Large Effect
	making inferences related to engineering contexts	0.93	Very Large Effect
	Inferring relationships among the different parts of an engineering discourse	0.91	Very Large Effect
	Responding to engineering discourses	0.93	Very Large Effect
	Overall Listening Comprehension Skills for Engineers	1	Very Large Effect

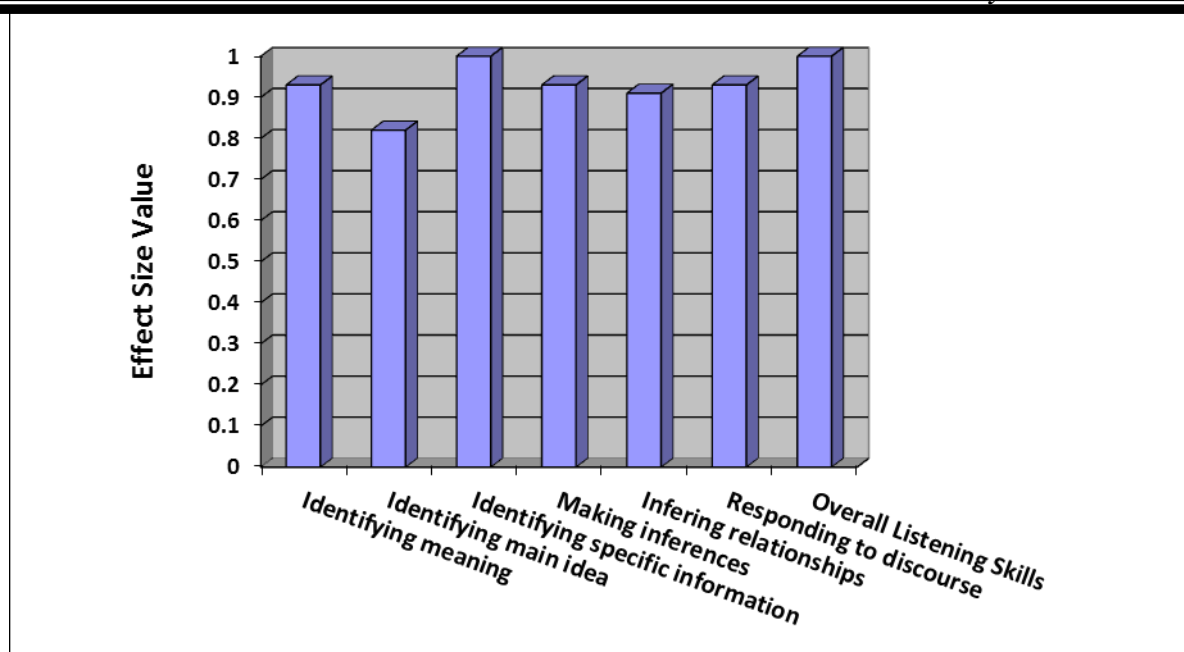


Figure 4.9. The Total Effect Size "rprb" of the C-DA Proposed Program on Listening Comprehension Skills of Engineering Students.

The results presented in Table 4.9 and Figure 4.9. indicate that the total size effect of the proposed program is very large as it is more than 0.9. This affirms the significant effectiveness of the proposed program.

## 5. CONCLUSIONS AND RECOMMENDATIONS

The current study was conducted to investigate the effectiveness of a program based on online dynamic assessment in developing listening comprehension skills of engineering students. The main results of the current study prove the effectiveness of online dynamic assessment in developing listening comprehension skills of engineering students. The results were bases for the following conclusions:

1. Using online dynamic assessment is effective when teaching listening comprehension skills for engineering students.
2. Computers can play the role of mediators effectively to assess and develop simultaneously various students' abilities.
3. Online dynamic assessment caters for different needs and abilities of students in ESP classes.
4. Using internet raises the flexibility of dynamic assessment and provides extra opportunities for learning at home.
5. Online dynamic assessmnet provides an amusement tool for practising listening comprehension skills, it provides a safe learning environment, and raises students' motivation as well.
6. Online dynamic assessment raises autonomous learning and enables students to observe and assess their learning.

7. The list of mediational prompts suggested by the current study (strategy hint, listen again, listen to a part, listen to a part with subtitles, listen to different parts added together, eliminate options, examples of the word in other sentences, note taking, and the correct answer and explanation) are effective in developing listening comprehension skills.
8. Adapting the mediational prompts included in online dynamic assessment according to students' preferences, ensures the positive response of students towards the mediation.
9. The difficulty related to Engineering English and listening comprehension skills can be eased by integrating online dynamic assessment into teaching.
10. The repetitive exposure to the audio tracks through the hints provides students with extensive practice and enhances familiarity with engineering lexical items and different accents.

Based on the results of the present study, the researcher recommends the following:

1. To adopt online dynamic assessment in teaching ESP, particularly for engineering students.
2. To consider web-based applications in dynamic assessment.
3. ESP instructors need to employ effective techniques to facilitate and simplify the complexity related to the nature of listening comprehension skills or these difficulties related to some ESP linguistic contexts like English for Engineering.
4. Engineering course designers and instructors should dedicate more time for improving listening comprehension skills, due to its significance for engineering students. They also should deal with it as a standing alone skill, i.e. not merely as an activity to present new lexical items or grammatical structures.
5. To consider the authenticity of audio/ video materials in ESP courses, since it stimulates learners' positive attitudes towards listening comprehension.
6. To consider students' voice in designing ESP courses. Mediational prompts should be adapted according to students' levels, needs, and views. This enhances students' progress positively.
7. To adopt leveled mediational prompts for teaching listening comprehension. They enable skills being formed at student's zone of proximal development to mature and to be part of the actual development level.
8. To establish special programs for teacher training, as a means of raising the awareness of the potentials, approaches, and formats of DA.
9. Curriculum designing specialists must work closely with software programmers to produce innovative educational applications to cater for the needs of students, and to provide feasible solutions to problematic areas.



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