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### The Effectiveness of a Program Based on the Integration of Neurolinguistic Programming and Digital Learning Objects to Develop EFL Communicative Competence and Linguistic Awareness in Engineering Students

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#### Abstract:

This study aimed to develop EFL communicative competence and linguistic awareness in engineering students via a proposed program based on integrating neurolinguistic programming and digital learning objects. No previous studies dealt with the integration of neurolinguistic programming and using digital learning objects, so this is the novelty point of the current study. There were forty participants for the experimental groups and the same for the control group. Questionnaires of communicative competence and linguistic awareness were designed and juried. Then, the communicative competence and the linguistic awareness tests were juried and administered to the participants of the two groups. The program was designed and administered in the first term of 2023, the academic year, and lasted for the entire term with one session per week for the experimental group. The study results revealed that the experimental group's post-results exceeded its pre-results in the post-administration of the instruments. Furthermore, it could be determined that the proposed program substantially enhanced the stated variables.

**Keywords:** communicative competence, linguistic awareness, integration, neurolinguistic programming, digital learning objects.

### 基于神经语言程序学和数字学习对象整合的项目对培养工程专业学生英

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## 语交际能力和语言意识的有效性

### 摘要:

本研究旨在通过基于集成神经语言编程和数字学习对象的拟议计划，培养工程专业学生的英语交际能力和语言意识。以前没有研究涉及神经语言程序设计和使用数字学习对象的集成，因此这是当前研究的新颖点。实验组有40名参与者，对照组有40名参与者。设计并评审了交际能力和语言意识的问卷。然后，对两组参与者进行了交际能力和语言意识测试。该计划是在2023学年的第一学期设计和管理，并持续整个学期，每周为实验组提供一节课。研究结果显示，实验组在仪器后管理方面的后结果超过了前结果。此外，可以确定拟议的计划大大增强了所述变量。

**关键词:** 交际能力、语言意识、整合、神经语言程序设计、数字学习对象。

### 1. Introduction

Communication lies at the essence of people's everyday interaction and is at the heart of world language instruction. Essentially, it is transmitting a message from one person to another. Communication is also the mechanism of assigning thoughts, feelings, actions and commands to someone else. It occurs when knowledge, information, and meaning flow from one point to another. In teaching a language, communication is essential if the stream is full, and knowledge is valuable and accurate (Consolo, 2006). Educators should develop EFL students' communicative competence to help them understand the value of meaningful social interactions, active communication, discovering meanings and collaborations with peers during their English language learning process. It can be decided that it is better to enhance a communicative competence model that considers the specific social, contextual, and linguistic factors of nonnative speakers. There is a demand for programs and approaches considering students' backgrounds, language goals, and needs (Consolo, 2006).

Linguistic awareness is the main feature of creating student-centered classrooms; it helps teachers present materials according to student readiness. Besides, it is important to advance students' linguistic awareness as it forms the foundation for discussing different methods of using the language. It allows unique and creative language use that is viewed without such awareness. It is an awareness of the language; its functions and structures let learners of that language think about and use it consciously (Burstein et al., 2014).

Advancing linguistic awareness with its different components or aspects (morphology, phonology, semantics, syntax and orthography) impacts EFL students' reading and early literacy in vocabulary use, listening transcription skills, reading comprehension skills, reading fluency and pronunciation enhancement. By capitalizing on the effective role of linguistic awareness, it can be viewed that phonological awareness plays a substantial role in communication

and reading comprehension in/outside classrooms as it contributes to efficiency in phonological decoding, freeing up cognitive resources for higher-level text processing (Cully & Teten, 2008). Moreover, it has been established that morphological awareness has an effective role in obtaining complex words and in accessing their meanings. Research in English has shown that orthographic awareness contributed to word reading is an essential factor in linking written structures with pronunciation (Abu-Rabia et al., 2013).

Neurolinguistic programming is an approach for teaching language that helps advance learners' performance. It allows students to understand a small portion of the world using their senses. It is a subjective experience that can improve interpersonal communication. NLP can be administered to different types of learners (visual, auditory and kinaesthetic) using sounds, pictures and emotions. It is a program that can be adopted by any student and a suitable technique for English classes (Moharamkhani et al., 2016). NLP is applied in the instructional field and the rationale behind that is the difficulty of having a wide-ranging learning and teaching process. Though the educational process confronts challenges, there is a need to overwhelm these challenges with practical solutions. The exploitation of NLP is one of these fruitful solutions. Hence, it can be applied in language learning. This is because of the success of this technique in other fields such as psychotherapy, law, medicine, sports, business and management (Tosey & Mathison, 2003).

Digital learning objects (DLO) is one of the intellectual outputs generated during the lifetime of "Erasmus+" KA2 project "Innovative teacher-motivated student "collaborative problem solving". Project partners representing eight European countries created digital learning objects and ideas for producing digital learning objects. The goal of this variety is to provide handy instances and ideas for teachers to develop their work in the classroom (Hockly, 2012).

#### 1.1. Delimitations of the Study

1. The first year of the Higher Institute of

Engineering and Technology EFL students in Zagazig;

2. Communicative competence components approved by the jury members;

3. Linguistic awareness components approved by the jury members;

4. The program based on integrating NLP and DLO as the independent variables for developing the dependent variables;

5. The duration of the academic year 2022/2023.

### 1.2. Context of the Problem

To state the problem, it can be outlined that many studies on communicative competence and linguistic awareness have been conducted, such as by Salem et al. (2012), who investigated the effectiveness of a program based on integrative grammar teaching in developing students' communicative competence. Burstein et al. (2014) assured that EFL students suffer from a lack of linguistic awareness aspects (phonology, morphology, orthographic, and syntactic).

Other researchers have assured the importance of enhancing aspects of communicative competence and linguistic awareness, such as Bin-Hady (2017), Abdulkader (2019), and Henbest et al. (2020). Confirming the same thought of carrying out this study, communicative competence and linguistic awareness need to be enhanced as the Higher Institute of Engineering EFL students have weaknesses in their

communicative competence and do not practice them successfully. Even they are effective in determining features of communicative competence, such as linguistic awareness (derivational morphological and phonological awareness) skills.

### 1.3. Statement of the Problem (Criteria for Selecting the Research Object)

Through the researcher's experience as an EFL instructor at the High Institute of Engineering and Technology in Zagazig, it was noticed that EFL students face communication challenges in communicative competence. They needed to interact with others in or outside the classroom and could not know the main principles of linguistic awareness.

The researcher conducted a pilot test on a sample of the Higher Institute of Engineering and Technology in Zagazig in the academic year 2019/2020 to probe this problem. The pilot study revealed that most students had problems with the following communicative performance (Table 1). Regarding linguistic awareness, an observation of the activities in the EFL course prescribed for university students showed ignorance and weakness in phonology and morphology as in syntax. Also, the students had grammatical errors. To address these problems, the researcher administered pilot test results showing that most students lacked sufficient linguistic awareness (Table 2).

Table 1. Results of the pilot communicative competence test (N=)

Communicative competences	N	Subskill score	Min.	Max.	Mean	S.D.	%
1. Pronouncing words correctly.	30	5	1	3	2.26	0.520	45%
2. Linking ideas linguistically (e.g. using pronouns, connectives).	30	5	1	3	2.033	0.808	40.6%
3. Using spelling and punctuation rules appropriately.	30	5	1	2	1.667	0.479	33.3%
4. Creating understandable conversations.	30	5	1	2	1.966	0.182	39.3%
5. Varying voice intonation, speed or rhythm.	30	5	1	3	1.0766	0.817	35.3%
6. Negotiating meanings and intentions.	30	5	1	3	2.033	0.808	40.6%
7. Using fillers or hesitation devices.	30	5	1	3	1.966	0.413	39.5%
8. Interacting spontaneously and confidently in informal communicative situations.	30	5	1	3	1.933	0.583	38.6%
Total	30	40	8	20	15,500	2,991	38,75

Table 2. Results of the pilot linguistic awareness test (N=)

Linguistic Sub-Skills	N.	Sub-skill score	Min.	Max.	Mean	SD	%
1. Recognizing the type and sounds of specific words.	30	5	1	3	2.100	0.607	42
2. Understanding that words are made up of meaningful units such as prefixes, root words, and suffixes.	30	5	1	3	2.000	0.787	40
3. Being aware of accurate punctuation rules.	30	5	1	2	1.633	0.490	32.6
4. Comprehending the meaning of words they have not encountered before.	30	5	1	2	1.866	0.345	37.3
5. Being aware of rhyming words.	30	5	1	3	1.833	0.746	36.6
6. Distinguishing grammatically incorrect words in a sentence.	30	5	1	3	1.800	0.761	36
Total	30	30	6	16	11.300	3.142	37.6

Therefore, it was thought that using a proposed program based on the integration of neurolinguistic programming and digital learning objects might have a positive effect on developing these variables.

The following sub-questions are derived from the main question:

1. What are the components of communicative competencies required for the first-year EFL university

students of the Higher Institute of Engineering and Technology in Zagazig?

2. What are the components of linguistic awareness skills required for the first-year EFL university students of the Higher Institute of Engineering and Technology in Zagazig?

3. What are the features of a program based on the integration of NLP and DLOs?

4. What is the effect of integrating NLP and DLOs on developing EFL university students' communicative competence?

5. How does the integration of NLP and DLOs affect developing EFL university students' linguistic awareness?

## 2. Literature Review

### 2.1. Neurolinguistic Programming

Neurolinguistics is the study of how language is represented in the brain: that is, how and where our brain stores our knowledge of the language (or languages) that we speak, understand, read, and write, what happens in our brain as we acquire that knowledge, and what happens as we use it in our everyday lives.

Neurolinguistic programming (NLP) is a psychological approach that involves analyzing strategies used by successful individuals and applying them to reach a personal goal. It relates thoughts, language, and patterns of behavior learned through experience to specific outcomes. Neurolinguistic programming was developed in the 1970s at the University of California, Santa Cruz. Its primary founders are John Grinder, a linguist, and Richard Bandler, an information scientist and mathematician. Neurolinguistic programming is an experiential approach.

Neuro denotes the human brain, i.e., how it works, thinks, and mentally organizes; it provides the brain with mental processes concerning human activities. Linguistics is the study of language areas, both macro and micro languages. This shows how people can practice language correctly, whether in communication or even producing language meaning. Programming is the mental process or structure that attracts humans to change their behavior and accomplish expected aims. This term relates to the potentiality of adapting mental processes (Rose & Abi-Rached, 2013).

### 2.2. Digital Learning Objects (DLOs)

Theorists have developed several explanations to refine and apply the concept of learning objects. Interchangeable terms are used for learning objects, such as educational teaching objects, instructional objects, data objects, intelligent objects, knowledge objects, and digital learning items (Nilsen, 2020).

In its widest sense, a learning object is any non-digital or digital entity employed for education, learning, or training. This definition is valuable because

it incorporates both activity-based and content resources. However, it mentioned little the features of learning objects that make them usable. A learning object is a variety of content practice items, components, and assessment constituents that are varied based on a single learning objective (Polit & Beck, 2014).

From a teacher's or designer's viewpoint, learning objects become reusable when they are both transferable and accessible. Transferability is improved when a learning object is, as far as available, independent of the learning settings for which it was initially developed. For instance, a learning object is extra transferable when it can be employed in a different curriculum, by a different group of students, or on a delivery platform of dissimilar technical specifications. Accessibility is improved when objects are available in a digital method referenced by online data and attributed by metadata that permit designers and teachers to assess the utility of the objects (Yassine et al., 2016).

Significant efforts have been made in the development of standards to annotate and designate objects. For instance, learning object metadata and its specifications for how metadata descriptions should be administered for a specific variety of learning objects. While attempting solutions for these issues is vital, the emphasis on chiefly technical reflections has left the implementation suggestions unexplored. Suppose this out-of-balance development and research thrust is not corrected soon. In that case, digital libraries will be found occupied with easy-to-find learning objects. Then, utility is not surely accomplished (Chan & Zeng, 2006).

### 2.3. Communicative Competence

Zimnaya (2013) explained the notion of competence as a formed, actual quality of an individual based on knowledge, an intellectually and personally significant professional and social trait of the individual, their personality quality. Furthermore, the term competence is attributed to potential, internal, hidden psychological knowledge, insights, and programs of action, which are then exposed to an individual's competencies. In the same aspect, Zhukov et al. (2015) claimed that communicative competence is a psychological distinction of an individual as a person, which displays itself in communication and the aptitude to find and preserve essential contacts with people.

In this regard, it was outlined that the creation of communicative competence can be referred to by constructing the following ingredients: self-presentation ability, emotional stability, situation understanding, socio-psychological competence, confidence, and communicative and organizational inclinations. The idea of evolving competencies is one of the key trends in education upgrading. The professional competence of the instructor in the classification of innovative training is not confined to a group of skills and knowledge. Still,

it is stated by the impact of their use in real educational exercises. To have competencies means to stimulate existing experience, knowledge, one's mood, and the will to solve a problem in precise conditions (Orazbayeva, 2016).

One of the teacher's key competencies is communicative competence, a professionally significant personal value of an expert shaped in self-development. The scope of interpersonal communication refers to the entire complex of social interactions where firm ideas about the world are shaped (Lukyanova et al., 2015). In this track, the aim should not be knowledge of the truth but the creation of confidential interaction, a socially significant issue that regulates the awareness of reality. This is particularly significant in extended education. A survey among pupils showed that those who attended clubs and hobby groups in many methods not so much to attain something but communicated with a teacher (Hyland, 2015).

#### 2.4. Linguistic Awareness (LA)

Duff (2001) assured that the concept of awareness was first associated with language in the late 1950s, when linguists and researchers in Australia and scholars like Hawkins or Halliday in Great Britain supported the target language, but ought to guide them about how to cope with issues related to language in general, to culture and learning. The so-called "language awareness movement" has re-emerged in the field of language learning, in part thanks to the work of Hawkins (2004), who claimed that the observation of language promotes linguistic reflection and favors the acquisition of metalinguistic competence.

Language awareness or language knowledge has grown over the last twenty years, mainly stimulated by the language awareness movement in the UK. Language awareness is "explicit knowledge about language, and conscious perception and sensitivity in language learning, teaching, and language use" (Duff, 2001). LA issues include exploring the benefits derived from developing a good knowledge of language, a conscious understanding of how languages work, and how people learn and use them (Jaton, 2017).

Language awareness (LA) is essential for language learning and teaching. This dimension brings to consciousness both the learner's and teachers' awareness of language use to achieve their objectives. It is considered a significant component of any language teaching and learning practice. Students become creators of knowledge rather than merely its consumers (Svalberg, 2007).

Furthermore, language awareness (LA) is a mental attribute that develops through paying motivated attention to the language in use, enabling language learners to gain such insights gradually. A key element of language awareness is that learners discover language for themselves. Hawkins (2004) mentioned

that it involves challenging students to ask questions about language, encouraging them to gather their data from outside schools, and helping them develop a growing insight into how language works to convey meaning.

### 3. Methodology

#### 3.1. Study Design

In this study, a quasi-experimental design was adopted for one experimental group who received treatment through integrating neurolinguistic programming and digital learning objects to develop EFL communicative competence. The current study adopted a quasi-experimental design. The control group obtained its professional development according to the regular method. Then, this treatment group was pre- and post-tested by the study instruments. The main steps of the research process are summarized in Figure 1.

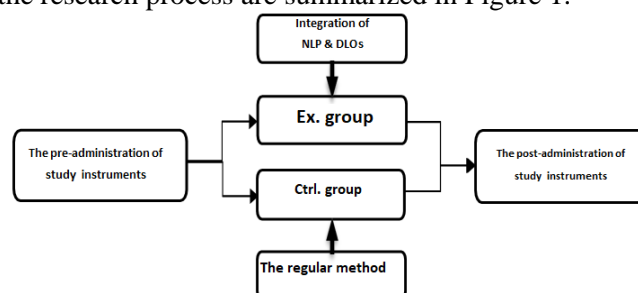


Figure 1. The quasi-experimental design of the study

#### 3.2. Participants

The participants of this study were intact classes chosen from the first year, Faculty of Engineering, Zagazig University, during the first term of the 2022–2023 academic year. The participants were divided into experimental and control groups, with forty students in each group. However, many variables were not involved in this study, such as stage environment, age, private teaching, gender, other uses of technological applications, etc.

#### 3.3. Instruments

Considering the study variables, the following instruments were designed and administered by the researcher:

##### *The dependent variables*

1. An EFL communicative competence questionnaire;
2. An EFL communicative competence pre-posttest;
3. An EFL communicative competence subcomponent scoring rubric;
4. An EFL linguistic awareness questionnaire;
5. Linguistic awareness pre/posttest and table of specifications;
6. An EFL linguistic awareness subcomponent scoring rubric.

Table 3. Comparing the post-communicative competence subcomponent results between the control and experimental groups

Test Domains	Groups	N	Mean	Std. Deviation	T-Test for Equality of Means		
					t	df	Sig.
Grammatical competence	Control	40	5.150	2.166	-8.517	78	Sig.
	Experimental	40	8.350	0.975			
Sociolinguistic competence	Control	40	4.675	2.004	-7.817	78	Sig.
	Experimental	40	7.625	1.294			
Strategic competence	Control	40	5.000	2.050	-8.730	78	Sig.
	Experimental	40	8.150	1.001			
Discourse competence	Control	40	5.050	2.111	-7.684	78	Sig.
	Experimental	40	8.050	1.280			
Total	Control	40	19.925	7.363	-9.723	78	Sig.
	Experimental	40	32.300	3.251			

Table 4. Pre-post results of the experimental group in linguistic awareness

Test Domains	Groups	N	Mean	Std. Deviation	t	df	Sig. (2-tailed)	h2	Effect size
Orthographic awareness	Pre	40	4.375	1.444	-18.564	39	0.01	0.898	High
	Post	40	8.225	1.025					
Morphological awareness	Pre	40	3.650	1.406	-15.122	39	0.01	0.854	High
	Post	40	7.700	1.244					
Phonological awareness	Pre	40	3.650	1.231	-20.916	39	0.01	0.918	High
	Post	40	8.300	0.939					
Syntactic awareness	Pre	40	2.850	1.424	-19.474	39	0.01	0.907	High
	Post	40	8.000	0.933					
Total	Pre	40	14.250	2.569	-35.017	39	0.01	0.969	High
	Post	40	32.400	2.790					

### 3.4. Verifying the Hypotheses of the Study

To register the advancement obtained by integrating neurolinguistic programming (NLP) and digital learning objects (DLOs) to develop communicative competence and linguistic awareness of the experimental participants' performance, the hypotheses of the study were examined. The following part documents the results of these hypotheses:

*The first hypothesis:* There was a statistically

significant difference at the 0.05 level between the mean scores of the experimental group in the pre-post administration of the communicative competence test in favor of the post one.

To compare the difference between the mean scores of the experimental groups' communicative competence subcomponent test before and after administering the program based on the integration of NLP and DLOs, the T-test was used.

Table 5. Pre-post results of the experimental group on the administration of the communicative competence subcomponent test

Test Domains	Groups	N	Mean	Std. Deviation	t	df	Sig. (2-tailed)	h2	Effect size
Grammatical competence	Pre	40	2.875	1.324	-19.421	39	0.01	0.906	High
	Post	40	8.350	0.975					
Sociolinguistic competence	Pre	40	2.450	1.259	-19.333	39	0.01	0.905	High
	Post	40	7.625	1.294					
Strategic competence	Pre	40	2.850	1.144	-25.311	39	0.01	0.942	High
	Post	40	8.150	1.001					
Discourse competence	Pre	40	2.850	1.026	-18.125	39	0.01	0.893	High
	Post	40	8.050	1.280					
Total	Pre	40	10.850	2.922	-30.613	39	0.01	0.960	High
	Post	40	32.300	3.251					

As detected in Table 5, there is a statistically significant difference at the 0.05 level favoring the post-administration (10.850) between the mean scores of pre-administration (32.300) of the communicative competence subcomponent test to the experimental group. The pre-standard deviation is 2.922, lower than the post-standard deviation (3.251). This means that the post-results of the experimental group were higher than those of the pre-results in favor of the integration of

NLP and DLOs. So, this hypothesis was valid.

*The second hypothesis:* There was a statistically significant difference at the 0.05 level between the communicative competence post-test mean scores of the experimental and control groups in favor of the experimental group. One-way ANOVA was used to confirm this hypothesis, and the results are documented in Table 6.

Table 6. Comparing the communicative competence subcomponent post-results between the control and experimental groups

Test Domains	Groups	N	Mean	Std. Deviation	T-Test for Equality of Means		
					t	df	Sig.
Grammatical competence	Control	40	5.150	2.166	-8.517	78	Sig.
	Experimental	40	8.350	0.975			
Sociolinguistic competence	Control	40	4.675	2.004	-7.817		

Strategic competence	Experimental	40	7.625	1.294	-8.730	78	Sig.
	Control	40	5.000	2.050			
Discourse competence	Experimental	40	8.150	1.001	-7.684	78	Sig.
	Control	40	5.050	2.111			
Total	Experimental	40	8.050	1.280	-9.723	78	Sig.
	Control	40	19.925	7.363			
	Experimental	40	32.300	3.251		78	Sig.

In Table 7, the mean scores of the experimental group (32.300) were higher than that of the control (19.925), group. Correspondingly, the experimental (3.251) standard deviation is higher than the control's (7.363). Thus, the experimental group exceeded the control group. A statistically significant difference at the 0.05 level was recorded between the whole attained mean scores of the experimental and control groups in favor of the experimental one of the post administrations of the communicative competence subcomponents test. This means that the post-results of the experimental group were higher than the pre-results in favor of the integration of NLP and DLOs. Also, among other variables not tackled by this study, they were vital in developing the participants' communicative competence. So, this hypothesis was valid.

Figure 2 shows that the mean scores of the experimental group were higher than those of the control group in the communicative competence subcomponents.

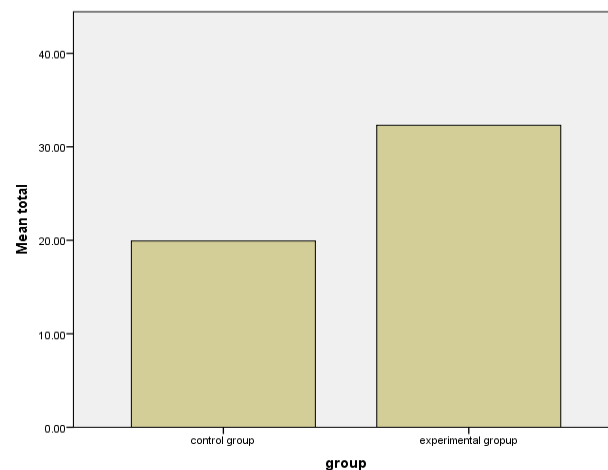


Figure 2. The communicative competence subcomponent post-results of the control and experimental groups

*The third hypothesis:* There was a statistically significant difference at the 0.05 level between the mean scores of the pre- and post-administration of the experimental group in linguistic awareness in favor of the post-administration. To test this hypothesis, the one-way ANOVA of the groups was used and documented in Table 7.

Table 7. Pre-post results of the experimental group in linguistic awareness

Test Domains	Groups	N	Mean	Std. Deviation	t	df	Sig. (2-tailed)	h2	Effect size
Orthographic awareness	Pre	40	4.375	1.444	-18.564	39	0.01	0.898	High
	Post	40	8.225	1.025					
Morphological awareness	Pre	40	3.650	1.406	-15.122	39	0.01	0.854	High
	Post	40	7.700	1.244					
Phonological awareness	Pre	40	3.650	1.231	-20.916	39	0.01	0.918	High
	Post	40	8.300	0.939					
Syntactic awareness	Pre	40	2.850	1.424	-19.474	39	0.01	0.907	High
	Post	40	8.000	0.933					
Total	Pre	40	14.250	2.569	-35.017	39	0.01	0.969	High
	Post	40	32.400	2.790					

Results in Table 7 reveal that the pre-mean score of the experimental group in linguistic awareness is 14.250. Nonetheless, the mean score of the post-administration was 32.400. It can also be noticed that the t-value for the overall test is -35.017. The S.D. of the pre-administration is 2.569, lower than that of the post-administration (2.790). This means an improvement in linguistic awareness with a significance value of 0.05 in favor of integrating NLP and DLOs. Also, among other variables not tackled by this study,

they are essential in developing the participants' communicative competence. So, this hypothesis was valid.

*The fourth hypothesis:* There was a statistically significant difference at the 0.05 level between the mean scores of the post-administration of the control and the experimental groups in developing linguistic awareness in favor of the experimental group. To test this hypothesis, one-way ANOVA of the groups was used and documented in Table 8.

Table 8. Comparing the post-results in linguistic awareness between the control and experimental groups

Test Domains	Groups	N	Mean	Std. Deviation	T-Test for Equality of Means		
					t	df	Sig.
Orthographic awareness	Control	40	5.825	1.465	-8.478	78	0.01
	Experimental	40	8.225	1.025			
Morphological awareness	Control	40	5.725	1.198	-7.231	78	0.01
	Experimental	40	7.700	1.244			
Phonological awareness	Control	40	6.000	1.432			



Syntactic awareness	Experimental	40	8.300	0.939	-8.493	78	0.01
	Control	40	5.900	1.498			
Total	Experimental	40	8.000	0.933	-7.522	78	0.01
	Control	40	21.750	3.0361			
	Experimental	40	32.400	2.790	-16.335	78	0.01

In Table 8, the mean score of the experimental group on the post-administration was 32.400, higher than that of the control group (21.750). The S.D. of the experimental group was 2.790 and outclassed that of the control group (3.36). This means that the experimental group's results were greater than those of the control one in favor of the administration of the integration of NLP and DLOs. Also, among other variables not tackled by this study, they were essential in developing the participants' linguistic awareness. So, this hypothesis was valid.

*The fifth hypothesis:* It was stated that the integration of NLP and DLOs would be effective in developing engineering participants' communicative competence of the experimental group.

The effect size was gauged by employing the paired sample t-test to compare the scores of the experimental group in the communicative competence subcomponents pre-posttest to validate this hypothesis. To authenticate this hypothesis, the paired samples were verified and presented in Table 9.

Table 9. The effect size of the experimental group in the pre-post communicative competence test

Test Dimensions	Groups	N	Mean	Std. Deviation	t	df	Sig. (2-tailed)	h2	Effect size
Grammatical competence	Pre	40	2.875	1.324	-19.421	39	0.01	0.906	High
	Post	40	8.350	0.975					
Sociolinguistic competence	Pre	40	2.450	1.259	-19.333	39	0.01	0.905	High
	Post	40	7.625	1.294					
Strategic competence	Pre	40	2.850	1.144	-25.311	39	0.01	0.942	High
	Post	40	8.150	1.001					
Discourse competence	Pre	40	2.850	1.026	-18.125	39	0.01	0.893	High
	Post	40	8.050	1.280					
Total	Pre	40	10.850	2.922	-30.613	39	0.01	0.960	High
	Post	40	32.300	3.251					

Table 9 shows that the effect size of the experimental group in the post-test was larger than the pre-scores in the communicative competence, as the effect size ranged from 0.89 to 0.96 for the overall variable. Therefore, this hypothesis was confirmed. These differences could be attributed to the integration of NLP and DLOs.

*The sixth hypothesis:* It was itemized that integrating NLP and DLOs would effectively develop engineering

participants' linguistic awareness of the experimental group.

To authenticate this hypothesis, the effect size was gauged by using the paired sample t-test to compare the scores of the experimental group in linguistic awareness subcomponents pre-posttest. To check this hypothesis, the paired samples were verified and presented in Table 10.

Table 10. The effect size of the experimental group in the pre-post linguistic awareness subcomponent test

Test Dimensions	Groups	N	Mean	Std. Deviation	t	df	Sig. (2-tailed)	h2	Effect size
Orthographic awareness	Pre	40	4.375	1.444	-18.564	39	0.01	0.898	High
	Post	40	8.225	1.025					
Morphological awareness	Pre	40	3.650	1.406	-15.122	39	0.01	0.854	High
	Post	40	7.700	1.244					
Phonological awareness	Pre	40	3.650	1.231	-20.916	39	0.01	0.918	High
	Post	40	8.300	0.939					
Syntactic awareness	Pre	40	2.850	1.424	-19.474	39	0.01	0.907	High
	Post	40	8.000	0.933					
Total	Pre	40	14.250	2.569	-35.017	39	0.01	0.969	High
	Post	40	32.400	2.790					

Table 10 shows that the effect size of the experimental group in the post-test was greater than the pre-scores in the linguistic awareness subcomponents test, as the effect size ranged from 0.85 to 0.96 for the overall variable. Therefore, this hypothesis was asserted. The differences in the participants' practices could be nominated to the integration of NLP- and DLO-based programs.

## 4. Results

Results of the current study are discussed concerning the study variables (communicative competence and linguistic awareness).

Traditional classroom teaching of English, which emphasizes the knowledge of system and integrity, bored the learners, and they were not interested in EFL communication. As EFL learners, they were reticent, passive, and completely molded in teacher-centered approaches. Parisi (2020) stated that a successful



communication class needs learner-centered approaches. They consider learners' backgrounds, language needs, and goals, allowing learners some creativity and role in instructional decisions.

Besides, choosing all the participants from the Higher Institute of Engineering and Technology turned out to be relevant when they got low scores in the communicative competence pretest that was administered after randomly dividing the participants into two groups before administering the integration program.

The present study proved a statistically significant difference between the mean scores of the experimental group on the pre-post-communicative competence test, in favor of the post-test results. This means that integrating the NLP techniques and models with digital learning object applications increased the participants' communicative competence as they explored their feelings, emotions, opinions, ideas, experiences, and linguistic knowledge freely while communicating in online groups and classroom sessions.

They were encouraged to communicate in a non-evaluative or critical way. Generally, EFL learners usually feel depressed when they are unable to communicate or express what they wish in English, but the tested program here allowed expressions that they were yet unable to construct easily when the communicative situation calls for them. The researcher built with them an effective learning environment through nurturing contexts for language communication evoking their feeling to speak, talk and express their personal experiences. Neurologically, the brain must be free from threat or stress (Halimah, 2018). This is what happened to the participants of the communicative language learning group.

They were studying the language through activities closely related to their feelings and lives (talking about their neighbors, a new friend in the classroom, their engineering study, a department of engineering they dream of joining, a dream they want to tell others about, etc.), and the researcher gave them confidence and respect to practice English communicatively in a non-defensive manner. Moreover, students helped each other, corrected their mistakes, analyzed their writings and conversations with each other, and were involved in activities (translation, group work, recording, transcription, analysis, free conversation reflection and observation) that helped them develop and enhance their communicative components and sub-components.

This result supports Lundine and Hall's (2020) statement that these activities can increase students' communication competence. Students enjoy, have fun, and become responsible in learning through these activities. They took the role of the teacher when they were asked to correct their mistakes. Their work in groups was psychologically beneficial, they were not afraid of making mistakes during speaking or writing, and they were courageous enough to put their hands on their own mistakes and correct them. One of the NLP techniques is modeling, which helped them spell the

words correctly and loudly in records after listening to videos about different topics (Gran, 2021).

In addition, the results revealed that the integration program achieved high scores on the linguistic awareness post-test results. The digital learning objects involve different activities such as translation, transcribing, conversation analysis and recording that develop the participants' linguistic awareness. In their groups, they recorded their conversations and then began to transcribe and analyze them. This continuum of activities provided the opportunity to reflect upon and think deeply about it. They learned to correct, describe, and explain their written or spoken language errors. They recognized that language consists of the knowledge and awareness of phonemes, syllables, rhymes, and morphology.

The results of the statistical treatment of the raw data revealed a statistical difference between the mean scores of the integration program on the pre-post Linguistic awareness test in favor of the post-test results. This higher achievement might be due to the effect of meta-modeling and anchoring techniques. The participants also began to analyze phrases so they could understand their construction lexically, what they mean, and how they might be used (phonemic, morphological, semantic, and syntactic knowledge).

Finally, participants had to make new texts (written or spoken). In each session, participants not only understood those collocations but could make some basic generalizations about them (supplying some slotfillers, knowing more words/chunks, and being more able to detect possible errors in these lexical chunks). This method emphasized linguistic knowledge and awareness for the students.

## 5. Discussion

Concerning results of communicative competence subcomponents:

1. Through scanning, the participants focused on discovering particular answers or ideas that serve their needs.

2. It can be concluded that the experimental group realized an observable development in inferential reading skills after being trained in the proposed program. They achieved many goals:

- a. As for "Utilizing the word formation," the experimental group used the table in the lesson plan to practice word formation, e.g., motor + hotel.

- b. "*Formulating sentences from words and groups of sentences by observing semantic and formative relations*": The participants expressed that while administering the program, they could form correct sentences using the diagram, the video about word groups, definitions of nouns and verbs, and embedded examples.

- c. "*Using synonyms to give similar meanings of a word or phrase*": A skill developed immensely by the participants who mentioned that the chosen videos about synonyms eased their understanding of definitions of synonyms, their uses, brainstorming

strategy, pictures, and examples.

d. *"Using spelling and punctuation rules correctly"*: The participants mentioned that they have built correct knowledge and usage about spelling and punctuation rules through fabricated mind maps created by the researcher, videos, diagrams, and linguistic tools through interactive whiteboards such as online dictionaries.

e. *"Using forms of language and functions properly"*: The participants properly comprehended the derivational morphology of nouns and (personal) functions through morphological analyzers, augmented reality, examples, drills, and videos to state meaningful parts of words, i.e., prefixes, suffixes, and roots.

f. *"Selecting suitable verbal and nonverbal (e.g., gesture, expressions, body language) means of expression in an everyday situation"*: Spoken and written communication was enhanced using digital video tools, part-of-speech, examples, drills, and ADDIE model steps. Even the participants said they managed to think before speaking and use precise language.

g. *"Expressing a specific language attitude (e.g., courtesy, friendliness, offering, apology, thanking, agreeing, opinions, and respect)"*: This component helped the participants to check their understanding of important information. At the same time, they read and make clues or text evidence to figure out more about story parts, develop their attitude, use positive words, use general thank-you phrases, create a friendly environment in classes, and think before speaking.

h. *"Utilizing convincing expressions to others"*: The participants could use convincing expressions and words with others through symbolic mirroring, using storytelling to convince others and examples. They also practiced convincing vocabulary such as "persuade", "assure", "prompt", "get", "satisfy", "prove," and "brainwash."

I. *"Administering convenient words for a situation"*: This skill was developed through explanations, examples and pictures. The participants could surf the internet to find suitable words for situations such as working in workshops, garages, and welding areas.

J. *"Using proper register (formal and informal) in speech"*: Some participants were asked to create a list of formal registers for professional writing. Others were asked to fabricate informal registers for conversations, examples, and differentiations between colloquial languages in movies standard in the study books.

K. *"Using non-linguistic means, gestures, or written symbols to constitute the language"*: In non-linguistic means, the participants used comprehension strategies and research- and inquiry-oriented learning methods and aids such as pictures, videos, and drills to manage sounds, gestures, facial expressions, signs, objects, and signals (Danger, Warning or Caution, Toxicity Stickers).

L. *"Employing paraphrasing to express an idea of a written or spoken material."*

Explanation steps and drills eased practicing paraphrasing.

c. *"Utilizing synonyms to substitute words for the speakers"*: Explanations, videos, and drills eased understanding the correct use of synonyms.

d. *"Using approximation to describe or exemplify the target object or action."*

The participants used an integrated strategy: referring/anchoring, video conferencing, drills, examples, and explanations to use simpler processes or models and make calculations easier. Also, they mentioned that they could not approximate before adopting the program.

e. *"Using definitions to state the exact meaning of a word"*: When administering the program, participants began to utilize dictionaries, videos, and drills to define words of their expressions.

f. *"Understanding a range of spoken texts in English"*: The participants found it easy to understand conversations via watching videos about different dialogues, drills, and examples.

G. The results of the recent study revealed that the experimental group, studied through a program based on the integration of NLP and DLOs, performed better than the control group in the post-administration of the communicative competence subcomponent test, as there were statistically significant differences at 0.05 between the mean scores of the control and the experimental groups in favor of the latter.

The participants' progress in the post-administration of the communicative competence subcomponent test could be attributed to the fact that while using the program based on the integration of NLP and DLOs, they were interested in practicing different attached topics of their syllabus.

The results of the recent study indicated that the experimental group excelled the control group in the post-administration of the linguistic awareness subcomponent test. The statistical results revealed statistically significant differences between the means of scores of the experimental group in their posttest performance equated to the pre-administrations, favoring the post-administration. The means of scores of the experimental group in the test were greater than those of the control group. Thus, the significant difference in the post-administration of the test is because of the experimental group's practicing the program based on the integration of NLP and DLOs.

Assisting students with a collection of aids such as videos, pictures, figures, diagrams, and drawings, integrating NLP and DLOs, ADDIE model steps, and activities of the program improved their communicative competence and linguistic awareness. Also, they had the opportunity to interrelate with each other and respond to the material delivered to them.

Through that interaction, they created a cooperative environment in which less emphasis was placed on conveying information from the teacher to the participants. Even the participants' attitudes were

noticed that they have encouraging attitudes toward communicative competence. They changed the method they felt about it. Giving them topics related to the lessons has increased their involvement and motivation and enhanced their communicative competence. Participants practiced with higher interest and satisfaction as they were engaged in topics that interested them. By the end of the experiment, the experimental group had achieved a high level of reading and writing skills. They enjoyed writing patterns of specific letters as words, stating the meaning of a particular abbreviation, identifying the accurate spelling of words, stating what a particular symbol means, and spelling sentences properly.

On the other hand, the control group participants who did not gain the chance to participate in the treatment did not show much advance in their communicative competence and linguistic awareness. The results of the study agree with Bin-Hady's (2017) and Abdulkader's (2019) results.

This study asserted the effectiveness of NLP in enhancing various fields. Zoghi (2017) and El Masry (2021) mentioned that NLP helps to preserve and transform thinking skills, sees the tracks to dealing with others, and understands how they think and feel. This study asserted the effectiveness of DLOs in enhancing various fields. Ford (2015), Jeong (2018), and Vurdien (2019) asserted that DLOs are suitable instruments and strategies that make the process of applying learning objects as seamless and flexible as possible. Research has been initiated to explore the instructional design implications of reprocessing learning objects. The results of this study drive other studies to be merged into learner-centered approaches and constructivist learning (Milutinović et al., 2015). Moreover, it referred that one of the best practices for teaching communicative competence can be achieved through designs in the structure of templates and wizards.

The results of this study provide a supplementary hint to other studies that designated the effectiveness of using Google tools such as Microsoft Word and Google Docs to enhance reading and writing skills. Furthermore, Zoghi (2017) probed the effect of NLP strategies to develop different learning styles and listening comprehension. In addition, Farahani (2018) used NLP techniques to improve the EFL reading comprehension of Iranian undergraduate learners with an ESP course.

To outline, this study asserted that using the program based on integrating NLP and DLOs effectively enhances engineering students' communicative competence and linguistic awareness.

## 6. Conclusion

Referring to the obtained results of this study, it is concluded that:

1. This study documents evidence that EFL engineering students' communicative competence can be experimentally enhanced via a program based on the integration of NLP and DLOs;

2. This study proves that linguistic awareness can be experimentally enhanced as realized among EFL engineering students via the integration program based on NLP and DLOs;

3. Teaching EFL communicative competence and linguistic awareness through the integration program brings remarkable learning outcomes, i.e., confidence and raising participants' attitudes;

4. The participants can categorize scientific idiom meanings and expressions from their courses through program activities;

5. Integrating some strategies and applications, such as employing morphological analyzers, augmented reality, and ADDIE model steps, helped students identify the root of the word, state the place of the affix, introduce the meaning of the prefix, and identify the meaning of the suffix;

6. Integrating some strategies and applications such as; using digital video tools and part-of-speech and ADDIE model steps assisted students to understand explanatory videos about the course topic;

7. Many activities are executed to read single speech sounds and blend them into whole words, read and segment the word into single phonemes, read and write down the sound that shares all words, and decide whether the words rhyme;

8. The program facilitates processing words when providing information to students;

9. The integrative strategies of the program enable the participants to acquire knowledge and subcomponents of integrating strategies and DLO applications;

10. Using the program based on the integration advance brainstorming, using online dictionaries, utilizing different strategies in teaching such as; providing linguistic tools (hierarchies of linguistic tools), providing thinking tools (representations, brainstorming, mind maps, graphs and graphical function) and sentence splitters (the process of dividing the text into sentences).

Conclusively, academic application of NLP strategies such as referring, anchoring, and modeling with DLO techniques and applications during teaching EFL to engineering students helped them to remove the fear and tension from communicating in English and made them accept learning the language and even enjoy it. These applications were in particular online classes through various social media means. Employing the ADDIE model steps helped students navigate subcomponents of communicative competence and linguistic awareness and regulate their learning phases. In addition, the program established a rapport and built interpersonal contact between the researcher and students through interaction, support, and empathy.

## 7. Recommendations

Rendering on the related yields, this study recommended the following:

1. Communicative competence should receive appropriate attention at the university stage;

2. Linguistic awareness deserves much attention in reading the EFL scientific courses for getting the core of the foreign language;
3. Syntactic awareness should be delivered to faculty scientific courses as it is needed in all stages;
4. Neurolinguistic programming strategies, digital learning object applications, and ADDIE model steps in the program should be combined in the curriculum to teach morphological awareness to university students;
5. Not only communicative competence should be manipulated inside the classroom but also students should be evaluated regularly to state their needs;
6. Designers of the EFL curriculum need to be integrated into administering programs based on the integration of NLP and DLO theories in the EFL books;
7. Lecturers must be trained to adopt different strategies and applications in teaching and evaluation;
8. Encouraging EFL students to use DLO applications such as interactive whiteboards and blog posts and introducing active learning to study science courses;
9. Communicative competence and linguistic awareness need to be presented to engineering students;
10. More interest should be given to enhancing EFL classrooms with various integrative programs;
11. Involving EFL participants in using DLO applications such as computerized environments (computer machinery, data storage devices, workstations, software applications and networks) can ease learning and administering the lessons;
12. Lecturers should be qualified to use digital video tools (shoot photos, shoot videos, keep records, digital photographic art, and record a meeting or an event). Digital video can be stored on digital media such as Blu-ray Disc, computer data storage and streamed over the Internet, desktop computer screen, or a digital smart TV in teaching and testing.

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