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On Acculturation and the Teaching of Scientific Terminology in ESP: A Case Study

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ABSTRACT: *This paper investigates the issue of acculturation and the teaching of scientific terminology at tertiary level, pointing out certain problems not sufficiently addressed namely with ESP engineering students at preparatory level in the ESSTT (Ecole Superieure des Sciences et Techniques de Tunis) in Tunisia. Specifically, the paper investigates the extent to which the ESP course provided has offered an adequate setting for the teaching of scientific terminology in its cultural context. To this end, a teachers' questionnaire was provided to evaluate ESP teachers in the institute on certain views on language and culture. Furthermore, three tests on three different but related specific fields in science were distributed to students of four groups in three weeks time, each for two hours per week. The results of the questionnaire and the tests revealed that the ESP course proposed at this institute can make the grounds for the subjects being operational in the ESP they need but with an insufficient account for the scientific terminology in its cultural context. At last, the paper ends up with a number of conclusions and recommendations about fostering cultural studies in ESP and/ or advocating culture based activities with regard to scientific terminology.*

Keywords: *ESP, scientific terminology, scientific culture, acculturation*

I. INTRODUCTION

Over the past few decades, English for Specific Purposes (ESP) has matured into a viable and vigorous movement within the field of Teaching English as a Foreign Language (TEFL) gaining thus ground alongside steady developments in science, technology, and world business. The globalization of world business triggered the teaching of ESP in terms of discursive features i.e. developing operational competence in a specific field, such as medicine, business, finance or technology. Raising the ESP course to a par with other language teaching courses has been a paramount concern, using 'educational variables'. However, social and cultural variables have been partially neglected. As a consequent result upon the fact that the cultural aspect has been marginalized, the discursive nature of scientific terminology as problematic and culture-bound has received similar concern.

Teaching the vocabulary of a new language involves exposing learners to new concepts and values. This means that learners in non-native English speaking environments may display their lack of cultural knowledge of learned concepts for the 'most obvious influence of language and culture on thought is that of vocabulary' (Valdes, 1986). Thus, this paper attempts to investigate the proficiency level of operational competence of four groups of first-year preparatory students. They were students of mechanical engineering whose English program includes a number of science specific related fields. There is an attempt as well to explore some aspects of ESP teaching in general and the teaching of scientific terminology in particular in one of the Tunisian settings.

II. RESEARCH BACKGROUND

One of the misconceptions that have permeated foreign language teaching in general and ESP in particular is the conviction that language is merely a code regardless of the social dynamics that undergird it which is behind misunderstanding and cross-cultural miscommunication (Kramsch, 1993). Any language user should not learn words simply as lists of meanings (vocabulary) and rules of bringing them together (grammar and syntax) but should learn these language patterns within their cultural background. In general, an interest in including culture learning into the foreign language curriculum and into learners' repertoire and outlook on life has emphasized the role of context and the circumstances under which language can be used accurately and appropriately (Kramsch, 1993).

Given that language and culture are inseparable,[1] language teaching requires a thorough analysis of language through culture and culture through language. Such interdependence may have crucial implications for

[1] The Sapir-Whorf hypothesis [named after Edward Sapir (1884-1939), US anthropologist and linguist, and Benjamin Lee Whorf (1897-1943), US linguist] states that language has a direct bearing on how we think about the external world of reality.

language teaching which enhances the implementation of culture-based activities. Needless to say, most teachers and students seem to lose sight of the fact that knowledge of the grammatical system of a language (grammatical competence) has to be complemented by understanding culture-specific meanings (communicative and/or cultural competence) (Byram et al. 1994).

To be less general and more specific, among the fundamental issues that ESP teachers are most likely to neglect is that the lexis of science is problematic and culture-bound (Lowe, 1992 and 2009). With regard to problems associated with the teaching of lexis in ESP, it is observed that a lucid nomenclature to describe different word levels in the language of science is absent (Lowe, 1992). Besides, the difficulty ascribed to one word level referred to as *Mixed*[2] (Lowe, 1992, 2009) and widely known as sub/semi-technical (e.g. Cassels and Johnstone, 1987 and Trimble, 1985) was not fully explored. Granted the above, the present enquiry addresses the issue mentioned above with one major claim; to link deficiency in learning the lexis of science to lack of cultural awareness. In fact, the following description of basic terminology in the language of science may facilitate our understanding of the matter in question:

Term	Meaning	Example	Language
Non-Specialized **words which although they are used in science, do not have a meaning specific to science.** ***mot usuel***	**Common** **Everyone knows these meanings**	**water**	**Non-scientific**
'Mixed' [sub-technical, semi-technical] **words which have both a common usage in ordinary situations and a different and precise usage in science, e. g 'cell'** ***mot technique déguisé***	**Common** **and** **--------------------** **Specific** **i.e. two meanings in one word**	**cell** **force** **pragmatic =practical** **linguist = knows many languages** **-----------------------** **cell** **force** **pragmatics(a subject in linguistics)** **linguist = knows about languages**	**--------------** **scientific**
Specialized **Technical words used only in science.** ***mot technique***	**One meaning (ideally)** **Science only** **Tend to be known by subject specialists, and by ordinary people when there is no other alternative**	**Bacterium**	

Table 1. Basic terminology in the language of science (Lowe, 2009)

According to Table 1, there is a distinction between three levels of words:[3]

1. Words used in science with no specific meaning (e.g. water)
2. Words commonly used in ordinary situations but with a specific meaning in science (e.g. cell)
3. Words analyzed in science and having a specific meaning in it (e.g. bacterium).

The majority (e.g. Cassels & Johnstone, 1987 and Lowe, 1992) agree that the second level of vocabulary is what constitutes some sort of a mental block for learners, whatever interpretation of it is held. Therefore, it is presumed that learners are less operational with this level.

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[2] *Mixed* (Lowe, 1992), widely known as semi-technical or sub-technical, is referred to here because it is descriptive to tell that these words tend to have mixed meanings across various contexts.

[3] See Lowe (2009) on the following website: www.scientificlanguage.com/esp/terminology/pdf

III. STATEMENT OF THE RESEARCH PROBLEM/QUESTIONS

This paper could be defined as an attempt to determine how important and necessary is the teaching of scientific terminology within its cultural context to ESP learners. One of the crucial issues examined is why despite recent attention and emphasis among EFL/ ESP practitioners on certain matters,[4] ESP at tertiary level encounters certain problems not sufficiently addressed namely in my country (Tunisia). As such, ESP engineering students at preparatory level in the *ESSTT* (*Ecole Superieure des Sciences et Techniques de Tunis*) were targeted for testing on their proficiency level in scientific terminology. Their teachers were subject as well to fill in a questionnaire to clarify their overall approach to the teaching of ESP in general and scientific terminology in particular. As such two vital questions guided most of the procedures in this enquiry:

1. Do ESP learners in Tunisia struggle to understand the scientific terminology of their ESP course namely the presumed word level two (i.e. *Mixed* words)?
2. Is cultural awareness developed among them? If not; what culture setting is suitable for teaching them the scientific terminology of their target language needs?

IV. METHODOLOGY

The research was carried out in the *ESSTT*. The research sample comprised four groups of first-year preparatory students of mechanical engineering, named A, B, C, and D. Each group consisted of about 37 students but the number of regular attendants was 25. The results were not primarily treated on a gender basis. For that reason the analysis shows no relevant disparity between male and female students. Data collection was based on tests for students and a questionnaire for teachers. The acquired data from the tests was tabulated and analyzed by descriptive and analytical statistics to satisfy the validity and reliability criterion.

4.1. Tests for students

Three tests were designed to check the students' overall proficiency level of operational competence in scientific terminology (*Mixed* words present the focal point of interest for reasons already discussed in the research background section). A collection of three texts derived from the internet were selected for they constitute an integral part of the students' program. Each text was distributed individually followed by a set of four proposed tasks, but two hours were allotted each for all texts (see Appendix I for the texts followed by the tasks)

4.2. A Questionnaire for Teachers

A questionnaire was designed for teachers dealing with some aspects of ESP teaching in general and scientific terminology in particular. The questionnaire aimed to reveal possible solutions to overcome the hurdle of learning scientific terminology and gain benefits from that. The questionnaire consisted mainly of closed questions; yet the teachers were left with an option of multiple answers to some of the most important questions (see Appendix II for the statement of the questionnaire).

V. PROCEDURES

A study was carried out at the *ESSTT*[5] with first-year preparatory students, whom I taught during the academic year 2008-2009. They were learners aged over 19 whose pre-university background in the domain of ESP was not so promising. Therefore, what their English teachers offered them in their course for the preparatory year of their academic study could be decisive for their final outcome.

The first step in carrying this enquiry was data collection using tests for students and a questionnaire for teachers. The tests were designed on purely aspects of scientific terminology. However, the questionnaire was administered to reveal about miscellaneous aspects related to the teaching of ESP with a gradual move to the aspect of scientific terminology and cultural awareness. Moving in this direction, from general to specific, constitutes a gradual intrusion into the more specific aspects of the English language necessary for their academic studies and future careers. The following flow chart describes the procedures pursued in this investigation:

[4] Needs analysis, syllabus design, in-service and pre-service teacher training are popular among ESP practitioners.

[5] General information about this institute is available on the following website: www.esstt.rnu.tn/utic

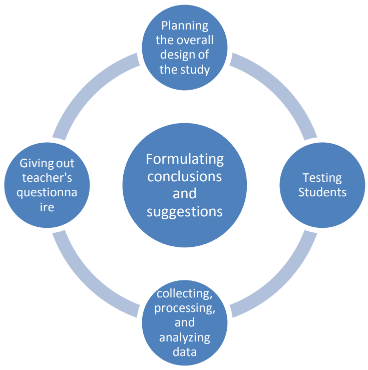

Figure 1. A flow chart of a five-step procedure

VI. RESULTS

The results obtained from the tests are described below statistically. There are two sides of analysis; one for descriptive statistics, the other for analytical statistics. Both sides inform each other. Altogether, they provide a clear description of the results and contribute directly to its validity and reliability

6.1. Results from the tests

6.1.1. Side one: Descriptive statistics of the acquired data

Test One (Scientific Forms of Energy)

	Task 1	Task 2	Task 3	Task 4
Group A	8.9 (3.2%)	12.2 (2.8%)	10.7 (2.5%)	5.1 (4.7%)
Group B	8.6 (2.4%)	10.8 (2.7%)	10.8 (3.0%)	4.0 (3.7%)
Group C	9.6 (2.8%)	10.1 (2.9%)	10.3 (2.7%)	4.4 (3.1%)
Group D	9.8 (2.7%)	12.1 (2.6%)	10.8 (3.2%)	4.7 (3.5%)

Table 2. Group mean and standard deviation per task

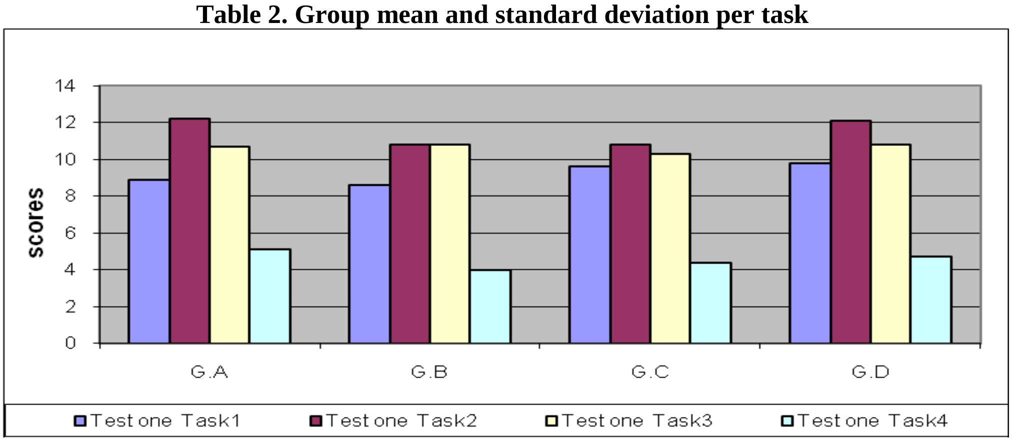

Figure 2. The distribution of mean scores in each group per task

According to Table 2, the mean scores in Task One are relatively low. However, in Task Two the performance is rather positive. Similar results are obtained in groups A (12.2) and D (12.1). In Task Three, the results obtained across the four groups indicate similarity; the difference is not remarkable. The results in Task Four show a regular sharp fall on the scale. In order to measure the extent to which the scores vary from the mean, standard deviation is calculated. Statistically speaking, the higher the standard deviation is, the more different the scores from one another become (the case here). The tabulated data is converted to a statistical graph in which speculation about the results are made clear.

Test Two (Searching and Seizing Computers)

	Task 1	Task 2	Task 3	Task 4
Group A	9.4 (2.6%)	11.9 (2.3%)	9.7 (4.0%)	5.6 (4.3%)
Group B	9.2 (2.8%)	12.2 (2.5%)	10. (14.0%)	5.5 (4.3%)
Group C	9.3 (3.0%)	11.7 (2.2%)	10.4 (3.4%)	5 (4.3%)
Group D	8.5 (3.4%)	11.6 (2.5%)	8 (4.3%)	2.7 (2.9%)

Table 3. Group mean and standard deviation per task

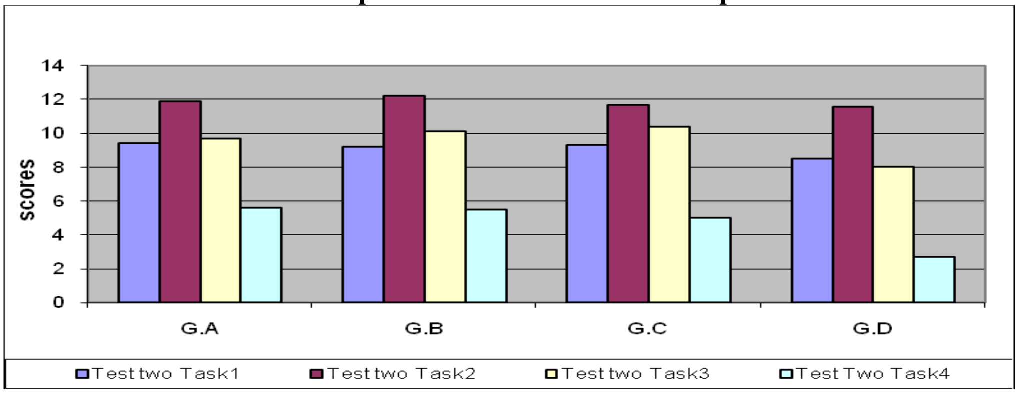

Figure 3. The distribution of mean scores in each group per task

The obtained results in Test Two do not deviate from the results found in Test One and Test Three. No discrepancy could be detected as the performance in Task One is always relatively low and extremely low in Task Four, while it indicates a slight change in Task Two and Task Three. Significant results can be documented basically with the standard deviation that signals systematically a negative performance. Figure 4 presents the results in Table 3 in the form of a statistical graph to clarify the differences and deviations.

Test Three (Automation)

	Task 1	Task 2	Task 3	Task 4
Group A	7.9 (3.5%)	11.5 (3.0%)	9.7 (3.2%)	4.8 (4.8%)
Group B	8.5 (2.8%)	11.8 (2.7%)	10 (2.7%)	3.9 (4.4%)
Group C	8.3 (3.1%)	11.9 (2.7%)	9.1 (3.4%)	3.4 (4.2%)
Group D	9.3 (2.7%)	11.3 (2.6%)	10.9 (3.8%)	3.6 (4.4%)

Table 4. Group mean and standard deviation per task

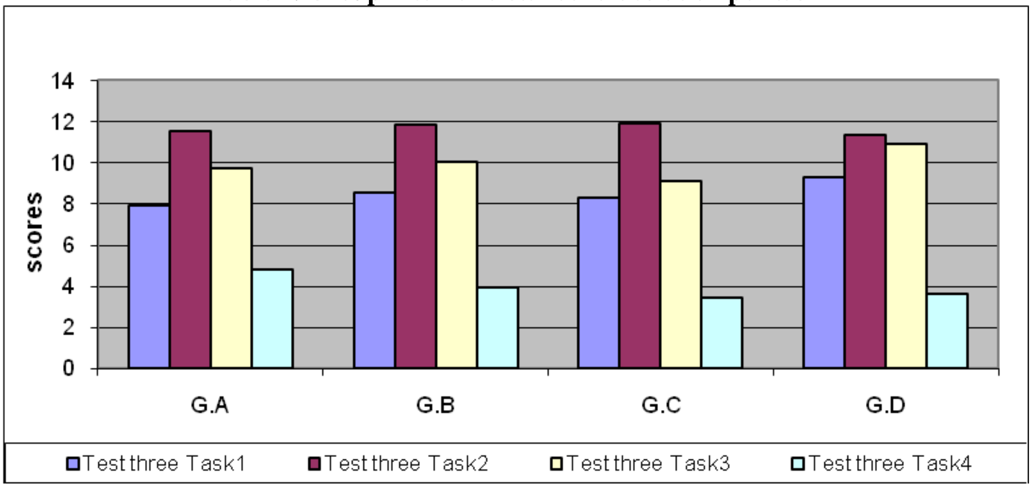

Figure 4. The distribution of mean scores in each group per task

It is observed from Table 4 that the mean scores in Task One are very low basically with group A. The standard deviation shows significant results that indicate a rather low performance. The performance is positive in Task Two with all groups. In Task Three there is a decline, while group D is the exception. The performance in Task Four indicates a sharp fall on the scale. Figure 4 makes clear the difference and similarity identified.

Correction Coefficients

Correlation coefficients are used here to measure the degree of correlation and/or statistical relationship between two observed data value (Appendix III shows the raw scores in the three tests). By way of illustration, the figures below illustrate the distribution of raw scores across Task One and Task Four in the three tests.

A diagrammatic representation of correlation coefficients in Test One

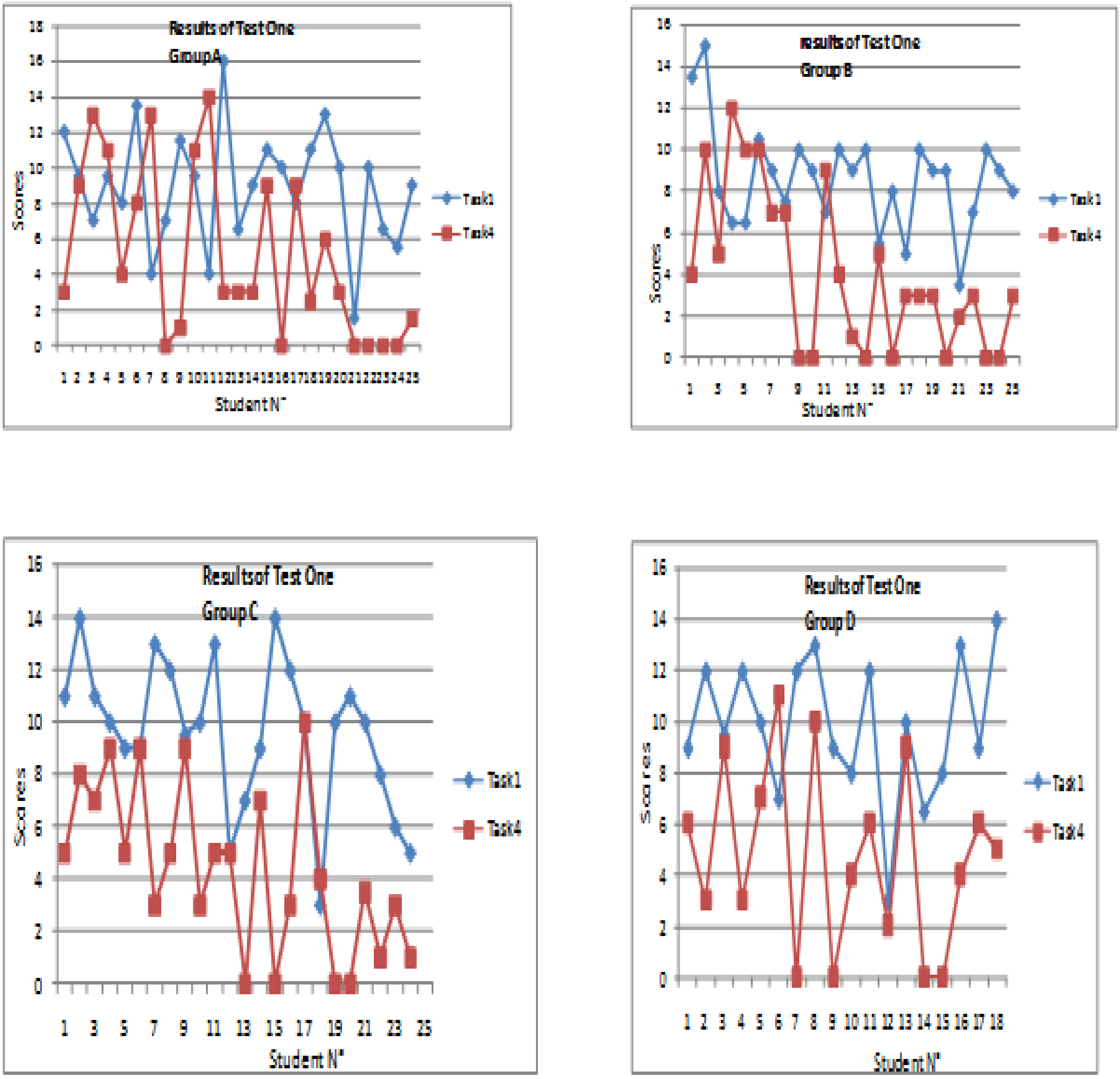

Figure 5. A comparative distribution of raw scores between Task One and Task Four in each group

Significant results can be documented in terms of correlation coefficients in Test One. Since the correlation coefficients are sensitive to a linear relationship between the two data value, the general tendency is geared towards a weak correlation, despite instances of strong correlation.

A diagrammatic representation of correlation coefficients in Test Three

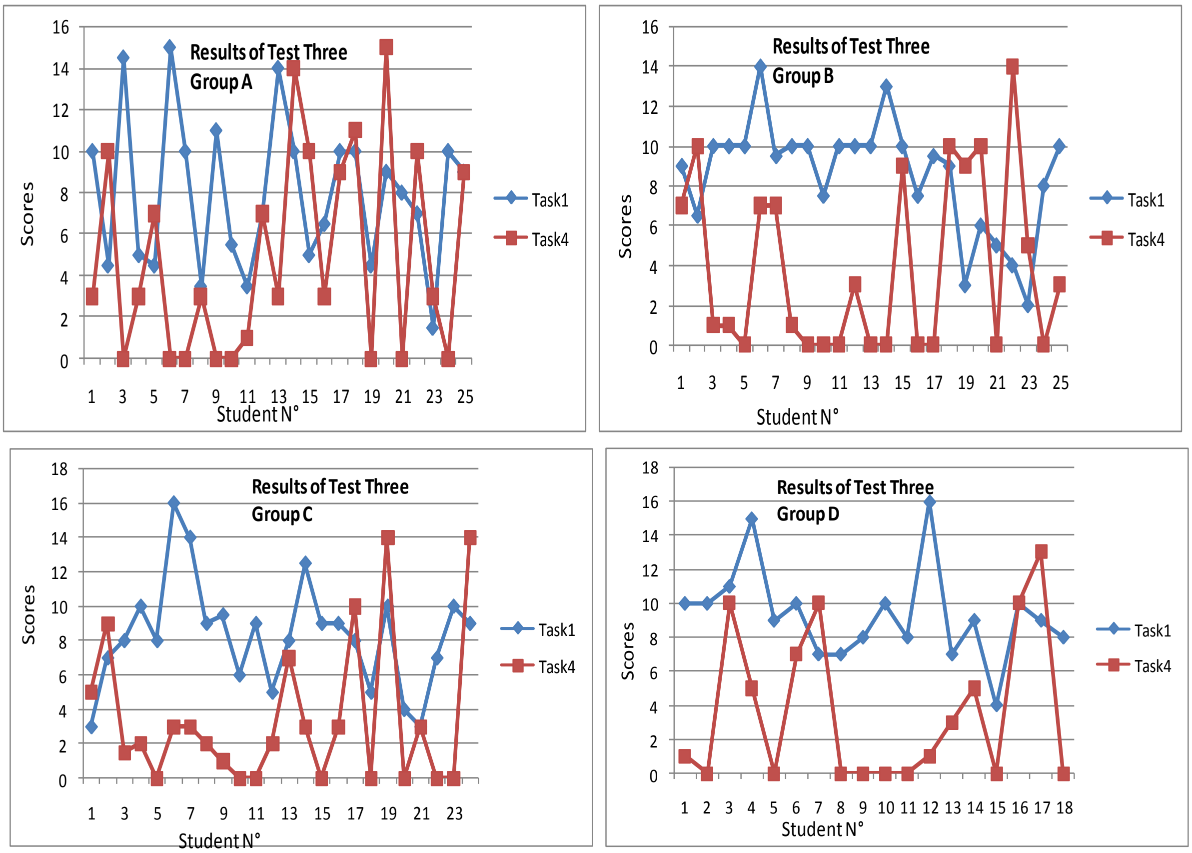

Figure 6. A comparative distribution of raw scores between Task One and Task Four in each group

Similar results are observed in Tasks Three and One. It is remarkable that the correlation is extremely negative with group A in both tests. It is also low with groups B, C and D in both tests.

A diagrammatic representation of correlation coefficients in Test Two

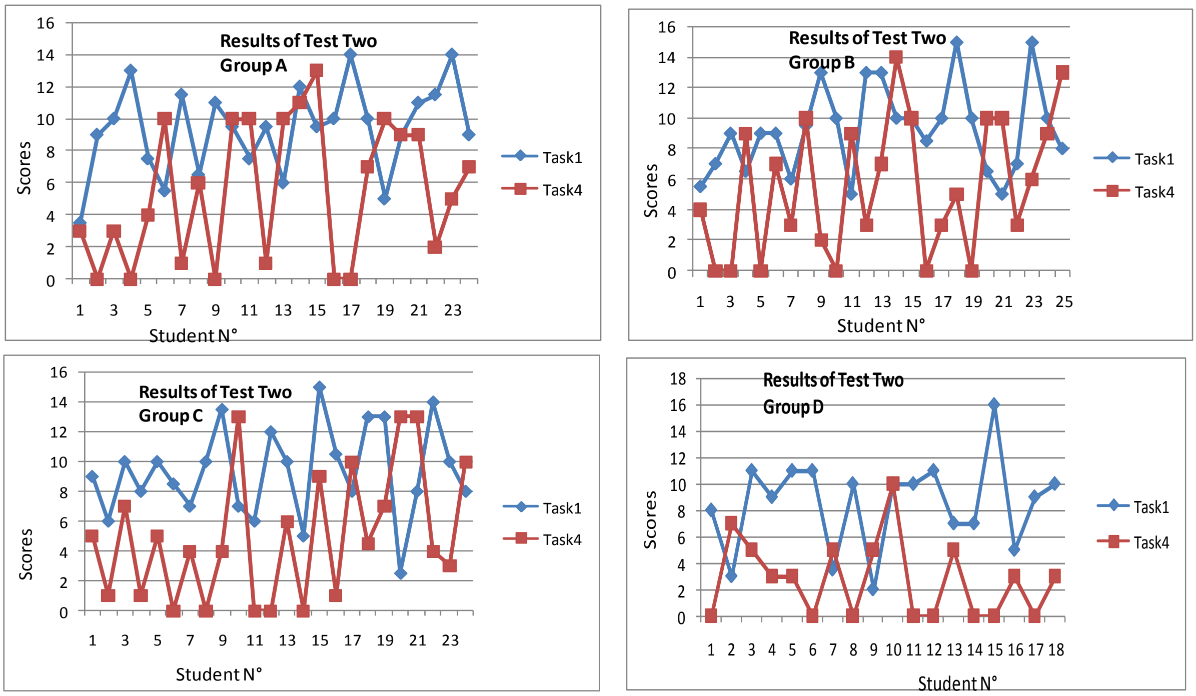

Figure 7. A comparative distribution of raw scores between Task One and Task Four in each group

As far as Test Two is concerned, there is no excellent linear reliability attested in the two tasks. When compared with the situation in Tests One and Three, Test Two is found to signal a change in terms of a linear regression. To wrap up, correlation coefficients are useful in that they indicate the predictive relationship that can be exploited in practice. Therefore, the negative correlation that is observed for the three tests is indicative of the degree to which data values conform to an expected norm of evaluation.

6.1.2. Side two: Analytical statistics of the acquired data

For analytical statistics, the test for Equality of Means is selected to determine whether, for a given test, two population means are equal or not. The test consists in calculating the amount of *t.obs* for the individual scores of each group then comparing the *t* distribution determined by the table of Student's *t* distribution.

We reject the null hypothesis (H_0) when the two means are equal .i.e. we reject the null hypothesis when two population means are different at the 0.05 significance level. We accept the null hypothesis (H_0) when the two means are not. See the following calculation of the amount 't_{Obs}' between G_A and G_B

$$t_{Obs} = \frac{|\overline{X_{GA}} - \overline{X_{GB}}|}{\sqrt{\frac{SCE_{(d)}}{n.(n-1)}}}$$

Where $\overline{X_{GA}}$: The mean in group A

$\overline{X_{GB}}$: The mean in group B

$SCE_{(d)}$: The sum of the differences is equal to:

$$\sum_{i=1}^{n} d_i^2 - \frac{1}{n}\left(\sum d_i\right)^2$$

n: number of students per group

Test One

	Groupes		
	GA-GB	**GA-GC**	**GA-GD**
t.obs Task1	0,483	0,690	0,733
t.distribution	2,064	2,064	2,064
H0	Unequal	Unequal	Unequal
t.obs Task2	1,658	2,180	0,076
t.distribution	2,064	2,064	2,064
H0	Unequal	**Equal**	Unequal
t.obs Task3	0,140	0,484	0,086
t.distribution	2,064	2,064	2,064
H0	Unequal	Unequal	Unequal
t.obs Task4	1,328	0,728	0,858
t.distribution	2,064	2,064	2,064
H0	Unequal	Unequal	Unequal

Test Two

	Groupes		
	GA-GB	**GA-GC**	**GA-GD**
t.obs Task1	0,275	0,761	0,747
t.distribution	2,064	2,064	2,064
H0	Unequal	Unequal	Unequal
t.obs Task2	0,452	0,833	0,644
t.distribution	2,064	2,064	2,064
H0	Unequal	Unequal	Unequal
t.obs Task3	0,519	0,552	1,373
t.distribution	2,064	2,064	2,064
H0	Unequal	Unequal	Unequal
t.obs Task4	0,122	0,557	2,525
t.distribution	2,064	2,064	2,064
H0	Unequal	Unequal	**Equal**

Test Three

	Groupes		
	GA-GB	**GA-GC**	**GA-GD**
t.obs Task1	0,915	0,419	1,237
t.distribution	2,064	2,064	2,064
H0	Unequal	Unequal	Unequal
t.obs Task2	0,359	0,415	0,172
t.distribution	2,064	2,064	2,064
H0	Unequal	Unequal	Unequal
t.obs Task3	0,542	0,648	0,848
t.distribution	2,064	2,064	2,064
H0	Unequal	Unequal	Unequal
t.obs Task4	0,882	0,982	0,883
t.distribution	2,064	2,064	2,064
H0	Unequal	Unequal	Unequal

Table 5. Comparison of group means through the test for Equality of Means

One can conclude that in the three tests the mean for Task Four is well below the means for other tasks. Besides, in the three tests the four groups have approximately the same means for Task One and the same means for Task Three. However, the means for Task Two of group C in Test One is statistically different from those of other groups. Even more, the mean for Task Four of group D in Test Two is statistically different from the means of other groups.

6.2. Results from the questionnaire

Question 1: All respondents answered that they had not any pre-service or in-service training in ESP.

Question 2: All of them agreed that ESP teachers need to have prior content knowledge in content-specific language and knowledge of methodologies suitable for ESP teaching. Nevertheless, for them, possessing basic specialist knowledge is not feasible. As for collaborating with content-specialist teachers and/or observing their courses, all respondents considered beneficial.

Question 3: The teaching of vocabulary was indicated an 'always' preferred option, followed by communication functions then grammar. As far as skills are concerned, there was no clear consensus on which skill(s) was treated most or least. Nevertheless, there was a tendency to integrate skills basically reading with writing and speaking with reading. A remarkable fact, however, was the marked 'never' use of listening as a basic skill.

Question 4: All teachers answered 'yes'.

Questions 5: A feeling of integrity towards what may be called an 'acculturated' context was favorably revealed. However, this was only theoretical because in practice there was no real authentic culture-based methodology in their ESP course.

Question 6: All teachers agreed that students could benefit from the vocabulary of their courses being presented within its cultural context. They argued that the cultural context could provide an adequate setting for the learning of vocabulary in association with a relevant culture background.

Question 7: Different expectations were reported. While some teachers expected their students to be less operational with general vocabulary, others allotted *Mixed* words a second position after general vocabulary in terms of the degree of difficulty they cause. There was another different expectation which posed technical vocabulary as the most problematic of all.

VII. EVALUATION OF THE RESULTS

The findings from the tests validate the research hypothesis that the main problem in understanding the lexis of science resides in the second word level i.e. the tackling of *Mixed* words both at the receptive and productive level. Although students were informed about the differences between technical versus *Mixed* words, most of them were unable to identify *Mixed* words. Indeed, very few words were identified. Needless to say, the *Mixed* words that students were able to identify in their sophisticated context proved to be very common among them. The identification of *Mixed* words was relatively low. Consequently, the findings from Task Four show no positive achievement in this regard except for some very common words such as 'mouse', 'sound', 'renewable', and 'instrumentation', which have become over time almost common understandable words marked with high degree of familiarity.

As far as findings obtained from the questionnaire are concerned, teachers were mostly dissatisfied with the courses they were teaching. They believed that more attention should be paid to the cultural context. They stated that students need to learn the vocabulary of their courses within its cultural context. However, most of them do not foster culture-based activities in their courses. None of these teachers was interested in getting to know something about the culture of the English-speaking society. Their concern was limited to those aspects of life and language that are strictly needed for their profession and everyday communication. Furthermore, their expectations about their students' proficiency in dealing with the course vocabulary proved to clash with what is shown in the findings. Students proved to be least operational with *Mixed* words. This might well be the reason for the neglect of this linguistic phenomenon.

Granted all the above, some recommendations need to be considered such as stressing the importance of acculturation in ESP especially in non-native English speaking environments. The scientific culture of lexis in science requires a special interest in what we learn whenever words in science are tackled. The lexis of science students are taught needs to undergo an acculturative process for a more advanced and operational course, at least for preparatory students at the *ESSTT* so as to enable them to reach the desired level of operational competence.

VIII. CONCLUDING REMARKS, SUGGESTIONS AND IMPLICATIONS

So far, this paper has discussed basic problems associated with the ESP course namely fostering cultural awareness as well as addressed key notions about scientific terminology. This entails the preparation of materials and requires a special approach to training in ESP teaching. Furthermore, collaboration with subject-specialist teachers should be viewed positively in order to meet the new language requirements of the specialty in question.

First, ESP teachers need to be selective about suitable and authentic task-based tasks from existing materials. This requires language teachers to collaborate with subject-specialist teachers to update their knowledge and therefore gain the competence to modify their teaching materials on the basis of two perspectives. The first is subjective; it entails materials requirements. The second is objective and it has to do with materials evaluation according to certain guiding questions such as:

1. Who is the material intended for?
2. What are the short/long term objectives of the material?
3. What kind of language description and contextual realization do students require?
4. What macro/micro skills do they need?

Additionally, given that ESP teachers need to be expert ESP practitioners and not subject-specialists (an ESP teacher is not expected to be a subject-specialist, with no pre-service or in-service training), being acculturated in the target language context is the best way to overcome the existing gap in their classroom pedagogy. The infusion of culture-based activities is needed as well so as to avoid inappropriate language transfer basically with scientific terminology. Accordingly, Wharton's (1999) acculturation model appears to serve our aim. This model rests on three steps (see Wharton, 1999 for more details); ***Induction***, ***Adjunct*** and ***Apprenticeship or Mentoring***

By implication, being a linguistic cultural phenomenon, the language of science is subject to change. Being itself a language intended to meet the scientific needs provides a further appeal for change. This entails that, scientific terminology, inter alia, is culturally embedded. Even coining and neologism, these newly-invented words that feature recurrently, dominantly and incessantly in scientific texts, represent an enormously interesting field of study in ESP. This is because in the language of science, more than in general language, words are re-coined and new words are created to refer to new concepts, objects and ideas. As such, investigations into lexical neologism and culture awareness when carried out may have far-reaching implications for the teaching of ESP.

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APPENDICES

Appendix I: It includes the three texts followed by the four tasks.

Text One: Scientific Forms of Energy

Energy is found in different forms, such as light, heat, sound and motion. There are many forms of energy, but they can all be put into two categories: kinetic and potential.

KINETIC ENERGY

Kinetic energy is motion—of waves, electrons, atoms, molecules, substances, and objects.

Electrical Energy is the movement of electrical charges. Everything is made of tiny particles called atoms. Atoms are made of even smaller particles called electrons, protons, and neutrons. Applying a force can make some of the electrons move. Electrical charges moving through a wire is called electricity. Lightning is another example of electrical energy.

Radiant Energy is electromagnetic energy that travels in transverse waves. Radiant energy includes visible light, x-rays, gamma rays and radio waves.

POTENTIAL ENERGY

Potential energy is stored energy and the energy of position—gravitational energy. There are several forms of potential energy.

Chemical Energy is energy stored in the bonds of atoms and molecules. It is the energy that holds these particles together. Biomass, petroleum, natural gas, and propane are examples of stored chemical energy.

Stored Mechanical Energy is energy stored in objects by the application of a force. Compressed springs and stretched rubber bands are examples of stored mechanical energy.

Nuclear Energy is energy stored in the nucleus of an atom—the energy that holds the nucleus together. The energy can be released when the nuclei are combined or

Light is one type of radiant energy. Solar energy is an example of radiant energy.
Thermal Energy, or heat, is the internal energy in substances—the vibration and movement of the atoms and molecules within substances. Geothermal energy is an example of thermal energy.
Motion Energy is the movement of objects and substances from one place to another. Objects and substances move when a force is applied according to Newton's Laws of Motion. Wind is an example of motion energy.
Sound is the movement of energy through substances in longitudinal (compression/rarefaction) waves. Sound is produced when a force causes an object or substance to vibrate—the energy is transferred through the substance in a wave.

split apart. Nuclear power plants split the nuclei of uranium atoms in a process called **fission**. The sun combines the nuclei of hydrogen atoms in a process called **fusion**. Scientists are working on creating fusion energy on earth, so that someday there might be fusion power plants.
Gravitational Energy is the energy of position or place. A rock resting at the top of a hill contains gravitational potential energy. Hydropower, such as water in a reservoir behind a dam, is an example of gravitational potential energy.

We use many different energy sources to do work for us. Energy sources are classified into two groups—**renewable** and **nonrenewable**. Renewable and nonrenewable energy can be converted into secondary energy sources like electricity and hydrogen.
In the United States, most of our energy comes from nonrenewable energy sources. Coal, petroleum, natural gas, propane, and uranium are nonrenewable energy sources. They are used to make electricity, to heat our homes, to move our cars, and to manufacture all kinds of products.
These energy sources are called nonrenewable because their supplies are limited. Petroleum, for example, was formed millions of years ago from the remains of ancient sea plants and animals. We can't make more petroleum in a short time.
Renewable energy sources include biomass, geothermal energy, hydropower, solar energy, and wind energy. They are called renewable energy sources because they are replenished in a short time. Day after day, the sun shines, the wind blows, and the rivers flow. We use renewable energy sources mainly to make electricity.
Electricity and hydrogen are different from the other energy sources because they are **secondary** sources of energy. Secondary sources of energy—energy carriers— are used to store, move, and deliver energy in easily usable form. We have to use another energy source to make electricity or hydrogen. In the United States, coal is the number one energy source for generating electricity. Today the cheapest way to get hydrogen is by separating it from natural gas, a nonrenewable energy source. Hydrogen can also be separated from water and from renewables but hydrogen made from these sources is currently too expensive to compete with other fuels. Scientists are working on ways to make hydrogen from water and renewables more affordable.
Retrieved May 20, 2009 from
http://www.eia.doe.gov/kids/energyfacts/science/formsofenergy.html

Text Two: Searching and Seizing Computers

Searching and seizing computers raises unique issues for law enforcement personnel. Before addressing these issues, however, it is important to have a basic understanding of key terms and fundamental concepts that will influence the government's search and seizure decisions. When people speak of searching or seizing computers, they usually are not referring only to the CPU (Central Processing Unit). After all, a computer is useless without the devices that allow for input (e.g., a keyboard or mouse) and output (e.g., a monitor or printer) of information. These devices, known as "peripherals," are an integral part of any "computer system."

Failure to more specifically define the term "computer" may cause misunderstandings. Having probable cause to seize a "computer" does not necessarily mean there is probable cause to seize the attached printer. Therefore, we need to be clear about our terms.

1. Hardware -- "The physical components or equipment that make up a computer system...." Examples include keyboards, monitors, and printers.

2. Software -- "The programs or instructions that tell a computer what to do." This includes system programs which control the internal operation of the computer system (such as Microsoft's Disk Operating System, "MS-DOS," that controls 1 Peripheral equipment means "[t]he input/output units and auxiliary storage units of a computer system, attached by cables to the central processing unit

IBM-compatible PCs) and applications programs which enable the computer to produce useful work (e.g., a word processing program such as WordPerfect).
3. Data -- "A formalized representation of facts or concepts suitable for communication, interpretation, or processing by people or by automatic means." Data is often used to refer to the information stored in the computer.
4. Documentation -- Documents that describe technical specifications of hardware components and/or software applications and how to use them.
5. Input/Output (I/O) Device -- A piece of equipment which sends data to, or receives data from, a computer. Keyboards, monitors, and printers are all common I/O devices.
6. Network -- "A system of interconnected computer systems and terminals."
7. System Administrator (or System Operator, "sysop") -- The individual responsible for assuring that the computer system is functioning properly. He is often responsible for computer security as well.
For search and seizure purposes, unless the text specifically indicates otherwise, the term "computer" refers to the box that houses the CPU, along with any internal storage devices (such as internal hard drives) and internal communications devices (such as an internal modem or fax card). Thus, "computer" refers to the hardware, software, and data contained in the main unit. Printers, external modems (attached by cable to the main unit), monitors, and other external attachments will be referred to collectively as "peripherals" and discussed individually where appropriate. When we are referring to both the computer and all attached peripherals as one huge package, we will use the term "computer system." "Information" refers to all the information on a computer system, including both software applications and data.
It is important to remember that computer systems can be configured in an unlimited number of ways with assorted input and output devices. In some cases, a specific device may have particular evidentiary; in others, it may be the information stored in the computer that may be important. In either event, the warrant must describe, with particularity, what agents should search for and seize.

Retrieved May 20, 2009 from
http://knock-knock.com/federal_guidelines. html

Text Three: Automation

Automation is the use of control systems (such as numerical control, programmable logic control, and other industrial control systems), in concert with other applications of information technology (such as computer-aided technologies [CAD, CAM, CAx]), to control industrial machinery and processes, reducing the need for human intervention. In the scope of industrialization, automation is a step beyond mechanization. Whereas mechanization provided human operators with machinery to assist them with the physical requirements of work, automation greatly reduces the need for human sensory and mental requirements as well. Processes and systems can also be automated.

Specialised hardened computers, referred to as programmable logic controllers (PLCs), are frequently used to synchronize the flow of inputs from (physical) sensors and events with the flow of outputs to actuators and events. This leads to precisely controlled actions that permit a tight control of almost any industrial process. Human-machine interfaces (HMI) or computer human interfaces (CHI), formerly known as man-machine interfaces, are usually employed to communicate with PLCs and other computers, such as entering and monitoring temperatures or pressures for further automated control or emergency response. Service personnel who monitor and control these interfaces are often referred to as stationary engineers.

Automation has had a notable impact in a wide range of highly visible industries beyond manufacturing. Once-ubiquitous telephone operators have been replaced largely by automated telephone switchboards and answering machines. Medical processes such as primary screening in electrocardiography or radiography and laboratory analysis of human genes, sera, cells, and tissues are carried out at much greater speed and accuracy by automated systems. Automated teller machines have reduced the need for bank visits to obtain cash and carry out transactions. In general, automation has been responsible for the shift in the world economy from agrarian to industrial in the 19th century and from industrial to services in the 20th century.

Automation is now often applied primarily to increase quality in the manufacturing process, where automation can increase quality substantially. For example, automobile and truck pistons used to be installed into engines manually. This is rapidly being transitioned to automated machine installation, because the error rate for manual instalment was around 1-1.5%, but has been reduced to 0.00001% with automation. Hazardous operations, such as oil refining, the manufacturing of industrial chemicals, and all forms of metal working, were always early contenders for automation.

Another major shift in automation is the increased emphasis on flexibility and convertibility in the manufacturing process. Manufacturers are increasingly demanding the ability to easily switch from manufacturing Product A to manufacturing Product B without having to completely rebuild the production lines. Flexibility and distributed processes have led to the introduction of Automated Guided Vehicles with Natural Features Navigation.

Different types of automation tools exist, for instance, Artificial neural network (ANN), Distributed Control System (DCS), Human Machine Interface (HMI), Supervisory Control and Data Acquisition (SCADA), Programmable Logic Controller (PLC), Programmable Automation Controller (PAC), Instrumentation, Motion Control and Robotics.
Retrieved May 20, 2009 from http://en.wikipedia.org/wiki/Automation

TEST OF ENGLISH (SCIENTIFIC TERMINOLOGY)
FIRST YEAR STUDENTS (*PREPARATOIRE*)
ACADEMIC YEAR: 2008-2009 **GROUP: A, B, C, D**

I. IDENTIFY SPECIALISED AND MIXED WORDS FROM THE TEXT AND WRITE THEM DOWN IN THE TABLE BELOW:

SPECIALISED	MIXED
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II. IDENTIFY COMPOUNDS.

COMPOUNDS
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II. IDENTIFY AFFIXED WORDS AND SEPARATE THE STEM FROM THE AFFIX.

AFFIXED WORDS		
PREFIX	**STEM**	**SUFFIX**
……………………………	……………………………	……………………………
……………………………	……………………………	……………………………
……………………………	……………………………	……………………………
……………………………	……………………………	……………………………
……………………………	……………………………	……………………………
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……………………………	……………………………	……………………………
……………………………	……………………………	……………………………

III. USE THE MIXED WORDS YOU IDENTIFIED IN OTHER CONTEXTS YOU KNOW

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Appendix II: It includes a statement of the questionnaire.

L'école supérieure des sciences et techniques de Tunis — Subject: English
First year preparatory students — Teacher's full name:
Academic year: 2008-2009

Questionnaire for Teachers

The aim of this questionnaire is to collect information concerning your views on language and culture with

specific reference to scientific terminology. Your responses will be kept confidential and restricted in use to this article. Thank you very much for your collaboration.

1. Did you get any pre-service or in-service training in ESP?
Yes ☐
No ☐

If yes, specify:
Pre-service ☐
In-service ☐
Both ☐

2. In your opinion, for ESP teachers to gain competence in the language they teach, they should possess basic specialist knowledge ☐

collaborate with content-specialist teachers ☐

observe specialist teachers while doing their courses ☐

3. Put a cross as applicable to your case (Please make sure you answer all the items)

As you teach your course, you opt for teaching………………….	always	often	sometimes	rarely	never
1. grammar					
2.vocabulary					
3.communication/functions					
skills 4. reading					
5. writing					
6. listening					
7. speaking					

If you integrate skills, specify………

4. Do you think that learners' linguistic, educational and cultural background influence their communication in ESP?
Yes ☐
No ☐

5. Do you opt for devising culture-based activities to foster culture awareness in your teaching pedagogy?
Yes ☐
No ☐

6. Do you think that your students could gain benefit from knowing the vocabulary of their course within its cultural context?
☐ Yes
☐ No
Why?...

7. Do you expect them to be less operational with……….?
-General vocabulary with no specific meaning in science ☐
-Specialized (widely known as technical) vocabulary ☐
-Mixed (widely known as sub-technical) vocabulary ☐

Student N°	Test One								Test Three							
	Group A		Group B		Group C		Group D		Group A		Group B		Group C		Group D	
	Task 1	Task 4	Task1	Task4	Task1	Task 4	Task 1	Task4	Task1	Task4	Task 1	Task 4	Task 1	Task 4	Task 1	Task 4
1	12	3	13.5	4	11	5	9	6	10	3	9	7	3	5	10	1
2	9.5	9	15	10	14	8	12	3	4.5	10	6.5	10	7	9	10	0
3	7	13	8	5	11	7	9.5	9	14.5	0	10	1	8	1.5	11	10
4	9.5	11	6.5	12	10	9	12	3	5	3	10	1	10	2	15	5
5	8	4	6.5	10	9	5	10	7	4.5	7	10	0	8	0	9	0
6	13.5	8	10.5	10	9	9	7	11	15	0	14	7	16	3	10	7
7	4	13	9	7	13	3	12	0	10	0	9.5	7	14	3	7	10
8	7	0	7.5	7	12	5	13	10	3.5	3	10	1	9	2	7	0
9	11.5	1	10	0	9.5	9	9	0	11	0	10	0	9.5	1	8	0
10	9.5	11	9	0	10	3	8	4	5.5	0	7.5	0	6	0	10	0
11	4	14	7	9	13	5	12	6	3.5	1	10	0	9	0	8	0
12	16	3	10	4	5	5	3	2	7	7	10	3	5	2	16	1
13	6.5	3	9	1	7	0	10	9	14	3	10	0	8	7	7	3
14	9	3	10	0	9	7	6.5	0	10	14	13	0	12.5	3	9	5
15	11	9	5.5	5	14	0	8	0	5	10	10	9	9	0	4	0
16	10	0	8	0	12	3	13	4	6.5	3	7.5	0	9	3	10	10
17	8	9	5	3	10	10	9	6	10	9	9.5	0	8	10	9	13
18	11	2.5	10	3	3	4	14	5	10	11	9	10	5	0	8	0
19	13	6	9	3	10	0			4.5	0	3	9	10	14		
20	10	3	9	0	11	0			9	15	6	10	4	0		
21	1.5	0	3.5	2	10	3.5			8	0	5	0	3	3		
22	10	0	7	3	8	1			7	10	4	14	7	0		
23	6.5	0	10	0	6	3			1.5	3	2	5	10	0		
24	5.5	0	9	0	5	1			10	0	8	0	9	14		
25	9	1.5	8	3					9	9	10	3				
Correlation coefficients	-0.094		0.002		0.114		0.170		-0.081		-0.373		0.093		0.128	

Correlation coefficients in Test Two

	Test Two							
	Group A		Group B		Group C		Group D	
Student N°	**Tas k1**	**Tas k4**	**Tas k1**	**Task4**	**Task1**	**Tas k4**	**Tas k1**	**Ta sk 4**
1	3.5	3	5.5	4	9	5	8	0
2	9	0	7	0	6	1	3	7
3	10	3	9	0	10	7	11	5
4	13	0	6.5	9	8	1	9	3
5	7.5	4	9	0	10	5	11	3
6	5.5	10	9	7	8.5	0	11	0
7	11.5	1	6	3	7	4	3.5	5
8	6.5	6	9.5	10	10	0	10	0
9	11	0	13	2	13.5	4	2	5
10	9.5	10	10	0	7	13	10	10
11	7.5	10	5	9	6	0	10	0
12	9.5	1	13	3	12	0	11	0
13	6	10	13	7	10	6	7	5
14	12	11	10	14	5	0	7	0
15	9.5	13	10	10	15	9	16	0
16	10	0	8.5	0	10.5	1	5	3
17	14	0	10	3	8	10	9	0
18	10	7	15	5	13	4.5	10	3
19	5	10	10	0	13	7		
20	9	9	6.5	10	2.5	13		
21	11	9	5	10	8	13		
22	11.5	2	7	3	14	4		
23	14	5	15	6	10	3		
24	9	7	10	9	8	10		
25	10	10	8	13				
Correlation coefficients	-0.349		-0.132		-0.113		-0.422	

Appendix III: it includes the raw scores and correlation coefficients in the three tests

Correlation coefficients in Test One and Test Three