

**TEACHING ENGLISH FOR SUSTAINABLE ENGINEERING DEVELOPMENT***Anca GRECULESCU<sup>1</sup>**Irinel MARIN<sup>2</sup>**Gina Florica STOICA<sup>3</sup>*

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**ABSTRACT**

*The purpose of any educational system should be to assist institutions and subject communities in developing curricula and pedagogy that will endow students with the necessary skills and knowledge to live and work sustainably. Hence, higher technical education for sustainable development will allow every engineering student to acquire the knowledge, competences, attitudes and values necessary to shape a successful professional future. Today's education and technical higher education respectively is crucial to the ability of present engineering students and future engineers and citizens to create solutions and find new paths to a better future. The qualitative results of our research have revealed some of the factors ensuring engineering students' sustainable development as far as the study of foreign languages is concerned.*

**KEYWORDS:** sustainability, higher technical education, education for sustainable development, foreign languages.

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**1. INTRODUCTION**

In line with the literature in the field of sustainability and languages, Education for Sustainable Development (ESD) deals with including some key sustainable development issues into teaching and learning: globalization, multiculturalism, economic growth etc. Hence, ESD represents a holistic interdisciplinary learning strategy, based on values, critical thinking, cross-methodological approaches, decision making policies that intends to assist young people such as engineers-to-be in dealing with an increasingly changing and challenging world. Therefore, ESD challenges us, teachers of foreign languages, English mainly, to adopt new attitudes and practices that will help us tackle the future. Educational process should be such that even the weakest engineering students be educated in a manner that their actions, present or future, pose no danger to society or even to themselves and allow them to manage successfully in a multicultural, globalized professional labor market.

Moreover, ESD also requires participatory teaching and learning methods that motivate and empower learners to change their behavior and take action for sustainable development.

The European Union has established that sustainable development is the basic principle of all European policies, in fact the competitiveness issue has come to dominate the political agenda. Sustainable development (SD) is a broad concept, many different issues are addressed by the Sustainable Development Strategy of the European Union, thus removing attention from the true direction of non-sustainable development (lack of sustainability). To face this problem, to turn the abstract concept of "sustainable development" into a more tangible one and to translate it into more specific educational measures, the UN General Assembly decided on the 20th of December 2002 on celebrating a period of 10 years, from January 1st, 2005, as the UN Decade for Education for Sustainable Development (General Assembly of United Nations, 2002).

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<sup>1</sup> University Politehnica of Bucharest, Romania, ancagreculescu@yahoo.com

<sup>2</sup> Bucharest Academy of Economic Studies, Romania

<sup>3</sup> University Politehnica of Bucharest

Initially coined as a type of development meant to ensure present needs, sustainable development has fascinated the world by giving hope to future human evolution. Gradually, though, the term has been given different interpretations such as „sustainable growth”, „sustainable use”, „sustainable consumption” or „sustainable partnership”. The concept as such can be defined as follows:

- *economically*: efficiency, growth and stability;
- *socially*: standard of living, equity, social dialogue and delegation of responsibilities, heritage protection;
- *environmentally*: protection and conservation of natural resources, biodiversity, pollution avoidance;
- *educationally*: sustainable behavior, quality, cooperation, partnerships.

In the light of the United Nations Decade, there have been developed four main ideas related to education for sustainable development: access improvement to basic quality education, restructuring of the present educational programs, development of public understanding and awareness, training programs assurance.

In 2010, in Romania, according to some research conducted by the Research Institute for Quality of Life, „population was divided as follows: 31% considered the Romanian education system as good and very good, 32% as bad and very bad. As compared to 2006, there was a growth in negative opinion as a result of continuous instability of the system throughout the years, aggravated by the recent economic downturn. 2010 marks the transition to the negative profile of the Romanian educational system, a rude awakening to disappointment” (Mărginean, 2010, p. 6).

Hence, the higher education institution involved in education for sustainable development can be recognized as students and teachers are encouraged to use critical thinking to explore and ask questions, clearly stating their values and reason on the values of learning, decision-making and participation. Continuous reflection, exchanging information, ideas and also experience between teachers and students are part of a dynamic school. A school of education for sustainable development is not dominated by traditional hierarchical structures, but by dynamic networks and local and global cooperation needs (Breiting, 2005, p.10).

Furthermore, the elaboration and implementation of a SD program for engineering students must welcome them to the world of language learning. Whether they are completely new to language learning or have been learning for a while, they will obviously want to make a success of it or, alternatively, they may be working and living abroad and looking for ways to get the most out of their environment in order to help them learn the language. It is worth mentioning that learning a new language as an engineering student may be an exciting prospect which opens windows on other cultures, their people, how they live and think, the history of these countries, their literature, music and heritage.

Hence, such a new SD paradigm of teaching and learning languages within technical higher education will keep alive the sense of excitement while giving practical help and guidance in all aspects of language learning.

## 2. THE AIM OF THE STUDY

The aim of the present study is to identify the factors ensuring quality and sustainable development in the study of English in higher technical education in order to help develop the engineering students' creative skills and linguistic competences for real participation and cooperation in a globalized English-speaking world.

The present study is part of a more extensive research which was conducted between 2012 and 2014 and aimed at implementing the quality criteria of sustainable development for higher technical education at the level of the didactic process (teaching-learning-evaluation of English).

Thus, the main purpose was to identify and elaborate recommendations to help improve higher technical educational practices for sustainable development.

## 2.1. Methodology

The research was based on the following hypothesis: if we identify the factors framing a SD program based on the engineering students' real needs and the beneficiaries' expectations, then, both the quality of education and the quality of life will enhance.

The pre-administered questionnaire targeted some of the factors thought to ensure language education for sustainable development. The target-group was made of 410 engineering students in all four years of studies, at the Faculty of Electrical Engineering, Chemistry, Power Engineering and Mechanics within "Politehnica" University of Bucharest (PUB) and "Politehnica" University of Timisoara (PUT). The questionnaire was made of 32 items related to quality criteria of education for sustainable development within the didactic process in higher technical education.

The data were obtained and interpreted by means of statistical procedures, CHAID method. For the purpose of this study the instrument was validated and the value of internal consistency reliability was 0.72.

## 3. RESEARCH FINDINGS AND OUTCOMES

The new quality paradigm in the study of foreign languages has shifted from the traditional way of teaching to a new modern communicational one, based on sustainable development. As a consequence, researches on SD in the study of foreign languages in Technical Higher Education should take in view the following variables:

- ❖ students (their input language knowledge when entering Higher Education System, motivation, previous linguistic experience, styles of learning as well as their level of training and their corresponding competences, professions to be enacted);
- ❖ professors' experience, motivation, competences, teaching styles;
- ❖ stakeholders (their needs, motivation);
- ❖ institutional educational amenities;
- ❖ material resources (customized teaching materials, language labs, realia);
- ❖ Curriculum, admission procedure (Anca, Greculescu, G., Solomon. (2009).

The qualitative results of our research have revealed some of the factors sustaining students' excellence performance in the study of foreign languages. The pre-administered survey tackled some open questions such as: „Why do you want to learn another language (English)?”; „What do you want to be able to do in your new language as an engineer-to-be?”; „How do you want to learn?”. All this will help teachers shape what and how engineering students learn, the skills they want to develop, the strategies and didactic methods and material resources they would like to benefit from.

61% of the interviewees admitted that an SD program may be guaranteed if:

- ❖ a placement test is taken at the beginning of the studies to determine their corresponding level of linguistic competence and roughly homogeneous learning groups are formed (Engineering students may find it helpful to look at tests that are specially designed to „diagnose” what they can and cannot do in the language and then „place” them at the right level). Hurd, Stella & Murphy, Linda 2005 ;
- ❖ linguistic/communicative competences are clearly stipulated on their Diploma Supplement;
- ❖ free and wider choice of the foreign language to be studied is ensured;
- ❖ teacher's competences are both linguistic and technical.

Moreover, the qualitative findings of the current research indicate that students' reasons for learning English are largely *practical*:

- ❖ they want to be able to book and arrange their business trips;
- ❖ they want to be able to deal with speakers of another language;
- ❖ they want to be able to live and work abroad;
- ❖ proficiency in another language may help them advance their career or gain promotion.

Likewise, their reasons are also *personal* or prompted by interest in the world around them, which, nevertheless, accounts once more for the elaboration and implementation of a SD program:

- ❖ they may not have had the opportunity to learn the language at school and wish to make up for that now;
- ❖ they may want to learn the language for pleasure or intellectual stimulation; for instance to be able to read scientific/technical materials;
- ❖ they may want to understand the language of the country they visit during holidays abroad;
- ❖ they may feel that learning a language will enable them to understand better the countries and cultures in which it is used.

In addition, approximately 95% of the interviewees would like to acquire both technical and linguistic/communicative competences since this will ensure a "quality professional profile" as required by all prospective employers.

Thinking about practical motivation in studying English and particular skills and their particular importance to engineering students as language learners will keep both the English teacher and the student focused in teaching and learning respectively and also help them work out the areas they need to work on in particular.

According to reaserch data, engineering students will have to produce written and spoken scientific/technical texts, presented in student scientific sessions, debates, presentations, job interviews; produce written and spoken articles, reports/ technical documentation and maintenance and use equipment manuals; elaborate e-mails, memos, business letters, CVs; present/describe/analyze technical or scientific equipment/ phenomena/processes/diagrams and figures.

A correlation between sustainable English learning and the amount of learning time (years of study) has shown that most of the engineering students would like to study English for four years (the entire academic learning period) and they believe „imagination" can help them develop their language skills. Likewise, they strongly believe that their level of English knowledge will play an important role in both their career choice and professional fulfillment in the field of engineering.

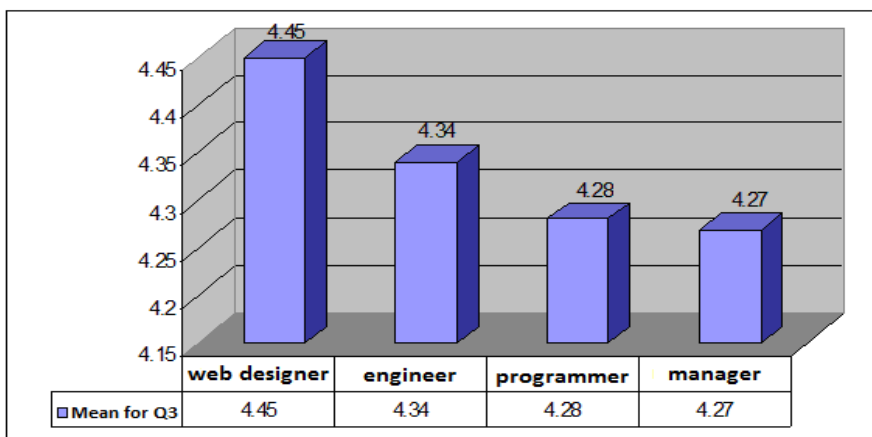
Those who have opted for three years of study would like their language teacher to help them develop „logical thinking" and „imagination" (Table 1).

**Table 1. Sustainable learning of English and classroom organization**

<b>Classification</b>					
<b>Observations</b>	<b>Predictions</b>				
	1 year	2 years	3 years	4 years	Percentage
1	2	1	0	0	66.6%
2	0	28	0	23	54.9%
3	0	0	57	16	78.0%
4	0	18	0	138	88.4%
<b>Percentage Total</b>	<b>0.70%</b>	<b>16.60%</b>	<b>20.10%</b>	<b>62.50%</b>	<b>79.5%</b>
<b>Research method: CHAID</b>					
<b>Dependent variable: amount of learning time (years of study)</b>					

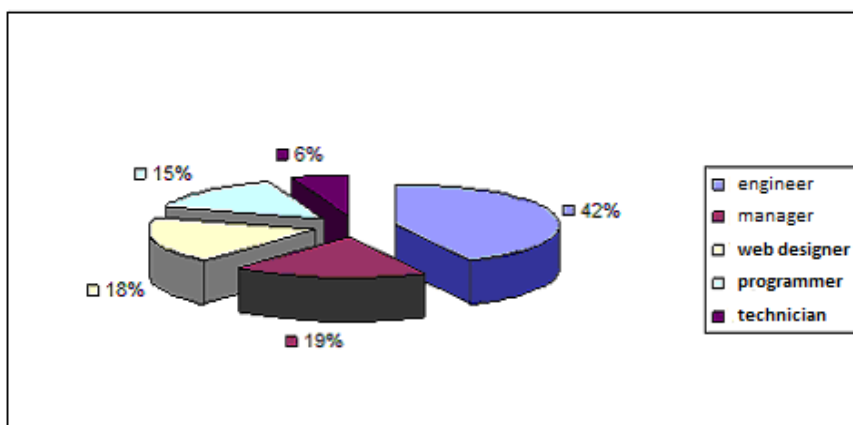
The qualitative stages of the present research aimed at answering another key question that any engineering student may pose: “What foreign language is best for a career in engineering?” The qualitative research has already emphasized the importance of studying English. This will help engineering students to broaden their linguistic and cultural knowledge; will ensure professional dynamics and occupational mobility; will sustain competition and foster their curiosity so as to “learn something new, innovative”.

As a result, the study of English will help the engineering student land a job as an *engineer* (42%); *manager* (19%), *web designer* (18%) and *programmer* (15%), as shown in Figure 1). Only 6% of the participants in the study opted for the *technician* position.



**Figure 1. Occupational choices for sustainable professional development**

By means of the CHAID method, a specific pattern was obtained, accurately predicting 71.4% of the answers, thus, validating the following correlations. Irrespective of their career choices, all participants believe that the study of English will facilitate employability in the engineering domain (a five item scale was used to analyze this variable), as shown in Figure 2.



**Figure 2. Occupational choices and the importance of English**

The engineering students’ practical professional motivation for learning English requires some linguistic competence such as the ability to speak fluent English, explain scientific and technical phenomena and processes, give arguments. Moreover, they must prove understanding of technical/scientific spoken production and, likewise, be able to design, draft any technical or scientific written text (as shown in Table 2).

**Table 2. Career choice and linguistic competence**

<b>Profession (job)</b>	<b>Linguistic competence</b>		
	<b>First option</b>	<b>Second option</b>	<b>Third option</b>
<b>engineer</b>	<i>Ability to speak fluently/explain /give arguments</i>	<i>Ability to understand the technical/scientific spoken production</i>	<i>Ability to design/draft a technical/scientific written text</i>
<b>manager</b>	<i>Ability to speak fluently/explain /give arguments</i>	<i>Ability to understand the technical/scientific spoken production</i>	<i>Ability to deliver a speech in English/any other foreign language</i>
<b>web designer</b>	<i>Ability to speak fluently/explain /give arguments</i>	<i>Ability to understand the technical/scientific spoken production</i>	<i>Ability to analyze/interpret/explain data shown in diagrams/graphs in a foreign language</i>
<b>programmer</b>	<i>Ability to speak fluently/explain /give arguments</i>	<i>Ability to design/draft a technical/scientific written text</i>	<i>Ability to speak fluently and accurately in a foreign language</i>

The target group's options prove, once more, that the study of English in higher technical education is a "must", since it has become the interface of all information and communication technologies and systems. English, as a motivational factor underpinning a career choice, will also ensure access to international projects and training programs; to information (all engineering legislation is drafted in English). Furthermore, it will facilitate the use of computers and software, especially for those who will opt to work as web designers.

#### 4. CONCLUSIONS

In conclusion, the outcomes of the present research clearly indicate the need to rethink educational policies for sustainable development that aim at developing social, economic and environmental knowledge that will, ultimately, assist pupils in tackling the problems of modern life.

By way of conclusion, we can recommend partnerships among institutions to provide teachers with efficient training programs; ensure multicultural contexts to help them understand diversity and practice tolerance towards the Other; work closely with parents, colleagues and the community; reflect and improve upon their didactic activity as far as education for sustainable development is concerned.

As for the teaching staff, to ensure the quality of the didactic activity in the light of sustainable development, they should acquire and develop competences and abilities based on formal, informal and non-formal means and have them officially recognized, such as: to identify each engineering student's specific needs and meet them by use of a wide range of teaching strategies; help them develop professional and cross competences according to the "European Common Reference Framework for Competences".

The elaboration and implementation of such a program for engineering students is conditioned by the ongoing importance of English as a global language. So much so as it improves linguistic and cultural knowledge; facilitates access to the international and national labor market; fosters and sustains successful professional relationships; develops and improves intra/inter professional communicative competences; sustains professional "excellence" ("you become better in what you do"); encourages professional competition and satisfies curiosity in learning something "of great novelty".

To conclude with, the wise selection of the occupation to which one's life is to be devoted and the development of full efficiency in the chosen field are matters of the deepest moment to young engineering students and to the whole society.

In this period of rapid growth in technology, information communication, the higher technical education system should guarantee to every engineering student a thorough all-round sustainable development of mind and character, a careful planning of and adequate preparation for any occupation in the field of engineering. This requires the provision of educational programs to ensure the development of linguistic and communicative competences likely to assist engineering students in meeting the professional demands worldwide and becoming sustainable professionals.

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