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Quality Improvement of ESP in Mechanical Engineering

***Abstract:** The latest political positioning of Serbia has caused many changes in the society with the most dramatic economic shift on the market. The market requires young educated employees with special additional “soft skills”. This has resulted in the need to change the Serbian educational system with the Bologna process implemented. Therefore, the syllabus of ESP in Mechanical Engineering must be adjusted to the demands as regards needs analysis so that it can meet the requirements of the rapidly growing market.*

This paper offers an outline of ESP syllabus which can be regularly updated with respect to technological and other changes on the market.

***Keywords:** ESP, needs analysis, syllabus design, quality*

1. INTRODUCTION

Scientific development is closely related and dependent on social and political trends/changes which has proved particularly true in the case of Serbia. Serbia was among the last in a number of countries to adopt political changes which resulted in rapid economic changes. The increase of foreign investments and private initiative has caused dramatic shifts on the market. On the one hand, there has been a large need for young, educated employees, while on the other hand, a great majority of unemployed young experts, especially in technical sciences, found they were ill-equipped for the demands of the rapidly growing new market. New trend employers are requiring not just a diploma, but innovative knowledge and other soft skills (computer literacy, communication skills, entrepreneurship and English for specific purposes) as well. In addition to this, many inadequate higher education programs present a serious obstacle to competition in the global human resource market. The fact that the Bologna process

has not been fully implemented has worsened the situation in the Serbian system of education.

This paper offers an example of a syllabus of ESP in Mechanical Engineering which embeds the following components: new trends in scientific fields, computer literacy, communication skills and entrepreneurship. It is also very important to include stakeholders' demands and Labor market demands. Besides, the Union of Engineers and Technicians should be consulted as well as the Chamber of Commerce to get a clear picture of the situation as regards employment in Serbia. The needs identified through the data which were obtained by the analysis of all specific demands serve as a starting point for shaping the ESP course at the Faculty of Mechanical Engineering. It is adjusted to fit the needs of the target group, i.e. future mechanical engineers. The syllabus which incorporates all the aforementioned components will equip students, i.e. future employees with integrated skills, a range of additional skills complementary to their

basic vocational skills gained through their basic education. It is also important, throughout the whole course, to make students realize that not only knowledge and skills are essential, but also a high degree of self-awareness, critical thinking and the importance of lifelong learning.

2. SYLLABUS DESIGN OF ESP

There are many different definitions of Syllabus Design (SD). However, they all refer to a process which includes many inextricably entangled factors such as learners, their needs, materials, curriculum, etc. SD in ESP is an even more requiring task because it is dealing with specific learners' needs, specific materials, and specific objectives.

SD is primarily concerned with the selection and grading of content (Nunan, 5). It is an instrument by which the teacher together with the syllabus designer can achieve a degree of "fit between the needs and aims of the learner (Yalden, 1984:14). Syllabus is a subpart of curriculum which is concerned with a specification of what units will be taught (Allen, 1984:64).

Van Ek (1975:8-9) maintains that a language syllabus should include the following components:

- The situation in which the foreign language will be used along with the topics which will be dealt with,
- The language activities in which the learner will be involved,
- The language functions the learner should fulfill,
- The general notions which the learner will be able to handle,
- The specific notions which the learner will be able to handle,
- The language forms which the learner will be able to use.

The first question a syllabus designer should confront is how to select and grade the content. This question is particularly demanding when the syllabus is supposed to meet specific requirements such as those imposed in ESP and when it is to be taught within short courses. The shorter the course, the greater the demand for precision in content specification (Nunan, 10). The case study presented in this paper will illustrate the aforementioned statement.

The 1970's brought about a communicative approach to syllabus design. The starting question was what learners need to do with the target language. Munby (1978:28) suggests that the first step should be to perform a needs analysis of the following parameters which every syllabus should contain:

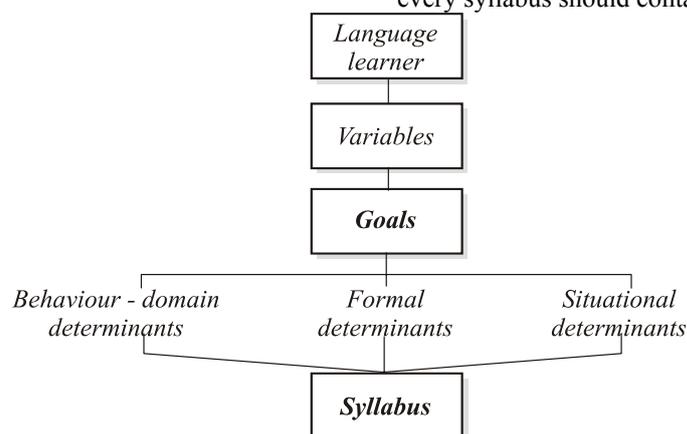


Figure 1. General parameters for SD

Functional skills were the focal part of language learning which led to the development of ESP which was concerned with experiential content.

English for Specific Purposes (ESP) as an integral part of Applied Linguistics is a consequence of the specific requirements imposed by the interconnection of influences of, on the one hand, scientific and technological progress, and, on the other hand, the specific fields of SLA. Dudley-Evans (1997) offers a multifaceted definition which clarifies the basic notion of ESP:

Absolute Characteristics

1. ESP is defined to meet specific needs of the learners.
2. ESP makes use of underlying methodology and activities of the discipline it serves.
3. ESP is centered on the language appropriate to these activities in terms of grammar, lexis, register, study skills, discourse and genre.

Variable Characteristics

4. ESP may be related to or designed for specific disciplines.
5. ESP may use, in specific teaching situations, a different methodology from that of General English.
6. ESP is likely to be designed for adult learners, either at a tertiary level institution or in a professional work situation. It could, however, be for learners at secondary school level too.
7. ESP is generally designed for intermediate or advanced students.
8. Most ESP courses assume some basic knowledge of the language systems.

Widdowson (1983) states that ESP differs from GPE (General Purpose English) in having “training function” aimed at the development of “restricted” competence, while GPE is aimed at the development of “general capacity”:

“...ESP is essentially a training operation which seeks to provide learners with a restricted competence to enable them to cope with certain clearly defined tasks.

These tasks constitute the specific purposes which the ESP course is designed to meet.” (Widdowson, 1983:6).

When discussing SD in ESP it is very important to carry out needs analysis (learner analysis and task analysis). The former is concerned with the information about the learner or why the learner is learning the language. The latter refers to the specification of the language skills required for dealing with real-world communicative tasks. Such a syllabus will embrace certain aspects of language which are concerned only with special purposes and which cannot be found in GE. This question actually presupposes the specification of learning goals which derive from many sources such as task analysis, learner data, the Ministry of Education specification, the length of the course, and the like. At present, teachers and syllabus designers are much more aware of the importance of needs analysis and the careful selection of materials in order to achieve the curriculum goals. The pragmatics and the teaching materials have to be explicit and narrowed. Methods and techniques should be selected well so that they facilitate ESP acquisition.

3. SD AND NEEDS ANALYSIS

The research is based on Munby’s Parameters Map (Figure 1) and a step-by-step needs analysis has been performed for each parameter required for SD.

While designing the syllabus for every single course in Mechanical Engineering various demands are taken into consideration starting from students of Mechanical engineering as the first parameter on Munby’s map, the Union of Employers, the Union of Engineers and Technicians, engineers who work in industries, as well as references from the IDEA League (European leading institution in technical sciences) as the goal analysis with the respective

determinants taken into account. The starting idea is to design the syllabus of ESP in Mechanical Engineering which would, on the one hand, include authentic materials from the chosen professional subjects of Mechanical Engineering, and, on the other hand, would embed additional knowledge and competencies from soft skills.

Students' needs (83% of the inquired students) are primarily concerned with English for communication, both general and business. They also stress the need to acquire a specific vocabulary so that they can read technical literature and other sources from the Internet.

The Union of Employers (57% of the surveyed companies) particularly insists on business English for future engineers since many engineers are employed in acquisition and marketing departments. This demand is even stronger in small and medium enterprises which require highly educated engineers.

The Union of engineers and Technicians as an expert institution (89%)

Mathematics	analysis, differential equations, linear algebra, vector calculus, numerical methods, statistics and probability.
Thermodynamics	entropy, constant pressure, volume temperature; 1st & 2nd laws, circular processes (Carnot, Joule, Seiliger), energy, exergy, anergy, efficiencies, heat transfer, solve engine problems.
Fluid Mechanics	conservation of mass, energy, momentum, pipe flow, boundary layer, turbulence, Bernoulli, Navier Stokes, dimensionless analysis Solid Mechanics statics, kinematics, dynamics, stress analysis, (finite-element methods).
Materials Science	relation between structure and properties for metals, plastics, ceramics, composites; failure, fracture, fatigue, wear, manufacture.
Systems & Control Engineering	modelling, simulating, automation control, system identification, tools, mechatronics
Information Technology	fundamentals, programming techniques, tools
Electronics	fundamental and instrumental electronics, sensors and actuators,
Product life cycle	innovation process; market studies, development process in detail; methods and tools, design principles and systematic; evaluation and dimensioning, machine elements, specifications and standards, design and production, quality, costs, project management
Management, economics & communications	details depend on university (communicate effectively both orally and in writing to different audiences)

clearly defines the specific fields of Mechanical Engineering in the context of ESP so that the transfer of knowledge and technologies would be easier and resources more available.

All the aforementioned taken into account along with stakeholders' advice, it can be concluded that the main knowledge outcomes which a BSC mechanical engineer requires are:

- 1) Knowledge of the basic disciplines and subdisciplines of Mechanical Engineering (mathematics, thermodynamics, mechanics, etc.) with respect to European standards.
- 2) Knowledge of computer and CAD tools, computer programming and IT.
- 3) Implementation of the acquired knowledge and skills, and
- 4) Technical documentation writing.

Hence, the main fields of Mechanical Engineering a BSC engineer should obtain are as follows:

According to the listed professional subjects of Mechanical Engineering, adequate units including a required vocabulary are created which are accompanied by step-by-step grammar points.

4. SD OF ESP IN MECHANICAL ENGINEERING

It has already been mentioned that in addition to professional subjects, future engineers need basic knowledge and skills in ESP in the following fields:

- Communication, Communication management,
- Computer literacy
- Business English, and
- Entrepreneurship

Students are expected to make presentations in English, to communicate in their operating environment, to perform business communication in English so that they can work in international companies.

Hence, the SD of ESP in Mechanical Engineering will embed:

1. ESP including professional subject content with respect to the current trends and European standards.
2. ESP including soft skills content (communication, English for computer literacy, business English and basic vocabulary for entrepreneurship).

Therefore, we can conclude that SD of ESP is supposed to consist of three parts: 1) theory and methods related to professional and vocational knowledge and competences (ESP texts), 2) theory and methods from a business perspective (soft skills), and 3) a practical part that integrates the former two via real life exercises.

The ESP course for the first year of the BSC studies at the Faculty of Mechanical Engineering in Kragujevac, lasts for 15 weeks, three hours a week as it

is regulated by the Ministry of Higher Education in Serbia. The number of students is 120 in their first year of bachelor studies. Each week during a three hour period the first two parts of the course will swap around with a special emphasis on the vocabulary. This part is followed by a guest lecture on various disciplines and subdisciplines of Mechanical Engineering and/or business in which practical examples are analytically analyzed with theory backup. Some lectures may be given by "FIAT" representatives (this multinational company has recently bought a local car factory "Zastava" and employs many local engineers) as regards the manufacturing process, special skills, employment demands and the like which will be more than useful to the future mechanical engineers. The second part represents a case study in which the students have to analyze and implement the processes in the right order. Students will perform this task in groups for their homework as paper assignments. They can choose any of the topics presented and discussed during the course: Mechanical Engineering in general and/or specific, global market, computer science, business plan, business English, etc.

The syllabus of ESP including all the counted parts may contribute to a better quality of the very ESP course as regards professional subjects and soft skills improvement.

5. CONCLUSION

Societies undergoing economic and political transition need thorough reorganization as regards education at all levels with BSC level in particular. The current situation when economic and educational processes globalize, multinational companies conquer the market, the number of small and medium-size companies is increasing and English is *de facto* becoming a *Lingua franca*, it is essential to create adequate curricula and

syllabi of English at non-philological faculties. Since Serbia is undergoing changes in many spheres of life, particularly in politics and economics, it has to adjust its policy to the aftermaths of those changes: a great shift on the market, (un)employment, new trends, etc. Young people in Serbia should be offered new programs of education which will be complemented by the European standards and which will provide better learning outcomes and offer better job prospects in the country and abroad.

The syllabus outline presented in this paper is designed for ESP of the BSC studies at the faculty of Mechanical Engineering, University of Kragujevac. It presents an attempt to unite different factors which may contribute to better students' training, better learning outcomes and prepare them for new trend demands imposed on the market. The learning outcomes were the starting point for the syllabus in question, i.e. what a future mechanical engineer is supposed to

know when the required course is completed. Learning outcomes are defined with the help of experts from Industry, the Union of Employers, the Union of Engineers and Technicians, and students. The knowledge and skills concerned with the English language are categorized as ESP for professional and occupational purposes which enable students to read technical literature and contribute to students' specialization and ESP for soft skills such as entrepreneurship, business communication, IT, etc. To become competent in the mentioned fields, students are provided with 9 weeks of ESP for professional and occupational subjects (with respect to the IDEA League standards) and 4 weeks of ESP for soft skills. By including additional skills into the syllabus, students obtain a higher level of not only professional and occupational knowledge in the field of Mechanical Engineering, but also soft skills which are a must in the rapidly growing market.

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