

# INNOVATION OF THE COURSES JAM03-04 – ENGLISH FOR MATHEMATICIANS – CHALLENGES OF SUBJECT SPECIFIC APPROACH AT THE FACULTY OF SCIENCE OF MASARYK UNIVERSITY

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**Abstract:** The paper focuses on the creation and innovation of the course English for mathematicians JAM03-04. When processing teaching materials and introducing innovations, several problems emerge. The first is topics selection. Natural sciences comprise extensive knowledge; it is difficult to choose topics that would relate to the specialisms or interests of all students. Secondly, various levels of professional and language competence of individuals must also be taken into consideration. Under the current circumstances it is impossible to create homogeneous study groups in which all students possess the same or similar expert and language knowledge. Thirdly, it is vital to assess the degree of authenticity of materials, and the possibility or necessity of their adjustments by language teachers. Students usually appreciate video lectures and conference papers for their expertise. However, these sources are not always suitable and applicable in language learning. Last but not least, a combination of skill-based and topic-based approaches, as well as problem-solving tasks, can keep students interested and motivated.

**Key words:** ESP, subject-specific approach, structure and content of a course, needs of students

**Introduction** A good characterization of an ESP teacher is given in a classical book of Tom Hutchinson and Allan Waters: “ESP teachers are all too often reluctant dwellers in a strange and uncharted land.” (HUTCHINSON and WATERS, 1994, p. 158). In my paper I would like to discuss reasons for this feelings of alienation many of my colleagues and I experience when we are trying to design and teach ESP courses. As resulted from many discussions we had at our department of the Language Centre of Masaryk University at the Faculty of Science, sometimes we are not quite sure whether we are teaching, say, English for Biology, or Biology in English. Even if most of us would, hopefully, opt for the first possibility, the distinction is not quite clear in all cases. Since the purpose of an ESP course is to prepare students for their professional life, i.e. develop their use of English in a specialized field of science, and enable them to use English as the main means of communication and cooperation with the partners in their expert fields, the necessity of subject-specific materials reflecting students’ study program becomes self-evident. At our department, we cater for the needs of a wide range of students of scientific subjects – biology, geology, geography, chemistry, mathematics, and physics. As our teachers prepare courses for two or three different levels, and sometimes even for two different subjects, the difficulties of the job they have to face are clearly manifested.

## **Difficulties the ESP teachers face**

**1) Lack of expertise.** The main obstacle for teachers is the insufficient expertise in a specialist field. Even if some teachers are exceptions since they have studied language and a scientific subject at college, the majority of them are still linguistics majors with a combination of some humanistic discipline. Hutchinson and Waters claim that ESP teachers do not need to master specialist subject knowledge. In their opinion only three things are required: 1) a positive attitude towards the ESP content, 2) a knowledge of the fundamental principles of the subject area, and 3) an awareness of how much they probably already know.

And they conclude that “the ESP teacher should not become a teacher of the subject matter, but rather an interested student of the subject matter”. (HUTCHINSON and WATERS, 1987, p. 163)

However, I believe that the problem is more difficult to address. A positive attitude and enthusiasm are, of course, necessary, but teachers may still need to overcome their natural fears related to the complexity of scientific disciplines. Moreover, for highly abstract disciplines as mathematics and physics, fundamental principles alone would not suffice, as they require a deeper understanding of their methodology as well. To complicate matters even more, as I discovered during my ESP lessons and when evaluating the course questionnaires, specialist knowledge is what students expect. Of course, I always state openly at the beginning of our course that I am not a specialist and would need and appreciate their help and understanding. Still, many of them think that language teachers should be experts in a scientific subject as well. To illustrate this point I quote some reactions of students gathered in an anonymous survey conducted by Masaryk University evaluating individual teachers and courses – these reactions concern only courses taught and prepared by me:

### **Answers of students in a survey evaluating individual teachers and courses (source - the Information System of Masaryk University)**

#### **1) Autumn term 2012 course English for mathematicians JAM01**

Angličtinu pro matematiky by měl učit někdo, kdo dané problematice rozumí. Nepochybuji o jazykových schopnostech Mgr. Čoupkové, ale sama přiznala, že té matematické části plně nerozumí. [English for mathematicians should be taught by someone who understands the subject and its problems. I do not doubt the language abilities of Mgr. Čoupková, but she herself admitted she did not fully understand the mathematical part of the course. (my translation)].

#### **2) Spring term 2010 course English for mathematicians JAM03**

Bylo by vhodné, aby tento předmět učil někdo, kdo něco ví o matematice (alespoň základy), popřípadě matematická témata měla být vybrána tak, aby jim rozuměli všichni. [This course should be taught by someone who knows something about mathematics (at least basics), and the mathematical topics should be chosen so that everybody in the group is able to understand them. (my translation.)]

It is true that as teachers prepare and adapt materials related to the specific scientific disciplines, they learn along the way and may become learned practitioners in the field. But, of course, this knowledge is still quite limited and not sufficient to protect the teacher from being seen by students as unprepared and incompetent, sometimes even ridiculous. So, where can ESP teachers look for help?

One obvious answer would be cooperation with the teacher of the subject. (HELSEVIG, 2012, p. 4) Developing a project based on collaboration of the language teacher and the subject teacher would have its merits, but there are also obstacles to overcome. The main is, at least at our university, a lack of funding and interest on the part of subject teachers. Even if the faculty policy is to support and require subject-specific content of language seminars, there is no subject-specific support for ESP teachers.

We tried to solve this problem by creating a course combining both subject and language. So far we have discovered that it may be quite challenging to find a common point of reference between a subject teacher and a language teacher. We started a collaborative project in our department aimed at addressing one scientific problem from different angles – as scientists (specialists) in their fields – and language teachers. Even if we are still at the beginning, the grounds for disputes are quite obvious: for specialists, the content of the learning process is of

the prime importance, and they are sometimes unwilling to include the communicative and language aspects as well. Language teachers, on the other hand, lack the adequate knowledge of the content and concentrate instead on grammar structures or syntax, which some of the specialists may find unsubstantial.

Some of my colleagues try to breach this gap by engaging in life-long learning programs provided by individual departments, or even become full-time students of the specialist subject. Others, like me, rely on the help of friends and family-members, my husband being a mathematician willing to give me advice. Still, I find this quite demanding – even if a life-long learning is an essential component of a professional development and dedication of any university teacher, trying to master a subject completely different from their own is perhaps too much to expect.

Many writers dealing with ESP recommend taking a learner-centered approach which relies on students' knowledge of their disciplines and leaves a large amount of expertise to them. (see MC COMBS, WHISTLER, 1997).

Even if we are trying in our country to adopt this learner-oriented approach in our whole education system, I believe that most students are still used to considering their teachers to be the main source of information, and do not doubt their knowledge. Moreover, our bachelor ESP courses are mainly designed for the first and second year students whose knowledge of their subject may be still insufficient. On the other hand, this can be seen as an advantage as well, because if students can learn something new about their subject in a language course, they will feel motivated and be more interested.

**2) Selecting course topics.** As the number of textbooks and resource books is quite limited, especially those dealing with scientific disciplines, the ESP teachers will need to design and develop their own materials for the course. The first challenge facing them is what to include or concentrate on.

Much recommended beginning is the needs analysis. But, if you ask students at the beginning of the first term - before they start their B1 level course, i.e. immediately after they had completed the secondary school - what they would like to do, most of them say practice grammar or discuss general topics, since that is what they had done so far. They have generally a very vague idea what they need as far as their professional English and university environment are concerned. The situation is much better with the advanced students attending B2 level course because they are normally undergraduate students who have spent 2 to 3 years at a university, possibly participated in some Erasmus mobility, and understand their needs much better. Then it is useful to ask them, through a questionnaire or other means, what their interests are and what they would like to do. But still, the teacher remains the person responsible for designing learning activities and materials.

Thinking about what specialist knowledge students need and appreciate, it is important to consider what they already know. To find this, it is possible to go through their subject syllabus and see the topics they deal with. The main problem here is that, in our courses, we have students from different study groups and levels. So, in one of my mathematical groups, there can be the 1<sup>st</sup>, 2<sup>nd</sup>, or even 3<sup>rd</sup> year students, and students of pure mathematics, applied mathematics, financial mathematics, statistics, mathematical modeling, or teachers of mathematics. These students have different background knowledge and different needs, yet they all attend the same class. It may happen that students learning ESP in their first semester do not have adequate specialist knowledge, since the topics discussed in their ESP classes precede the topics they consider in their specific fields. On the other hand, students of more advanced levels find some topics too easy, unsubstantial, or difficult to recall from their previous studies. Sometimes, more advanced students may be willing to help the teacher and younger students to explain advanced topics, which can improve the learning process. But, in

cases different from these ideal ones, advanced students can be just bored and feel they are learning very little. That is why choosing specialist topics which everybody in the group understands and is interested in, as the second respondent in a survey above demanded, is a very complex task.

I tried to address this issue by introducing topics that are, in my view, basic and understandable for all students. The drawback related to this approach is that then students may feel that the content is too simple. Unfortunately, I can offer no clear solution to this problem. Generally, I try to cover all branches of the field, i.e. for mathematicians I include several topics in algebra, geometry, applied mathematics, statistics, and so on, so that, hopefully, there is at least one topic each student can enjoy. What I find useful is to ask students during their first lessons what they like about their specialist fields and what their favourite topics are. For advanced students, I often use topics they discuss in their presentations, since these are by definition more general and supposed to be understandable for most of them. I also recommend more advanced students to attend advanced courses and skip the initial ones, which is also an option since our courses are voluntary and do not have to be taken in a specific order.

**3) Designing course materials.** This area comprises a concrete text selection and decision on its adaptation and creation of learning activities. There it is possible to refer back to the lack of expertise as the first difficulty being mentioned, since for ESP teachers who are not specialists in the professional fields it can be difficult to decide how to abridge or adapt texts without omitting the substantial information or terminology. Similarly, if they are not able to understand the content of the text, it is impossible for them to design meaningful activities. (HELSEVIG, 2012, p. 1)

First decision must be made about the texts. Generally, if they are too difficult, the students may lack sufficient professional knowledge to deal with them and feel embarrassed; on the other hand, if they are too simple or too popular, students tend to disregard their content as well as language. So I believe the text should pose questions and activate the professional knowledge of students, but not intimidate them; if they feel professionally motivated, they are also ready to concentrate on the language aspects of the texts. Moreover, both teachers and students should bear in mind that “in the real world people learn language and content simultaneously”(HELSEVIG, 2012, p.3), so there is no need to separate the two areas in an ESP classroom.

For listening exercises, teachers can use video lectures, for example those offered by MIT, which provide excellent and authentic learning materials. They are very motivating for the students since they resemble the experience students obtained in their lessons delivered in Czech. However, it is not always easy to adapt them, as they are full-fledged lectures given by experts in their fields. Difficulties for the language teacher stem from the form itself – as most of the lectures are approx. 1 hour long, and it is feasible to use only 5 – 10-minute parts in a language lesson - choosing just one short part of the lecture containing sufficient and meaningful information is far from straightforward. Moreover, lecturers often refer to previously discussed problems and employ specific professional terms, or sometimes even a jargon, which may be difficult to understand even for the experts in the field who are familiar with English field-specific terminology. Last but not least, since these are lectures, to use them in every lesson may become boring and repetitive. That is why it is advisable to prepare, at least sometimes, less professional but more amusing materials – a good choice would be, for example, an excellent popular BBC Four series entitled *The Story of Maths*, which outlines aspects of the history of mathematics and why mathematics is important, and examines the development of key mathematical ideas and the lives of many of the greatest mathematicians.

**4) Deciding on learning processes and activities.** There are several activities I go through when discussing specialist topics in my courses. The first step is to find out what the students know. To do this, I include pre-reading or pre-listening exercises to warm up the students and concentrate their attention on the problem we are about to deal with. These tasks may be just answering questions about the topic, suggesting keywords, predicting problems discussed in the text, or trying to outline the possible structures present in the text. Alternately, they can try to explain the meaning of the terms used in the material. They work in pairs or groups so that they can develop their communication skills in the area of professional English. Then I continue with listening or reading activities. Students start with listening or reading for general information, looking for the main idea of the text, or answering general questions. After that they concentrate on more specific information or data, as interpreting graphs, describing processes, explaining the results, or comparing methods. Students of scientific subjects generally like problem-solving tasks since this type of activity is professionally oriented and most similar to what they normally do in their specialist courses. So, if the topic permits it, I often think of real problems related to it, like making a similar computation using slightly different input, creating a new graph which interprets the given data differently, solving puzzles, etc. What is important from the language perspective is to ask students to explain their methods or steps in English because in that way they can practice and use new vocabulary and phrases related to the topic. I conclude with the final discussion in which I ask students whether they have learned something new in terms of the specialist field itself or its terminology, or whether their pre-conceptions concerning the topic have changed. A good speaking task is to try to explain the problem to a non-specialist, which shows students how to simplify things and concentrate on the most important aspect, or, in a broader sense, how to popularize science for the general public.

**Conclusion.** In conclusion I would like to summarize the most important points.

- 1) ESP teacher does not have to be a specialist in the field, but a sufficient knowledge of the topic is essential. It is advisable to ask students what their interests in their fields are and ask them for help where appropriate, but the person responsible for designing and teaching itself is the ESP teacher.
- 2) When selecting and adapting the topics for an ESP course, it is convenient to try to consider the previous knowledge of your students as well as their professional interests and needs, and relevance for their future careers.
- 3) It is advisable to use a mixture of skill-based and topic-based approaches that may activate students' professional knowledge, and enhance their language competence. Problem-solving task are especially important, since they enable students to use their specialist skills as well as communication skills in English.

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