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Operational program, education for competitive advantage“, preparation of study materials for teaching in English

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Abstract

The aim of the contribution is to present Operational program "Education for Competitive Advantage" and first experience of its usage. The provider of the grant is the Ministry of Education, Youth and Sports of the Czech Republic. Faculty of Military Technologies of University of Defence in Brno is in 2009-2011 solving the project "Innovations in the Study Program of Military Technologies", to be more specific, (among others) key activities "Extending Teaching of Specialized Courses in English". This partial activity is dealt by 69 academic workers of FMT, 3 post-graduate students and 10 academic workers of Center of Foreign Language Training. The result of the work will be study materials of individual specializations in English, in total range of 901 AA. The author of the contribution, who for five years has been dealing with teaching mathematics in English to students, whose mother tongue is not English, is also involved in the process.

Keywords: Education; inovation of study program; study materials;

1. Introduction

Colleges and universities all over the world today more and more often provide their students the possibility of university study in English. Reasons for this trend are clear - graduates have a much better chance to use their specialized knowledge. The Czech Republic is not an exception. The membership of our country in NATO and the EU enables our graduates more and more often to find their place outside the country that is why also the University of Defence (UoD) must adapt to this trend very soon. The effort of the university management within the frameworks of innovation of existing study program "Military Technologies" is to increase the readiness of pedagogues to teach in English and significantly enlarge the range of specialized education in English. To reach the set goal will certainly be easier with the help of three-year Operational program "Education for Competitive Advantage", to be specific the project "Innovation of Study Program Military Technologies", that has been being carried out at Faculty of Military Technologies of UoD since 2009. The provider of this grant is the Ministry of Education, Youth and Sports of the Czech Republic. The activities when completing tasks of the above-mentioned grant lead to increased competences of pedagogues of faculty to teach in English and also to create optimal conditions to manage the expertise in English on the part of students. In case of teachers, we speak especially of

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systematic language preparation on a general, as well as on a specialized level. In the field of improvement of conditions to manage the language by the students, it is needed to create:

- a collection of printed and electronic study texts,
- e-learning study contents,
- test program equipment .

The aim of the Faculty of Military Technologies of UoD (FMT UoD) is to significantly widen the teaching of specialized courses in English. To be successful, these things are needed:

- language preparation of academic workers of FMT
- preparation of study materials and program equipment in English.

2. Current state of teaching of specialized subjects in English

In the last several years, some departments of FMT UoD have been offering complete subjects or their parts to chosen (language-skilled) study groups or individuals in English. This is true especially for Dep. of Mathematics and Physics, Dep. of Air Defence Systems and Department of Communicative and Information Systems (KIS).

Teaching of mathematics and physics in English has already been happening for 5 years, based on optionality of students (mainly Czech and Slovak) and teachers. However, only a limited number of university textbooks in English is available, they were bought from other universities or in abroad. They, unfortunately, do not correspond to the study programs of bachelor's study at FMT UoD, and moreover, they always cover only a part of the study topic. In physics, the study materials especially for seminars (calculation as well as laboratory) are still missing. At present, the only department at FMT UoD that has already prepared the accreditation documentation[2] is KIS for bachelor field of study "Communication and Information Systems". Many other departments providing study of other fields of study program "Military Technologies" want to and will follow this department, and that is why they must focus their personnel and material preparation towards the possible provision of teaching in English. More information can be found in e.g. (Hošková, Š., 2009). It is necessary to prepare for this personally (ability to speak English) and materially (study materials).

The aim of this contribution is to present the findings taken when creating the study materials at the Department of Mathematics and Physics for teaching of these subjects in English. Concerning that the author belongs to the group of mathematics, she is going to focus mainly on this field. The aim of the contribution is not to deal with language abilities of the teachers.

3. Aim of the “Key Activity”

The aim of this “Key Activity” of MEYS grant is to significantly extend teaching in English, which would have several consequences:

- greater possibility for graduates to find a job,
- easier possibility of scholarship / study for foreign students,
- better qualification of pedagogues,
- easier to get scholarship in abroad for our students and teachers.

The result of this change (innovation) is providing gradually increased portion of teaching subjects of individual study specializations in English. The outcome will also be the possibility of training specialists from military-technical specializations from other countries and our specialists can become more applicable in EU countries or NATO. Nowadays the system of preparation of military-technical specialists is provided mainly in Czech. Even though the specialized terminology in many specializations is very often mostly English, graduates are not able to use it correctly, or to implement it in practice. Also, the university does not have the possibility (due to language reasons) to train specialists from other countries (except for Slovakia where the language barrier is almost non-

[2] Without accreditation by MEYS it is not possible to teach the particular specialization at any university in the Czech Republic

existent). That is why it is necessary to transform the subjects into English and to unify the Czech and English terminology. For intended (and also accredited in the future) education, it is necessary to create own study materials in English which would in the level and range correspond to the study plan of the individual specializations. Except for that, it is necessary to create special subject dictionaries covering the taught subject fields, sorted according to individual taught topics. Providing of study materials is possible to divide into several parts:

- printed study publications,
- electronic publications (e.g. published in Adobe Acrobat format),
- e-learning study contents and test program equipment. See also (Hošková, Š., 2010).

4. Ways of realization of the set goal

The aim is to provide a sufficient number of quality study materials in English. There are two ways to accomplish it: The first is to buy foreign literature in a number of at least one copy for each student, the second--preparation of study funds in English using the means of individual departments followed by language correction.

In case of purchase, the materials would be quality and proved materials of renowned foreign publishers (books from English-speaking countries would be best) but there is also a possibility to buy English literature from home - especially university - publishers. This literature, however, will not correspond to the curriculum (books do not cover all necessary parts, or do not content the necessary parts, the way of presentation corresponds to the Anglo-Saxon tradition, it differs from traditional presentation at Czech schools, there is no direct connection to secondary school classes, etc.). This literature then does not fit from the point of view of topics, it does not cover all problems of subjects in a way they are ready at FMT UoD and approved in accreditation procedure.

More convenient (and not only from the point of view of finance but also from the point of view of long-term contribution for UoD) is the second option, which is built on quality pedagogical team with long-time experience. This way supposes to provide translations of textbooks, lectures and tests into English, followed by proofreading of all above-mentioned study materials. Materials created by academic workers of our faculty will be much more suitable for teaching, and their usage for students will be more effective, as the contents will correspond to the requirements of individual subjects of departments of FMT UoD. The first option would be faster but in case of a larger number of students also very financially demanding. It is possible to buy very quality and extensive textbooks abroad, out of which it is necessary to choose concrete topics and whose style does not correspond to our needs (usually too many facts and not enough of higher mathematics). Moreover, these textbooks are very expensive and - regarding the dimensions and weight - not suitable for bringing into lessons. That is why the most suitable option seems to be the creation of our own study materials respecting the required contents and level.

5. Realization procedure of activity at Department of Mathematics and Physics

5.1. Bachelor's study

At Department of Mathematics and Physics there are available own, new and quality texts in Czech, covering a substantial part of topics taught in bachelor's study. (Hošková, Š., 2009). By their translation, there would be created materials with completely identical contents as in Czech versions and thus exactly corresponding to the curriculum. Contents of some of the Czech materials will be possible - based on experience with their use in class - to modify, together with the creation of the English version of the textbooks, the current Czech ones will also be innovated.

5.2. Master's study

- Texts for master's study exist in Czech only for some parts. It will be necessary to create texts in Czech first, and then have them translated into English.

- Besides versions for printing, also hypertext version enriched of multimedia elements will be created at the same time. These hypertext texts will then be suitable also for students of combined study (e-learning).

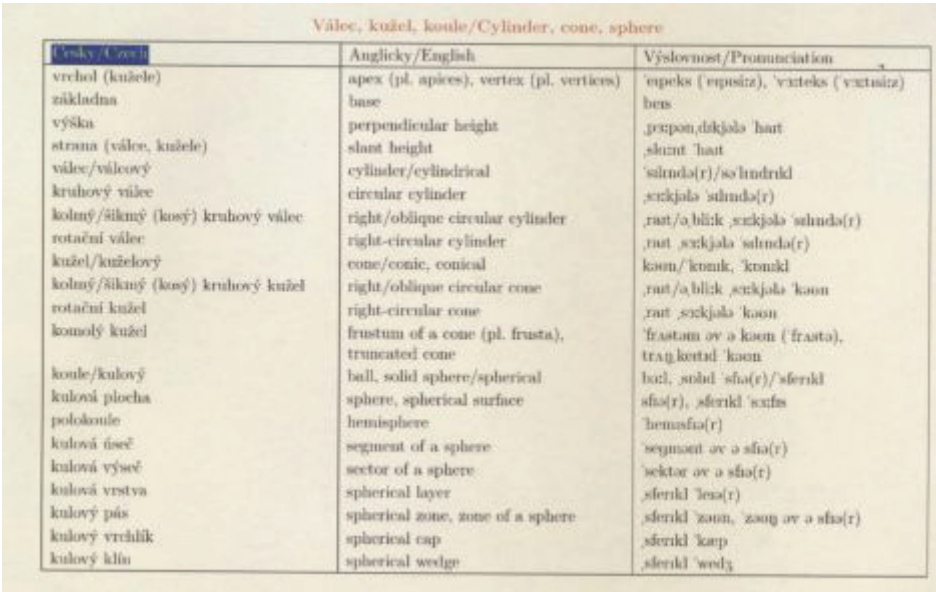
Our main job assignment at our faculty is to prepare study funds in English within our own abilities and resources, followed by language correction. There are 69 workers of FMT UoD involved in the project, out of which 7 workers are of Department of Mathematics and Physics and 1 student of Master's study. Within 3 years of the project, these texts will be created: "Laboratory Seminar of Physics" and electronic versions of testing tasks of physics, "Specialized dictionary of Physics", "Mechanics", "Electricity and Magnetism", "Oscillations, Waves and Optics", "Quantum Physics and Atomistics", "Differential Calculus of Functions of One Variable", "Integral Calculus of Function of One Variable", Collection of exercises "Probability" and "Statistics", "Dictionary of English Mathematical Terminology". Department of Mathematics and Physics will create study materials in total range of 144 AA. Almost half part of the amount is ready now.

6. Discussion

- From the experience of the Department of Communication and Information Systems from preparation of accreditation documents for bachelor's study program KIS we know that the provision of study materials is for the faculty financially demanding. The price for 15 students for complete bachelor's study of KIS accounts to 1,490,000 CZK.
- Publications prepared by academic workers of FMT UoD are possible to be printed relatively cheaply on the faculty's printer with the possibility of flexible reprint according to the needs of teaching and especially distribute them cheaply and conveniently in Adobe Acrobat format.
- Part of the preparation to teach in English will also be the preparation of materials in electronic way for distant study and testing - e-learning type of study. At UoD and FMT, e-learning technologies and electronic study support is already used in many places - unfortunately in various and mutually incompatible program environments. The effort is, then, to unify these activities under one system of control of this type of distant study - e.g. recommendation of one of proved LMS (learning management system), e.g. Moodle.

The main part of the task will be given to pedagogues who will guarantee the contents and quality of the study materials. The target group of the study materials will be students of bachelor's as well as master's studies, who will use them when studying. The manuscripts will be continuously used in the lessons even a year before publishing so that the teachers can prepare them according to the experience from lessons and so that the students themselves could evaluate them. To make the texts available for students from the language point of view, the students can help when preparing the materials in a way that they will provide information about their initial language abilities in the pilot courses. The created materials will be used in lessons as well as in home preparation. Students will have the possibility to use the gradually created parts and evaluate them. This way they can really successfully provide feedback. In the process and realization of individual activities, interactive co-operation of teachers and students is expected.

The first text which was created at the Dep. of Mathematics and Physics to support the education process in English was English mathematical terminology (Kuben, J., 2010). See Figure, 1 were you can find one page from it. This text was essential to enable the education of mathematics and moreover physics in English. All text is divided into two parts. In the first, called "high school knowledge" and "general terminology, is listed some of the terminology discussed in the math at secondary school (even primary school) and a variety of useful and necessary general vocabulary. Selection of vocabulary in the first part was given by the necessary continuity in the covered parts of higher education and of course by author taste and timing options. Students should familiarize with the terms gradually. The second part then responds progressively to mathematics discussed in the first and second semester. But there are often included "secondary school matters" so that students have the necessary words together and can learn a new vocabulary as easy as possible. Some terms are repeated. Ideally, students should study the relevant



Válec, kužel, koule/Cylinder, cone, sphere

Česky/Czech	Anglicky/English	Výslovnost/Pronunciation
vrchol (kužele)	apex (pl. apices), vertex (pl. vertices)	'eipeks ('eipisiz), 'vɜ:teks ('vɜ:tisiz)
základna	base	beis
výška	perpendicular height	ˌpɜ:pənˌdikjələ 'hait
strana (válce, kužele)	slant height	ˌslɑ:nt 'hait
válec/válcový	cylinder/cylindrical	'silində(r)/sə'lindrikl
kruhový válec	circular cylinder	ˌsɜ:kjələ 'silində(r)
kolmý/šikmý (kosý) kruhový válec	right/oblique circular cylinder	ˌrait/əˌbli:k ˌsɜ:kjələ 'silində(r)
rotační válec	right-circular cylinder	ˌrait ˌsɜ:kjələ 'silində(r)
kužel/kuželový	cone/conic, conical	kəun/'kɔnik, 'kɔnikl
kolmý/šikmý (kosý) kruhový kužel	right/oblique circular cone	ˌrait/əˌbli:k ˌsɜ:kjələ 'kəun
rotační kužel	right-circular cone	ˌrait ˌsɜ:kjələ 'kəun
komolý kužel	frustum of a cone (pl. frusta), truncated cone	'frʌstəm ɔv ə kəun ('frʌstə), trʌŋˌkeitəd 'kəun
koule/kulový	ball, solid sphere/spherical	bɔ:l, ˌsɔlid 'sfiə(r)/'sferikl
kulová plocha	sphere, spherical surface	sfiə(r), ˌsferikl 'sɜ:fis
polokoule	hemisphere	'hemisfiə(r)
kulová úseč	segment of a sphere	'segmənt ɔv ə sfiə(r)
kulová výseč	sector of a sphere	'sektə ɔv ə sfiə(r)
kulová vrstva	spherical layer	ˌsferikl 'leiə(r)
kulový pás	spherical zone, zone of a sphere	ˌsferikl 'zəun, 'zəuŋ ɔv ə sfiə(r)
kulový vrchlík	spherical cap	ˌsferikl 'kæp
kulový klín	spherical wedge	ˌsferikl 'wedʒ

Figure 1. Czech – English mathematical dictionary

chapters of the English language prior to lecture. Some of them do so, some unfortunately not. At the end of the described textbook are Czech and English alphabetical index that allows to find a page where the English, respectively Czech equivalent is given. The textbook may serve as a Czech-English, resp. Czech-English dictionary.

7. Conclusion

Finally, we can say that our first experience teaching mathematics and physics in English on a voluntary basis by both students and teachers is very good. Motivation plays an important role in both parties. Preparation for this type of teaching is extremely difficult and time consuming. But this is offset by the interest of students in learning, gaining new experience for our teachers, expanding your vocabulary and the improvement in mathematical and physical terminology. We believe that our observations and the data will help everyone who will participate in similar training.

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