

Received: 2017-11-28

Accepted: 2017-12-01

Online published: 2017-12-04

DOI: <http://dx.doi.org/10.15414/meraa.2017.03.01.24-31>*Original Paper***Assessment of competences acquired via CLIL in selected subjects
at the Slovak University of Agriculture in Nitra****Dana Országhová^{1*}, Jarmila Horváthová²**¹ Slovak University of Agriculture, Faculty of Economics and Management, Department of Mathematics, Tr. A. Hlinku 2, 949 76 Nitra, Slovak Republic² Slovak University of Agriculture, Faculty of Economics and Management, Department of Languages, Tr. A. Hlinku 2, 949 76 Nitra, Slovak Republic**ABSTRACT**

The main objective of this paper follows from the education of students at the Slovak University of Agriculture in Nitra who will work as experts in different areas. The educational system of experts and professionals cannot operate in the isolation but in the context of changes in the professional field and society. In the paper we focused on the analysis of students' mathematics and language competences acquired via method CLIL (Content and Language Integrated Learning). The learners can realize the impact of their acquired knowledge to the study of other specialized courses and to better conditions for study stays. In the research part it is described the survey through which we verified the efficiency of CLIL methodology in the education of chosen topics of two study subjects: Mathematics and English. The results of pedagogical experiment were analyzed using statistical methods. The experiment confirmed that the above-mentioned methodology of mathematics teaching was effective. Based on the obtained results we can conclude that the students have the abilities to use mathematical apparatus and language skills, which is an important prerequisite for their professional advancement.

KEYWORDS: education, CLIL methodology, mathematics, foreign language education, communication skills, statistical hypotheses testing**JEL CLASSIFICATION:** D40, C50, M10**INTRODUCTION**

At the Slovak University of Agriculture in Nitra undergraduates are educated for successful careers in different areas such as: agriculture, food, biotechnology, economy and technical industry. The contemporary professional and scientific practice emphasizes the requirements for the students to be able to communicate in a foreign language. Apart from the common

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social communication it is important that the students could acquire new information and present the professional knowledge in a foreign language. The ability to communicate in a foreign language is becoming the significant advantage for any person looking for the appropriate job at the labor market. Therefore, teaching subjects in a foreign language means the excellent opportunity for the connection of a language and professional knowledge in the particular subject [11].

Moravcová and Maďarová [8] claim that “the degree of language mastery is based on the needs and interests, in our case, of the agricultural learners. It also depends on the amount of vocabulary, knowledge of grammar, as well as the correct ways of the verbal interaction. It is also important to have knowledge in social communication, culture, and language variations”.

A teacher of a professional foreign language is required to have profound linguistic knowledge, to be familiar with the terminology of a particular science and also to be able to enhance teaching process via the information and communication technologies [5].

The “Faculty of European Studies and Regional Development” of the Slovak University of Agriculture in Nitra provides the students with the opportunity to choose the study program in English entitled “Regional Development and Policies of the EU”. They learn all subjects in the given language, e.g. Macroeconomics, Microeconomics, Mathematics, English Language, Economic Geography, Computer Data Processing, Statistics and Sustainable Development. The learners have to combine their knowledge effectively in thinking, problem solving, reasoning and case studies. The cross-curricular educational process enables to transfer learners’ knowledge from one context into another and from one subject to others. This course means the embodiment of CLIL (Content and Language Integrated Learning) in practice.

CLIL is a methodology for studying content through a foreign language, thus acquiring both the subject and the language. This term was used for the first time by David Marsh from the University of Jyväskylä, Finland in 1994. This author claimed: “CLIL refers to situations where subjects, or parts of subjects, are taught through a foreign language with dual-focused aims, namely the learning of content and the simultaneous learning of a foreign language” [9].

The European Commission has been looking into the state of bilingualism and language education since the 1990s, and has a clear vision of a multilingual Europe in which people can function in two or three languages. Languages will play a key role in curricula across Europe. Attention needs to be given to the training of teachers and the development of frameworks and methods which will improve the quality of language education [1].

In the period of globalization the exchange mobility of university students and teachers are becoming common. English language is being used as lingua franca. The foreign students coming to study to the Slovak University of Agriculture usually choose English as the language to acquire knowledge in subjects and also for communication with peers and teachers.

The principal objective of CLIL methodology is to enable students the achievement of a high level of communicative competence, i.e. accuracy and fluency, and at the same time to present them content of particular subjects with the emphasis on specialized vocabulary in English.

The expression ‘4Cs’ (Communication, Cognition, Culture, Content) is also being used for the definition of CLIL methodology. Content matter does not mean only acquiring knowledge

and skills; it also involves the learners creating their own knowledge and understanding and developing skills (personalized learning). Cognition comprises the content related to learning and thinking. If the learners want to achieve the ability to interpret the content, they have to analyze it for its linguistic demands; thinking processes (cognition) need to be analyzed in terms of their linguistic demands. Language needs to be learned and practiced through communication, reconstructing the content and its related cognitive processes. The interaction in the learning context is essential to learning. The relationship between culture and languages is evident. The acquisition of a foreign language always implies the intercultural awareness. The CLIL methodology develops certain aspects of language competence, predominantly listening and reading, vocabulary, grammar, in particular morphology, fluency of the spoken language, creativity, critical thinking and reasoning. This methodology also motivates students to concentrate on both a foreign language as well as content of a subject matter. Still another aspect is the increased learners' competence. On the contrary, CLIL requires more preparation, special skills and competences from teachers [3].

CLIL increases students' motivation towards learning foreign languages. It also leads to the cognitional development, i.e. knowledge acquired in one context can be transferred and utilized in another context. CLIL groups can achieve a higher level of foreign language competence.

One of the important tasks of education should be the increase in students' motivation to learn. Based on the obtained results it can be concluded that learning objectives are not clear to students, who probably assume that the study subject is not needed for their further education and professional application [4]. Pokrivčáková [12] states that there is no question about CLIL and the fact that nowadays it represents the most effective preparation of graduates to meet the requirement of the multilingual European labor market as well the international study opportunities. According to Kováčiková [6] it seems that ESP (English for Specific Purposes) can work under CLIL methodology, using first of all contents of some other subjects via methods reinforcing language communicative competence, such as projects, presentations, reports, etc. Then, the students can acquire the specialized vocabulary needed for their branch of study as well as the language competence in everyday situations or professional talks.

MATERIAL AND METHODS

In the academic year 2015/2016 we carried out the survey at the Faculty of European Studies and Regional Development. The survey was targeted at the comparison of acquired knowledge of the selected tasks at Mathematics and the English language in the first year of the bachelor degree.

We obtained the data about students' knowledge from the teaching of the obligatory subject 'Mathematics' (taught in the 1st study year of bachelor degree). The range of hours in one semester is: 1 hour of lecture per week and 3 hours of practical seminar per week. We summed up the results from the students' partial tests during semester and final exam tests. We focused on the basic topics of this mathematics course, which were put into the following pairs of the representative tasks for each student:

- Task 1: Function with one real variable; Task 2: Derivative of a function,
- Task 3: Matrices; Task 4: Systems of linear equations.

The next data were obtained from the partial and final tests in English, particularly in the subjects `Communication in English` and `English for Specific Purposes` (ESP). Given test tasks were in accordance with the study content of these subjects. The range is two hours of practical seminar per week. We focused on the basic topics of these language courses, which were set into the following pairs of tasks for each student:

- Communication in English: testing vocabulary by multiple choice (Task 1 – agricultural terminology; Task 2 – economic terminology),
- ESP: testing specialist vocabulary by matching (Task 3 – Food and Agriculture Organization; Task 4 – accounting).

The existence of dependences and statistical significance among data will be examined by statistical testing methods: F-test and parametric two-sample t-test. The detailed description of these methods can be found in [7]. We will test the null hypothesis providing that the level of students' knowledge is the same, when testing the representative tasks at Mathematics and English. In order to test the null hypothesis we will use the two-sample test of equality means. At first we verify by F-test if both random choices have the same variability and then we apply t-test. The calculations and the graphic interpretation are executed via the table processor MS Excel 2010 which has the given testing functions installed.

RESULTS AND DISCUSSION

Teaching a subject in a foreign language requires further study of teachers not only in their own subject area but the language improvement is also essential. Teaching course in a foreign language constitutes a certain specialization which contributes to the increase of quality of the university education. Still another opportunity to utilize the acquired competences in this area is the possibility to participate in the students' and teachers' mobility projects abroad.

Table 1 Results of paired two sample *t*-test for means in Mathematics, n = 61

Variables	Task 1	Task 2	Task 3	Task 4
Mean	4.11	5.51	6.88	7.10
Variance	7.00	6.89	5.14	5.02
Pearson Correlation	0.911**		0.941**	
Hypothesized Mean Difference	0		0	
Df	60		60	
t – test	- 9.763		- 2.142	
P(T ≤) two-tail	5.257E-14		0.036	
t Critical value	2.000		2.000	

Source: authors' calculations

The correlations between Task 1 and Task 2 and also between Task 3 and Task 4 were statistically highly significant. The differences between studied variables are significant at the significance level $\alpha = 0.05$.

In the Figure 1a and Figure 1b we present box-plots of the achieved points in math tasks.

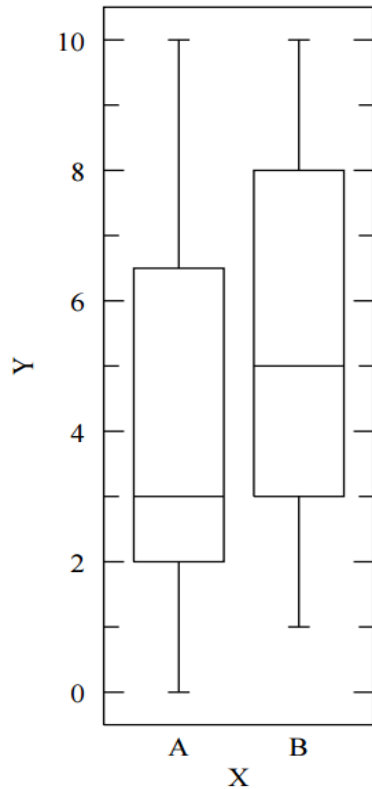


Figure 1a Box-plots of the achieved points in tasks Functions – Derivatives

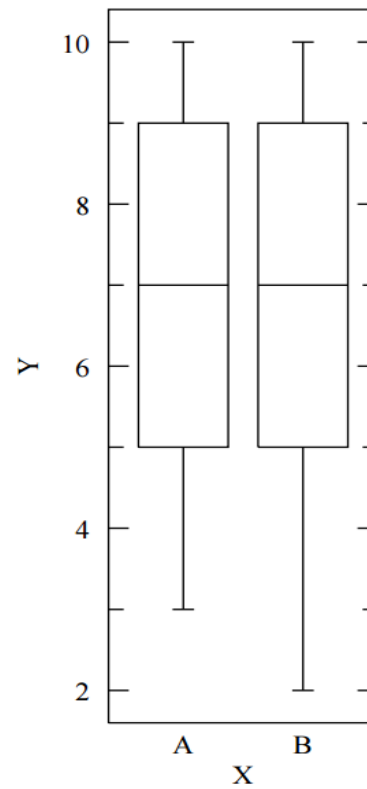


Figure 1b Box-plots of the achieved points in tasks Matrices – Systems of equations

Table 2 Results of paired two sample *t*-test for means in the subject Communication in English and in the subject English for Specific Purposes, n = 41

Variables	Communication in English		English for Specific Purposes	
	Task 1	Task 2	Task 3	Task 4
Mean	8.00	8.02	8.07	7.76
Variance	7.00	6.62	5.12	4.24
Pearson Correlation	- 0.154		0.347*	
Hypothesized Mean Difference	0		0	
Df	40		40	
t test	- 0.039		0.820	
P(T ≤ t) two-tail	0.969		0.417	
t Critical value	2.021		2.021	

Source: authors' calculations

The correlation between Task 3 and 4 was statistically significant. The differences between studied tasks are not significant at the significance level $\alpha = 0.05$.

In the Figure 2a and Figure 2b we present box-plots of the achieved points in tasks from the language tests.

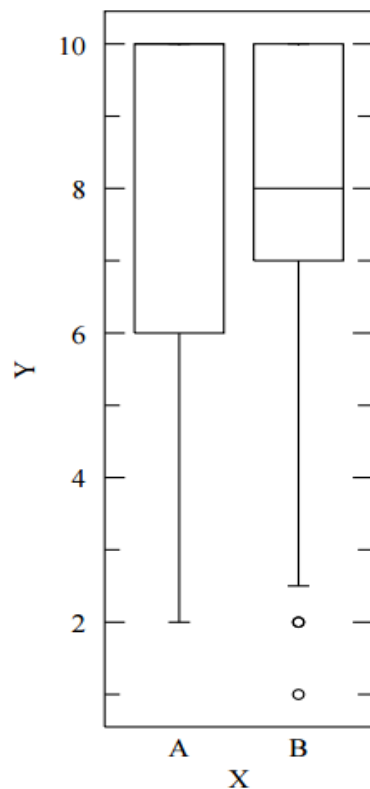


Figure 2a Achieved points
in tasks Communication in English

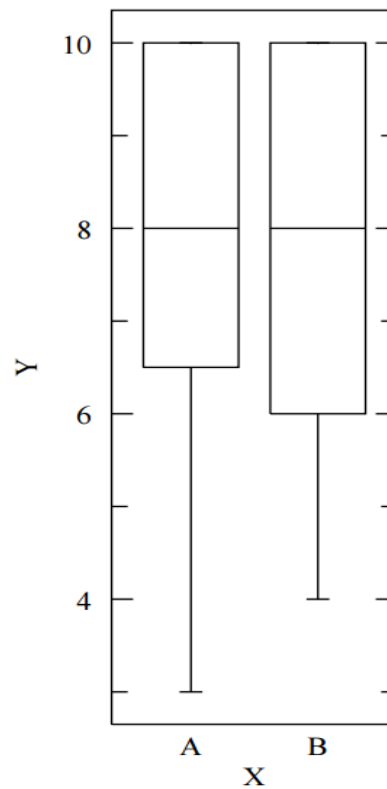


Figure 2b Achieved points in tasks
English for SP

The European Commission states the benefits of CLIL as following:

- Develop intercultural communication skills;
- Prepare for internationalism;
- Provide opportunities to study content through different perspectives;
- Access subject-specific target language terminology;
- Improve overall target language competence;
- Develop oral communication skills;
- Diversify methods and forms of classroom practice;
- Increase learner motivation [3].

The positive impact of the CLIL on the mathematical performance of pupils was identified even after a short period of time [13]. Therefore teaching specialist subjects in a foreign language represents the beneficial space for the unification of a language and professional knowledge in a particular subject [10].

In other studies, the question of teacher quality in terms of language teaching and professional subject is examined; they say that the optimal solution is the cooperation of a language teacher and a teacher of the professional subject with a native speaker [2].

CONCLUSIONS

In the contemporary society the university education is the important factor for employment opportunities on the labor market. In the research we analyzed knowledge and skills level of students through their outputs from the partial tests in the following subjects: Mathematics, Communication in English and English for Specific Purposes. We concentrated our attention on the groups of students from the Faculty of European Studies and Regional Development and on the study program taught in English.

The current trend at universities is to offer to students the study programs with the subjects taught in English. The education of the future experts and scientists in the field of agriculture, biology, crop and animal production, food industry is important from many aspects. The agricultural science, research and practice require a good command of foreign languages and mathematical statistical methods.

The results of Mathematics confirm that differences between tasks of the analyzed topics (matrices and systems of linear equations, functions and derivative of a function) are significant. According to the research results we can state that there are the significant differences in students' knowledge in topics matrices and systems of linear equations. Next, we found out that the significant differences exist in students' knowledge in topics function property and function derivative.

The results of language skills of the tested students demonstrate that the differences between analyzed tasks are not significant. Based on the gained analysis and results we can conclude that students at the SUA in Nitra have the adequate abilities to achieve a command of the English language on a very good level. The cross-curricular relations could help students to understand and combine knowledge of different areas, and consequently improve the quality of university education.

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