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Teaching Biomonitoring through English

Abstract. The aim of this article is to describe how the interdisciplinary approach to teaching English, based on some aspects of content and language integrated learning (CLIL) methodology, is implemented by combining environmental science, sustainable development, and the English language. The paper introduces an English as a Second Language (ESL) course book designed for students of Environmental Monitoring, who study biomonitoring within the framework of an experimental CLIL course. At the end of each topic students present a project which proves their acquisition of professional and language knowledge. As a result, students obtain professional competence in a wide range of skills. More importantly, this goal is achieved without extending the curriculum.

Keywords: ESL, biomonitoring, education for sustainable development, CLIL, ESP

1. Introduction

The following article describes the experience of the creating of an ESL course book called "English for biological monitoring" based on some aspects of CLIL methodology and containing the elements of Education for Sustainable Development (ESD) thereby expressing an interdisciplinary approach in education.

The book is designed for the third year students of the faculty of Environmental Monitoring engaged in the experimental course on Biomonitoring. The course is comprised of a set of lectures given in Russian by a subject teacher, a set of practical training carried out in English by the same subject teacher assisting by

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an English teacher, and a supporting ESL course conducted by an English teacher. Thus the presented book is the main textbook for the supporting ESL course. It is obvious that such a supporting course has its unique challenges and therefore they must be reflected in both its contents and language components. The subject matters are provided by the teacher of Biomonitoring according to the themes of the lectures and practical training, and the texts for the course book are collected in collaboration with that subject teacher. The language constituent is focused on the terminology, the use of English; and reading, listening and speaking skills. As the course is at the testing stage the materials are not available on the Internet yet.

2. On the question of teaching english for occupational purposes

From the early 1960's, English for Specific Purposes (ESP) has grown to become an important and distinctive part of English Language Teaching (ELT). ESP was defined by Tony Dudley-Evans in particular as designed to meet specific needs of learners or for specific disciplines, making use of underlying methodology and activities of the discipline it serves; aimed at the language appropriate to these activities in terms of grammar, lexis, register, study skills, discourse and genre [Dudley-Evans & St John 1998: 26]

The ESP development has been slow but definite over the past two decades in Belarus. This has led to a growth in English courses included into university curricula aimed at specific disciplines, for example, "English for Ecologists," in place of the more traditional "General English" courses.

The emergence of CLIL in the 90s brought a new matter of argument as to whether ESP and CLIL are different methodologies or two different terms used for the same approach. The core of CLIL is that a content subject, such as environmental science, is learned through the medium of a foreign language and a foreign language, by studying a content-based subject. In other words, a non-language subject is not only taught in a foreign language but also with and through a foreign language.

It is considered that the main difference between ESP and CLIL is that they have a completely different approach to the language studied. In ESP a foreign language is both the content and the means of learning while in CLIL language is seen as just the tool for learning a non-language subject. Another difference lies in the sphere of the objectives and learning outcomes. ESP aims at language-learning objectives whereas CLIL claims that content-learning objectives are either equal or even more important than language-learning ones.

CLIL is now strongly supported by the European Commission and the Council of Europe in order to improve the English teaching and the English language proficiency in students [European Communities 2004; Coyle, Hood & Marsh 2010]. Involving European countries into the Bologna Process engages the standardising of higher education not only in the sphere of internationalising of universities curricular but also in implementing higher education in English.

Belarus joined the Bologna Process in 2015 therefore the need of standardising of the higher education systems has emerged. As a result, universities are trying to internationalise their curricula to facilitate academic cooperation, thus encouraging student mobility. Hence Belarusian university teachers of English are faced with the choice whether to apply CLIL or remain teaching ESP courses in order to meet these needs of standardisation and internationalisation.

3. Implementing CLIL technologies

The English teaching process at International Sakharov Environmental Institute of Belarusian State University has been based on the ESP principles for about 25 years. Such ESP courses as "English for ecologists," "English for medical ecology," "English for nuclear safety," etc. has been designed and successfully implemented. But recently in the light of joining the European educational environment the Chair of Foreign Languages has become interested in CLIL technologies. In collaboration with the Chair of Environmental Monitoring and Management it was decided to organise a special experimental course on biomonitoring in the framework of the main course on Environmental Science. The main feature of this biomonitoring course is that the practical training is conducted in English. Thus a course book called "English for biological monitoring" has been developed. Besides the language objectives the book is aimed to prepare the students to this practical training in English. So, going back to CLIL principles, biomonitoring is taught with and through the English language.

4. Education for sustainable development in the framework of the course

Working on the book the developer came to the understanding that the interdisciplinary relations of the course concern not only biomonitoring and the English language, but they are also referred to the issues of sustainable development. It is considered that when conducting ESD it should be instilled into the subjects

of the curriculum [HEPS 2004] rather than introduced as a separate one; thus the teachers of different subjects are encouraged to share knowledge and work together on the matters of interest, to make links between their disciplines. Such links have been established in the structure of the course.

It is known that education for sustainable development is the process of equipping students with the knowledge and understanding, skills and attributes needed to work and live in a way that safeguards environmental, social and economic wellbeing, both in the present and for future generations [QAA & HEA 2014].

Although the three components of ESD – social, economic, and environmental – are interdependent, in the framework of ecological education the ecological component of sustainable development appears prevailing. Undoubtedly, impartial information has to be provided on the key issues on climate change, biodiversity loss, and anthropogenic influence on ecosystems allowing comprehension of human vulnerability, responsibility for their future and the future of the planet; but at the same time the purpose of ESD is to motivate and enable the students to change their attitude (as, unfortunately, it commonly can be described as "it's none of my business") and behaviour, to encourage students' learning in this context, and to act deliberately for sustainable development [UNESCO 2012].

5. The course book contents

The following describes the interdisciplinary links that have been arranged within the course. The content of the book is divided into 10 units. The first two units concern general matters referring to the main environmental problems and describing biomonitoring as a component of an environmental monitoring system. The subsequent eight units touch upon different species serving as bioindicators of certain kinds of environmental pollution.

The first species under discussion are butterflies as indicators of climate change. The issues of butterfly-host plant interactions, phenological changes of butterflies, their life cycle and how they are influenced by the permanently warming climate are considered as well as the associated biodiversity responses to the changes in the climate [Boggs, Watt & Ehrlich 2003].

Then biomonitoring with macroinvertebrates goes. The monitoring and assessment of the quality of freshwater habitats that are threatened by anthropogenic stressors are considered. The attention is paid to decreasing water quality and the loss of aquatic biodiversity caused by organic and chemical pollution. The maintaining of the sustainable use of waterbodies and therefore the protection of the ecological integrity of freshwater ecosystems are also under discussion.

In the further units, algae, daphnia, and frogs as representatives of water pollution bioindicators are also studied.

Air pollution is recognised by the World Health Organisation as one of the biggest current environmental health issues [WHO 2016]. Hence, lichens and higher plants as air quality bioindicators are the topics of the following units. Not only the questions of lichen sensitivity to nitrogen- and sulpher-containing pollutants and their accumulation patterns are discussed but also the mapping techniques of lichen diversity are studied as it is possible to correlate it – lichen diversity – and air quality because lichen species exhibit varying tolerance levels to air pollution.

And soil pollution can't be set aside as well. The issues of both heavy metal contamination and the use of snails to assess it; and the use of frogs to evaluate in particular soil chemical contamination are touched upon in the light of preservation of human health.

6. The course book structure

The structure of each unit is quite the same. Following the aim of preparing the students to practical classes each unit starts with the training of the topical vocabulary in different ways from simple tasks to more and more complicated ones. Special attention is given to the main terms on the topic. Not only are the mere words studied but also their compatibility in phrases and collocations. Grammar is not taught within the course, but the book contains the exercises which help the students realize how the language works. Through these exercises the students learn that one thought may be expressed in different ways, using different grammar structures; and what means of the language should be used to get the goal.

Keeping in mind that CLIL is a content learning the developer introduces certain text work. Fostering reading comprehension is considered highly important in CLIL. Apart from building up extensive reading skills, information manipulation in the post-reading exercises develops general language competence and helps the students expand their vocabulary. In addition the students get acquainted with how the material they study at the lectures conducted in Russian can be expressed in the English language. At the same time the students consolidate their knowledge on the subject.

The third part of each unit is devoted to listening and speaking activities. At this stage the students are offered to watch some videos and then to discus the problems described in them. For example, studying butterflies as bioindicators they get acquainted with the work of Camille Parmesan who did the research on

how the climate change effects the butterfly populations and who served as a lead author for the Intergovernmental Panel on Climate Change, which in 2007 was awarded the Nobel Peace Prize [NBC Learn 2016; ESI 2011].

Each unit also includes a scientific or popular scientific article given for analysis. This kind of activity teaches the students to search for essential information, develops critical thinking as well as discourse skills, prepares them to the following independent project work. While working on the abstract the students improve their English language skills and simultaneously penetrate into the subject matters analysing phenomena, facts, events and various point of view. This kind of activity is a guided one, conducted under the teacher's supervision.

7. Project work

Each unit ends up with project work. Project work advantages have been widely recognized for many years in the teaching practice in relation to what benefits it brings concerning motivation, relevance, and educational values.

The tree types of such activity are practiced. The first type is individual project work involving rendering and annotation of scientific discourse on the topic. Project work thus enables the students to drill the language and professional knowledge that will be of most value to them as language users in their professional environment [OUP ELT 2010]. Furthermore writing a discussion in the framework of the project work encourages the students to assess the current ecological situation; develops attitudes, values and behaviour necessary to conform their lives to sustainable development-related principles.

The second type is the projects that simulate real-life situations, which allow the students to get involved in experiential practices or practical work which is not immediately accessible. These projects give a chance for student-led, collaborative work relative to a real-world problem or issue. In the framework of the course the modeling of the biomonitoring of water quality with macroinvertebrates was done. At the beginning the students got acquainted with the practices of water quality assessment during the English listening and reading activities based on the materials provided by the University of Wisconsin-Extension website [UW-Extension 2012a; 2012b; WAV 2003]. Using the instructions provided by University of Wisconsin, images of macroinvertebrates, the "Key to macroinvertebrate life in the river" and the recording form [UW-Extension 2012c; WAV 2003] they then simulated the same research in the class describing the equipment needed, then how to select the sample sites and the sampling procedure in English. And at the end the presentations in English, in which they showed and

explained the outcomes of the simulated research, were displayed and the ways of solving the problems were discussed.

Simulation activities include not only modeling of field studies but also role plays, debating the results of experiments studied, and gaming giving the students a clear sense of involvement, engaging them with real-world issues, helping them develop appropriate professional behaviours. These activities also provide the students with the opportunity to evaluate the perspectives of living sustainably, to develop the strategies conducive to sustainable development.

The third type is experiential project work which includes participatory activities in real bioindication studies. In this place-based learning, the students work in collaboration with a subject teacher implementing their knowledge in practice.

For example, the air quality assessment using lichens as bioindicators of air pollution was done during the course. It was focused on quantitative evaluation of lichen species in the selected sites which were located nearby the ISEI buildings, Minsk Tractor Works, and Power Station, 3, Minsk. First, the field guide published on the UK Air Pollution Information System website [APIS 2015] and designed by Center for Ecology and Hydrology, Natural History Museum and The University of Nottingham was studied at the language classes. Then, the field study itself was conducted according to the instructions given in the APIS manual in collaboration with the biomonitoring teacher. Finally, the students demonstrated the outcomes of their field work in presentations given in English. During the field work the students showed high engagement and interest which resulted in very informative presentations containing not only the pure results of the study but also the students' discussions, their attitudes, ways of problem solving and knowledge about sustainability issues.

Place-based project work is a particularly useful approach for a CLIL programme as it enables the students to produce a worthwhile product in the language learned and at the same time gives a clear sense of achievement in the professional sphere. Fieldwork and action research are the practices in which learning the principles of sustainable development can be engaged not only with reference to the discipline, but also regarding students' own values and attitudes.

8. Conclusion

Considering the benefits of CLIL it is worth to be mentioned that the whole content and language organisation of the course book provides the students with the opportunity to develop high linguistic and professional competence. The dual

aim of CLIL methodology is clearly seen in each kind of activities. The vocabulary section makes the students learn the biomonitoring terminology they have to use in the following tasks. Reading, which is highly important in CLIL classes as the content is paid particular attention to, helps the students revise the material of the lectures and at the same time drills the reading skills and enhances the language learning motivation. Speaking and listening tasks are aimed at both consolidating the knowledge on the subject and the language skills themselves. Text analysis and abstract writing affords the opportunity to obtain additional information on biomonitoring issues and develops skills in academic writing. Project work contributes to the students' ability to demonstrate their comprehension of the subject matters, their skills in composition and discussion and promotes developing of the professional competence. To conclude it should be said that during the experimental course the teachers involved in it noticed students' enhanced advancement not only in biomonitoring but also in learning English. The interdisciplinary process has appeared to be mutually beneficial as the acquisition of knowledge on biomonitoring issues are highly supported throughout the English classes and the language skills are intensively drilled during practical training and project work. Although the developer of the book had no intention to make any comparative analysis, it has become evident through practice that CLIL technologies, rather than ESP, are more suitable, motivating and creative in the light of attaining interdisciplinary goals.

Following the interdisciplinary approach the developer of the course book "English for biological monitoring" has made an effort to embed sustainability in the curriculum. Citing the UNESCO website, Education for Sustainable Development allows every human being to acquire the knowledge, skills, attitudes and values necessary to shape a sustainable future [UNESCO 2014]. The discussion over some key sustainable development issues which are more or less relevant to the topic of each unit is included into the speaking activities and of course they are an integral part of project work as it is believed that students' expertise acquired from different disciplines can be brought to bear on the sustainability problems. There is no doubt that it is just the first step towards the implementing ESD in the CLIL language teaching. The curriculum of the faculty of Environmental Monitoring contains a wide range of disciplines which are planed to be involved in the interdisciplinary educational process. It mainly concerns such disciplines as "Waste Management," "Water Supply and Management," etc. During the CLIL English classes the students, future ecology managers, would have an opportunity not only to acquire the knowledge on the subject they would also study the experience of developed countries in organisation of project work done by students in collaboration with the local enterprises and local communities. In the framework of CLIL classes it is also planned to engage them in place-based project work which relate to there future profession, connect them with their

probable future place of work, and involve them in real-world issues which can help them realise how to make decisions and perform their work in a sustainable manner. This is the field where CLIL technologies and ESD principles can be brought together.

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Nauczanie biomonitoringu w języku angielskim

Streszczenie. Celem artykułu jest przedstawienie sposobu wdrożenia interdyscyplinarnego podejścia do nauczania języka angielskiego opartego na wybranych aspektach zintegrowanego kształcenia przedmiotowo-językowego (CLIL) poprzez połączenie nauki o środowisku i rozwoju zrównoważonym z nauczaniem języka angielskiego. W artykule opisano podręcznik do nauki języka angielskiego jako języka drugiego (ESL) przeznaczony dla studentów monitorowania środowiskowego, studiujących biomonitoring w ramach kursu CLIL. Należy zaznaczyć, że na końcu każdego tematu studenci prezentują projekt, w którym demonstrują wiedzę merytoryczną i językową, jaką sobie przyswoili. Cel ten jest osiągany bez zwiększania wymiaru czasowego programu nauczania.

Słowa kluczowe: ESL, biomonitoring, edukacja dla zrównoważonego rozwoju, CLIL, ESP