E-Learning From Nature: Picking From Nature The Inspiration To Teach And Learn Science

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Abstract

This work aims to present the work done so far by the Polytechnic Institute of Bragança (IPB) within the project E-learning from Nature. The project includes, at national level, a network of secondary schools from the district of Bragança and aims to promote a proactive students' approach to scientific subjects learning and propose innovative teaching methodologies to science teachers. Five geographical areas of natural interest have been selected: Azibo Reservoir Protected Landscape, Douro International Natural Park, Montesinho Natural Park, Landscapes of Serra da Nogueira and the Cork oak forests of Jerusalém do Romeu. Among the scientific topics to be illustrated by examples found in nature, Mathematics, Biology, Geology, Physics, Chemistry and/or Geography are in focus.

Apart from the work to be done at national level, a fruitful cooperation is expected from the exchange of experiences among the international partners (Italy, Belgium, Ireland, Greece, Lithuania, Portugal and Romania).

Key-words: E-learning, nature, sciences, secondary level students and teachers

1 Description of the international partnership and tools for dissemination

E-learning from Nature is a project funded by the European Commission and the Italian National Agency for the Erasmus+ Programme (Key Action 2: Cooperation for innovation and the exchange of good practices). It addresses two main objectives: (i) to promote a proactive students' approach to scientific subjects learning and (ii) to propose innovative teaching methodologies to science teachers. The consortium involves 8 partners from 7 different European countries (Italy, Belgium, Ireland, Greece, Lithuania, Portugal and Romania), as described in Table 1, and is coordinated by the Institute Frederico Enriques from Italy. The project is directed to Science and English teachers, and includes a network of secondary schools interested in the identification of new methodologies to teach science.

Table 1 - Description of the partnership (country and type of organization).

Country	Partner	Type of organization
Belgium	INFOREF	Non-profit association of teachers, technical and educational experts.
Greece	Epimorfotiki Kilkis SM LLC	Vocational Training Center (VTC).
Ireland	Limerick Institute of Technology	Higher Education Institution (HEI)
Italy	I.I.S. "F. Enriques" PIXEL	Secondary and Higher Education and Training Institution
Lithuania	Trakai Educational Assistance Authority	Organization for non-formal adult education, qualification raising and pedagogical psychological services.
Portugal	Polytechnic Institute of Bragança	Higher Education Institution (HEI)
Romania	Fundația EuroEd	Non-profit educational organisation.

The project is supported by a web portal (http://enature.pixel-online.org/) and a Facebook page aiming at promotes an easy dissemination (https://www.facebook.com/enatureproject/). The web portal will serve, among other utilities, to make available for the community, the developed materials. It will give access to: (i) a database of local areas relevant to teach/study scientific subjects, (ii) a set of e-learning lessons related to the local areas; and (iii) a teacher's guide

comprising methodologies/strategies to implement a more innovative and attractive teaching/learning process.

2 Portuguese network of schools, teachers and students

The project involves several researchers from IPB and a group of teachers and students (aged from 14 to 19 years old) from 5 schools of the district of Bragança (full description in Table 2).

Table 2. Portuguese network of schools in numbers.

School	Teachers involved	Students involved
Agrupamento de Escolas Miguel Torga (Bragança)	3 teachers (Biology, Physics/Chemistry and English)	20 (age range: 16-17)
Agrupamento de Escolas Emídio Garcia (Bragança)	7 teachers (Biology, Physics/Chemistry, Geography and English)	26 (age range: 14)
Agrupamento de Escolas Abade Baçal (Bragança)	5 teachers (Biology/Geology, Physics/Chemistry, Mathematics, English)	50 (age range: 14-18)
Agrupamento de Escolas de Mirandela (Mirandela)	5 teachers (Biology/Natural Sciences, Physics/Chemistry, English)	20 (age range: 14-18)
Agrupamento de Escolas de Macedo de Cavaleiros (Macedo de Cavaleiros)	3 teachers (Biology, Physics/Chemistry and English)	20 (age range: 14-18)

3 Geographical areas of interest

Among other objectives, and after selecting 5 regions of natural interest from the North Eastern Portugal (preferably regions defined as of EU interest, for example defined in Natura 2000 Network Viewer - http://natura2000.eea.europa.eu), information of scientific interest concerning flora, fauna, natural elements and any other reporting human intervention will be collected by students in a digital format (photos, videos, drawings, etc.). Using this material, and following a predefined learning guide developed by groups of teachers and researchers, small e-lessons will be produced, aiming at identifying the connection between the above mentioned natural elements with school scientific curricular activities in Mathematics, Biology, Geology, Physics, Chemistry and/or Geography and the related basic skills to be acquired.

This work is already in course and the following geographical areas of interest have been chosen: Azibo Reservoir Protected Landscape, Douro International Natural Park, Montesinho Natural

Park, Landscapes of Serra da Nogueira and the Cork oak forests of Jerusalém do Romeu. Table 3 gives a brief overview of the main characteristics of these areas and corresponding Natura 2000 region code.

Table 3. Brief description of the geographical areas and corresponding Natura 2000 code.

Geographical area	Brief description	Natura 2000 code
Azibo Reservoir Protected Landscape	Azibo reservoir consists of 3 watercourses, Azibo, Azibeiro and Reguengo, belonging to the river Sabor (tributary of Douro River) basin. Located in the transition region between Terra Fria (Cold Land) plateau and Terra Quente (Hot land), it is inserted between medium altitudes of 500 to 700 meters.	PTCON0023*
Douro International Natural Park	The Park covers the border stretch of the Douro river, including its valley and adjacent plateau surfaces, and extends south through the valley of its tributary, the river Agueda. This granitic area is characterized by a microclimate, with low rainfall and mild winter temperatures (hot land).	PTCON0022
Montesinho Natural Park	The Park is a protected area of 74 229 ha, located in the municipalities of Vinhais and Bragança, in the northeast Portugal. This mountainous region, named Terra Fria (Cold Land) is characterized by a succession of rounded elevations and valleys deeply embedded, with altitudes ranging between 438 and 1481 m.	PTCON0002**
Landscapes of Serra da Nogueira	Serra de Nogueira is a small mountain complex reaching 1375 m, part of Natura 2000 site Montesinho/Nogueira it is located in the municipalities of Bragança, Macedo de Cavaleiros and Vinhais, in the northeast Portugal. This area is included in the “Terra Fria” (cold land).	PTCON0002**
Cork oak forests of Jerusalém do Romeu	Located in Trás-os-Montes, the Natura 2000 region of Romeu was created to protect two of the most well preserved habitats of Cork oak. This site occupies an area of 4768.59 ha, located between Mirandela and Macedo de Cavaleiros and includes a small areas of	PTCON0043

	olive grove and Douro Wine Region vineyards. It has a typical mediterranean microclimate (hot land).

* Azibo Reservoir Protected Landscape is a protected regional/local area. Part of the region is included in the Natura 2000 region Morais (PTCON0023)

** Montesinho and Nogueira are included in the same Natura 2000 region (PTCON0002)

4 Brief descriptions of the scientific topics to be covered and defined strategies

The science of water and soils will be studied, starting by the collection of samples in the natural environments of the defined geographical areas. The chemical and physical analysis will be performed using portable equipment complemented by laboratory analysis at IPB. The relationship between soil quality and flora characteristics will be also discussed when relevant.

Renewable energies will be introduced by visiting areas where hydropower and wind-power have been implanted. The full concepts will be explained in situ and thereafter complemented with the visit to the VerCampus, a park of renewable energies located at the IPB campus. Complementary concepts can be also presented at laboratorial level.

Chemistry of natural products and botanical classification of plants and fungi can be also studied taking advantage of the wide diversity existing in the region of Trás-os-Montes.

In the mathematics area, concepts such as volumes and surface, Pythagoras' theorem, functions, statistical measures will be related to architectural or nature elements.

5 Conclusions and future work

Apart from the work to be done at national level, a fruitful cooperation is expected from the exchange of experiences among the international partners. All the produced materials will be available in an online portal for the community. In a second phase of the project, a guide for science teachers focusing innovative methods to enhance students' motivation to study scientific subjects and improve their basic skills in science will be developed as a result of the cooperative effort between partners.

6 References

Pixel (2015). E-Learning From Nature. Website: http://enature.pixel-online.org/.

7 Acknowledges

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