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ANALYSIS OF AN INTERDISCIPLINARY OPTIONAL COURSE: GEOINFORMTICS

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Abstract

In the first part, we presented the concept of curriculum and analysed aspects related to the introduction of school-based curriculum in secondary education in Romania. The objective of this study was to analyse the curriculum of a Geoinformatics optional course, the "annual plan", the "learning unit plan", the learning activities included in the Geoinformatics optional course, the students' achievement in this course and their views on the subject matter. In order to identify the students' opinions about the course, we used the questionnaire as the survey method. We concluded that this optional course met the students' expectations and interests, being correlated to the prospects of evolution of the knowledge-based society.

Keywords: *school curriculum, digital competence, school education, e-learning*

INTRODUCTION

The concept of curriculum has been used since the second half of the twentieth century in some European countries. In Romania, the concept of curriculum was used after 1989 in different contexts, with different

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meanings (Dulamă, 2013, p. 67). In the current pedagogical literature, there are various approaches to curriculum: learning-oriented, being "a series of actions meant to induce learning" (De Landscheere and De Landscheere, 1979), covering aims, contents, methods, assessment, teaching materials, textbooks, teacher training; content-oriented (Potolea *et al.*, 2013), including all types of referential school documents in which the learning contents are mentioned (educational plans, curriculum, textbooks); process-orientated (Potolea *et al.*, 2013), focussing on the joint work of teachers and students, who interact in learning experiences in a certain space and time, making use of certain available resources; product-orientated, etc. (Potolea *et al.*, 2013).

The Romanian education system operates with several types of curriculum. The core curriculum includes the common core of learning experiences (65-75%) for a level of education (Dulamă, 2013). The school-based curriculum (SBC) includes 25-35% of students' learning experiences, allowing their differentiation and even their personalisation (Dulamă, 2013). The school-based curriculum encompasses all educational processes and learning experiences that each school provides for its students as part of their curricular offer. At the level of education plans, the school-based curriculum is represented by the number of hours available in designing the school's own curriculum project. It covers the difference between the number of hours included in the core curriculum and the minimum/maximum number of hours per week, subject and year of study provided in the framework plan (Dulamă, 2011b, p. 96). The school-based curriculum includes three curricular subtypes: the deep core curriculum, the extended curriculum, and the curriculum developed inside the school. The deep core curriculum aims to deepen the teaching-learning-assessment experiences for students who cannot retain the mandatory curriculum in the assigned number of hours (Dulamă, 2013). The extended curriculum is meant for students with potential that have a special drive for certain classes (Dulamă, 2013). The curriculum developed inside the school involves optional activities provided by the school according to: the existing human resources (teachers, students), the school's material resources, the parents' and students' preferences, the students' interests and preferences, the particularities of the location or of the local community, the specifics of the school, and the importance or attractiveness of the topics.

In Romania, geography classes are part of the curricular area called "Man and society". In the middle school curriculum for this curricular area, they provided 0-1 hours of optional courses for each year of study. The methodology for approving optional courses (Order no. 3,449/1999) and their introduction into the educational offer of a school in Romania includes: the submission of proposals to methodical commissions for approval (the motivation for choosing the course, duration – school year, education level, learning contents, methodological suggestions, assessment methods, and

bibliography) in the school year preceding the year in which the school-based curriculum will be taught by teachers who are interested and qualified for the optional course; the course approval by the school curriculum board and by the area inspector; designing option sheets for parents and students (students should choose the school-based curriculum after consulting their parents, without being influenced by the school); drafting groups of students from different classes who opted for the same optional course or establishing for the class level the optional that is preferred by both parents and students and is approved by the school board of directors; the inclusion of optional courses in the timetable scheme of each class at the beginning of the school year. To set up a group, a minimum of 10 students belonging to the same class or parallel classes is required. If the maximum number of hours included in the curriculum of the educational framework for geography is already assigned, the hours for optional courses are assigned to other subjects of the curricular area.

In the context of nowadays Romanian education system and through the analysis of the activities performed with the students in the classroom, we identified a tendency directed towards the use of information in the formal and non-formal educational process. Romanian students were very interested in using computers and the internet, which was why we thought it appropriate to offer 7th grade students the ability to operate with geographical concepts under a school-based curriculum titled *Geoinformatics*, learning geography at this level being frequently extended outside of the limitative space of the classroom. In this study, we analysed the curriculum, the activity plan, the learning activities held during the *Geoinformatics* optional course*,* the students' achievement and their opinions on this course.

RESEARCH MATERIAL AND METHOD

Method. In the 2014-2015 school year, we designed the curriculum for the *Geoinformatics* optional course, also held in the school year 2015-2016 due to feedback from students. After designing the curriculum, we presented it to the area inspector for approval, we informed the students and parents on the objectives and on the contents of this course. After forming each group of students who chose the optional, we developed two documents: "The Annual Plan" and "The Learning Unit Plan". The optional was included in the timetable and into the register of the class in order to write down non-attendances, grades, and annual averages. In order to identify the students' opinions about the course, we used the survey questionnaire method. The questionnaire included multiple choice and open response items.

Participants. The questionnaire was applied to 63 students belonging to three groups of 7th graders who attended the *Geoinformatics* course during the 2014-2015 school year. They represented the whole group of

people who attended this course held by the first author. Students perceived me as a teacher, not as a researcher.

The research material is represented by the curricula in line with school-based curriculum (Annex no. 1), the plans for the course and students' answers to the questionnaire.

RESULTS AND DISCUSSION

Analysing the curriculum (Annex 1)

In formulating general competences, we took into account the eight domains of key competences specified in the National Education Law (2011), aspect mentioned in the argument of the course. Because it is an interdisciplinary course, we formulated each general competence so as to be correlated with both geographical content and computer studies. In formulating the values and attitudes targeted throughout this course, we took into consideration the key competence areas from the National Education Law and the arguments stated in the law in order to support the formation and development of these key competences for the Romanian students, as EU citizens.

While selecting the elements of contents, we took into account the contents of the syllabi for geography and for computer studies that students had learnt up to 7th grade, to be able to harness the knowledge, skills, and their previous experiences. The presented content combined geographical information with that in other areas such as: computer study, mathematics, and English. I considered that it was important for students to be confronted with applications that were being used in the whole education system in Romania (the software provided by *Intuitext*) and those that they could use for free by downloading them from the Internet. Being a *Geoinformatics* course, the contents were predominantly practical. The name itself suggested that the intended purpose was for students to learn to put together a product (e.g. a website on the topic "Making sites with geographical content") or use an application ("use Google and Google Earth").

At the end of the curriculum, they gave several methodological suggestions. Researchers pointed out the fact that, for the formation and development of the students' productive and reproductive skills (Dulamă and Roşcovan, 2007), the main method to be used was the exercise (Dulamă, 2011b). They recommended to use individual exercises, in pairs, in groups, associated with various geographical materials (maps, images, charts, documentaries, animations) and various educational means

(computer, projector, mobile phone, smart board, etc.). The assessment of knowledge and acquired and developed competences during this course was best to be addressed as part of the learning process. For this purpose, self-assessment and complex assessment methods (project portfolio, essay, etc.) were suggested.

Analysing the planning of the Geoinformatics course

This course was assigned one hour per week. In "the Annual Plan", we designed seven learning units, one for each unit of contents mentioned in the curriculum. These learning units were set to be studied in the same order they were mentioned in the curriculum. In "the Learning Unit Plan", suggested topics for each lesson included a small part of computer science theory which could be applied to various contents of geography. In this document, we explained in detail each lesson as a series of learning activities associated with certain forms of learning, teaching materials, and teaching, learning and assessment methods.

Analysing learning activities

Students were involved in various activities, in different forms of organisation: individual activities, pair activities, and group activities. During the activities based on interactive methods they were able to share information and learn from each other. We followed the order of the activities mentioned in the initial plan to ensure a constructivist approach to training and developing competences. Throughout the carrying out of the activities, basic impediments occurred, such as the school's old computers or insufficient resources (low number of computers compared to the number of students in the classroom).

Analysing student achievement in Geoinformatics and Geography

Student grading for *Geoinformatics* was based on electronic portfolios, individual or group papers, projects, posters, interviews, and presentations. By statistically comparing the averages obtained by students in the optional course to those in geography, a subject matter located in the core curriculum, we noticed significant differences in the averages of 5-6 and 9-10 (Figure 1). In *Geoinformatics,* we noticed that only 2 students had averages of 5 and 6, while in Geography there were 16 students with those averages. Regarding the averages of 9 and 10, 51 students were in this range in *Geoinformatics* and only 24 students in Geography. This underlined major differences between the minimum passing mark of the Romanian grading system, which was 5, and the maximum, which was 10.

Analysing students' opinions about the Geoinformatics course

Analysing the 63 questionnaires filled in by students who studied this optional during the 2014-2015 school year, we had a series of findings.

To the question "Were you asked for your opinion when selecting the *Geoinformatics* optional course?" 100% of the students answered "Yes". This response indicated that the methodology of the school-based curriculum was observed. This result indicated also that prior to selecting this optional course, as well as others, a diagnosis on the students' needs and desires and of the social and economic context needed to be performed in order to offer different courses of study.

To the question "Were you informed about the optional content of *Geoinformatics* before making the choice?" 100% of the students answered "Yes". This answer indicated compliance with the methodology and that the students were informed, prior to selecting the desired optional course, about its contents and assessment methods.

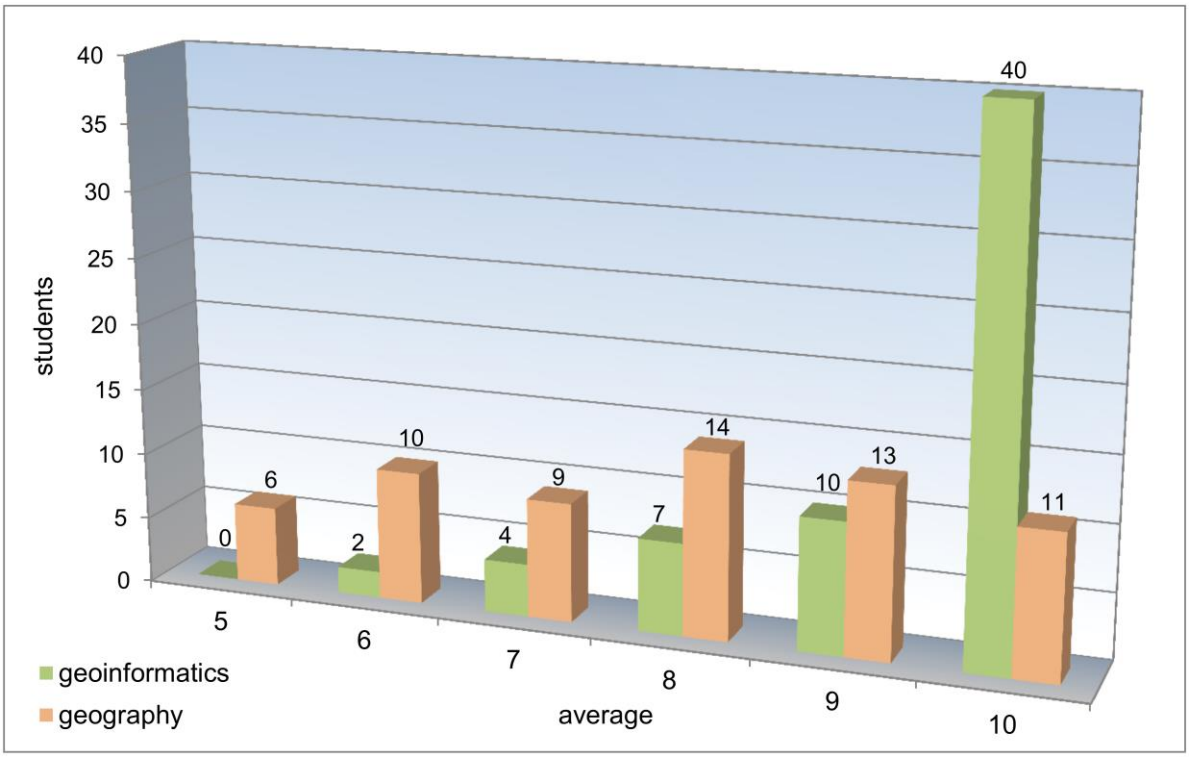

Fig. 1. Distribution of students' average grades when comparing Geoinformatics to Geography as school disciplines

To the question "Did you consult your parents before making your choice?" 79% answered "Yes". Those who gave a negative response probably chose *Geoinformatics* on their own free-will being drawn in by geography, the "mother" course, or by their passion for computers. Confident in their own decisions, they did not feel the need to talk to their parents. The lack of cases in which parents were consulted could be explained by their absence from home or by their lack of interest in their children's school activities.

To the question "Do you enjoy attending *Geoinformatics* classes?" 100% of the students answered "Yes". This answer indicated that students believed that this course met their expectations and interests.

To the question "Do you consider that the number of optional subjects should be higher?" 84% answered "Yes". The fact that some students believed that studying multiple optional courses would be pointless could be justified perhaps by their fear that these would decrease the study time dedicated to compulsory classes or maybe they felt pressured in their learning and assessment due to the very high number of classes (15).

To the item "List three interesting things you studied in the *Geoinformatics* optional course" the most common answers were: creating websites with geographical content (25%), map drawing using specialised software (19%), discovering geography related information while consulting websites with geographical content (17%), studying the Universe using different types of software (Stellarium, Celestia) (10%).

For the item "List three interesting things that you wouldn't have wanted to study in the *Geoinformatics* optional course", students listed the contents they disliked or did not want to study, but argued that some lessons seemed more difficult and that they would have liked to go into more details while covering a larger time interval (using *Publishe*r in geography and *Microsoft Encarta* because this encyclopaedia uses English, and not all students have the appropriate language level).

For the item "Do you find it necessary to study the *Geoinformatics* optional course during the next school year as well or not? Why? Justify your answer." 88% of the students said that it would be useful to further study the optional course correlated with the geography contents taught in 8th grade. The 12% who answered that they would not need to study the course during the following year, probably considered that they had got enough information and had learnt how to use sufficient types of software containing geographical content or they had concerns about the large number of classes to be studied in the school year prior to their high school admission examination.

For the item "What do you think can be of good value in studying this *Geoinformatics* optional course?" 44% of the respondents said creativity and digital literacy, 38% chose thinking and digital competences, and 18% chose all three answers.

For the last item "Grade the *Geoinformatics* optional course", 95% offered it the maximum number of points (10) and only 5% of the respondents gave it 9. These results indicate that after completing all learning and evaluation activities for this course the student satisfaction level was very high.

CONCLUSIONS

The *Geoinformatics* optional course proved to be a course that met the students' expectations and interests, being correlated with the development prospects of the knowledge-based society. This course offered students a context and learning experiences based on different educational resources and teaching materials, student-oriented methods and techniques, the exercise method proving to be essential. By attending this course, students developed various competences: using specialised language, using investigative methods for geographical facts, data processing and representation of results, digital competences, etc. Complex methods of evaluation (project, essay, and portfolio) enabled the enhancement of knowledge of *Geoinformatics* and their application in other contexts, facilitating the development of creativity and divergent thinking.

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Annex 1. *Geoinformatics* Curriculum

Argument

The aim of this optional course is to facilitate the evolution from descriptivist geography to an attempt of investigation of the geographical area using ICT in order to ensure students' best adaptation to a knowledge-based society. Through the contents presented in this course, students will be involved in learning activities that will develop the following key competences set out by the National Education Law (2011): digital competences - to use information technology as a tool for learning and knowledge; learning to learn; communication in foreign languages; basic technology ones.

General competences

1. Proper use of the concepts of *Geoinformatics*;

2. Accessing and using geographical content on a computer;

3. Using methods and techniques for the investigation and processing of geographical information on a computer;

4. Development of geographical representation skills for electronic media mapping and graphics;

Values and attitudes

Interest and curiosity in discovering the geographical reality using a computer;

Personal initiative;

Favourable attitude towards science and knowledge as a whole;

Availability to asses/self-assess practical skills;

Respecting the others' opinions;

Openness and willingness to listen to others' opinions;

Availability for lifelong learning.

Specific competences and contents

Specific competences	Contents
1.1. Localising geographical elements; 1.2. Analysing the order of geographical elements; 2.1. Analysing the computer's role in learning geography; 2.2. Analysing spatial representations of physical and human geography; 2.3. Looking for information on the Internet; 3.1. Selecting geographical aspects and concepts; 3.2. Investigating geographical space (observation, analysis, interpretation); 4.1. Writing and pronunciation of geographical names in foreign languages; 4.2. Analysing and interpreting electronic maps; 4.3. Explaining the phenomena, processes and relationships between the components of the geographical environment; 4.4. Using conventional symbols on digital maps; 4.5. Using specialised geographical programs; 4.6. Analysing geographical information using databases available on the Internet.	*Geoinformatics - general characteristics* What is Geoinformatics? *IT resources in teaching geography* Educational software, portals and other applications Google Earth Seterra Microsoft Encarta AmiGlobe2002 Celestia Stellarium *Internet - infinite source of information* Searching and studying geography documentaries Using Google Earth Looking for web pages containing geographical content Analysing weather conditions on the Internet *Virtual field trips using a computer* Virtual exploration of different areas on the Earth Computer-generated maps Map drawing using the MapCreator application Exploring the Earth using the internet *Microsoft Office - applications in geography* Working on a geographical project using Microsoft Word Drawing geographical charts using Excel

	Devising PowerPoint Presentations with geographical content Microsoft Publisher and its applicability in geography *Intuitext and interactive learning* Presenting the Intuitext program Using Intuitext during Geoinformatics classes *Ael software in teaching geography*

Learning activities

- localisation exercises on a given electronic device;

- describing observable systems (rivers, vegetation tiers, etc.) on an electronic device;

- studying the software used during *Geoinformatics* classes;

- identifying geographical facts using information source (dates, names, locations) exercises;

- explaining terms, facts, and geographical phenomena and processes;
- selecting web pages with geographical content using various browsers exercises;
- transforming information on electronic devices;

- analysing the weather forecast, the sequence of phenomena during a year;

- correct spelling of proper names in various languages;

- analysing electronic maps;

- localising of geographical elements on the digital map;

- interpreting electronic geographical maps;

- simple mapping of areas within the local horizon.

Methodological suggestions

To give students a context and optimal situations for training and development of productive and reproductive skills, the main method used will be the exercise. Students will perform various types of exercises such as individual, in pairs, and in groups. These exercises will be associated with various educational means: computer, projector, mobile phone, smart board, etc. For this purpose, students will use maps, pictures, diagrams, documentaries, animations, various applications, etc. All activities will focus on developing communication skills in a geographical context, encouraging the online exploration of the geographical environment or by using information technology.

Assessment methods

The evaluation will be designed as an organic component of the learning process. During the evaluation, the emphasis will be placed on formal, non-formal and informal learning experiences and on students' competences. For this purpose, we shall mainly use self-assessment and complex assessment methods (essays, projects, etc.).

Assessment within the school-based curriculum will be achieved through:

- creating electronic portfolios;
- devising and presenting geography projects using PowerPoint;
- writing and presenting individual or group reports;
- electronic tests with various items;
- drawing electronic maps;
- interpreting digital images and maps.