

AN ICT BASED APPROACH TO IMPROVING GEOGRAPHY TEACHING

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Abstract :This paper presents improved software for enhancement in teaching process of geography in the primary school. At the same time it can be used for any other subject in primary or secondary school. The development of multimedia material consisting of both theoretical background and practical applications of geographical map, coordinates and space orientation are presented. We decide to demonstrate proposed software solution for implementation in geography because statistics shown a lot of problems with this subject especially in fifth grade of primary school. This kind of approach enables accessibility to educational material for the pupils, interactive learning, testing and additional knowledge. This learning process is intended for better understanding basic geography conceptions and facts. According to the basic concept of e-learning these materials should be web oriented, interactive and support multimedia materials.

Introduction

Nowadays information and communication technologies (ICTs) are inseparable parts of everyday life [1], [2]. The development of technology and appearance of new technologies introduce many possibilities in various human activities, including education, teaching and learning [3].

There are numerous reasons for the application of ICTs in all parts of educational domain. Namely, ICTs provide various ways of bringing educational opportunities to wider group of people. In addition, it expands availability of the quality educational materials, thus enhancing the efficiency and effectiveness [4].

According to the experience of the author, in teaching process of geography in the primary school, there is a need to improve teaching materials. This is very important from the point of pupil's interests [5]. A new materials must be adapted to the modern information and communication technologies in the form of multimedia materials in order to attract pupil's to spend more time in teaching and exploring geography [6], [7]. This paper present material intended for better understanding geography [8], [9].

The basic idea of this paper is making multimedia material implemented in web site which can be used in the school and

from pupil's house [6]. Material should attract pupils' attention by making these materials similar with games [10]. Very important fact is stimulating competition between users and makes learning process informal [6], [10].

Pupils' problem in learning Geography

The main goal in teaching geography in primary school are distribution of knowledge and skills which will provide pupils better understanding of natural and social phenomenon and processes in geography and their relationships in space [5]. Teaching in geography should contribute assimilation of knowledge about uniqueness of geographical space on Earth, assimilation of knowledge about geography of their countries and its role and place in the world [10].

In the fifth grade pupils learn about cartography. They meet, for the first time, with concepts of geographic coordinate system (meridian, parallel, longitude, latitude) [11]. These concepts are the hardest items for learning and understanding for pupils. Descartes coordinate system pupils learn in the seventh grade in mathematics. Because of this fact they cannot understand that every point on Earth, including cities and other geographical object, has two coordinates: x and y axes. The second problem is scale and its practical use. For solving this kind of problem pupils should understand a proportion and others mathematical skills which will be learned in the higher grade. The official book contains a few examples which are too difficult and also based on several formulas which should be learned in sixth grade. The problem is more complicated if we know that official teaching program includes only one class per week. All these problems make teaching process difficult and misunderstand. The solution is changing classical way of teaching and equipment in use [6], [7]. Until now teachers use hard cover printed book and map.

This paper offers one new implementation of e-learning by its modification for school environment [3], [4], [6]. That means we should make specified web site which should offer multimedia materials with short and long explanation of teaching lessons. This way should include interactive animations, audio and video data and unusual exams [12]. These

exams should grade and learn pupils at the same time. All pupils can use these materials at the same time in classroom and be motivated for getting better score than others. Every pupil can read and solve tests by its own speed. After the class the materials, distributed by lessons, could be offer to pupils by Internet. On that way learning process can be continued or replayed by every pupil asynchronously from their home. Until now, our experience in this project shown good results in the most important point: pupils interesting and motivation for learning geography raise [13], [14]. This project is not realized completely and all lessons don't have all predicted materials. We started with basic version and make evaluations together with pupils during test phase. Internet, new technology and different materials could be good candidate for improving in teaching geography in primary school [15].

Content of multimedia material

The multimedia materials are divided into two main parts: practical examples and theoretical background. In the first part pupils should be motivated for exploring a new knowledge by interesting interpretations of teaching lessons. This should be organized as kind of games and should increase pupils' competitions [6]. For this purpose we used special created flash animations and Java applets for demonstration. There were three reasons for that: a) it is very simple for usage (application is included in web page and web browser is only needed), b) very similar with games and c) provide good possibility for animation and system design (design is very important because these materials should be interesting and different from classic teaching equipment).

In the foreground are practical examples without any theory [4]. This way should make these materials easier for learning. In the first level pupil should give only true or false responses which are offered. If the response if false pupil have possibility to view theoretical background and learn everything about that problem. This theory is second part of this project. For this work theory is divided in two levels. If pupils click for help it will be shown only short explanation about requested question. At the end of its explanation is link for details. This link will provide more information about some lesson. These two levels theory organization are results of several years' observation and discussion with pupils. Their first need is short information about the problem. Any other long text will be forbidding, and their interesting decrease.

These multimedia materials contain exercises for three big teaching lessons: geographical map coordinates and space orientation [5]. All these lessons are addressed to one problem: pupils don't know Descartes' coordinate system. This is material for the next grade in mathematics. That is the reason of misunderstanding terms like point position, point description with two numbers (latitude and longitude)

and hemisphere. These terms are directly associate with x and y coordinates positive and negative part of y axe and quadrants. In official teaching materials and plans main point is addressed to understanding and implementing this knowledge. According to this requests this material is organized by five steps.

The introduction brings elementary checking knowledge from geography. In this step pupils should learn basic terms and facts in maps, map's elements (continents, river, towns, mountains, relief etc.) and space orientation [11]. There are 10 questions and answers with explanations about cardinal point, maps, map's elements, notation, parallel and meridian, zones and scale [5]. These questions are in dynamically connections with cursor position, and after read the question; pupil should click or mark some part of map. Every false response generates opening short instruction. If the request is wrong again, pupil has to read theoretical background, see the answer and then take the next question. For all tests questions order of appearance is different, and number of all questions in database are bigger than number shown to one pupil. Every answer has appropriate number of points, and this is adding to pupils' points until that moment. Every wrong answer brings negative points and support graphical representation, Fig 1.

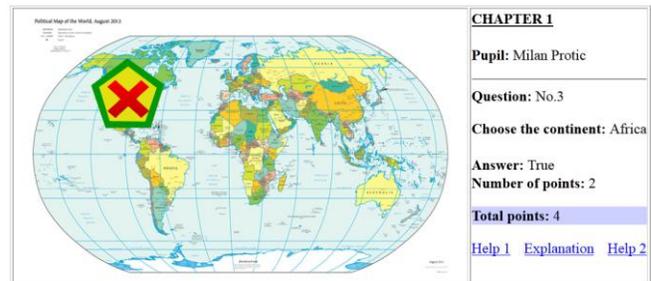


Figure 1: Selection of wrong destination.

Final results for all pupils can be shown on competition list. On Fig 2. is shown view of introduction in Chapter 1. Pupil Milan Protic has given true answer on the third questions by clicked on "Africa" and gained 2 points.



Figure 2: Selection of right destination.

In the first step pupil have task to click on city which coordinates are given. Map is given for whole world with lines which are ended by number representing (latitude and longi-

tude). Names of cities are not given but cities are chosen to be on crossing lines. On this way pupils can learn based problem of understanding latitude and longitude but on the same time collect knowledge about world known capitals. After getting coordinates and name of cities pupils should click on image map and see result. Only three mistakes are allowed, and after that requested task is shown. If pupils can't find requested task there is Help, Fig 3. Help can focus map on 1/4 of size, and make task easier. If pupils click on link *Help* they can learn how should read map and find unknown city and also can find more text about terms, task and theory.



Figure 3: View of Help window.

If the pupil needs any additional explanation about the lesson, it can be found under the link *Explanation*. In the case of lesson Africa, the view of Explanation window is shown on Fig 4.

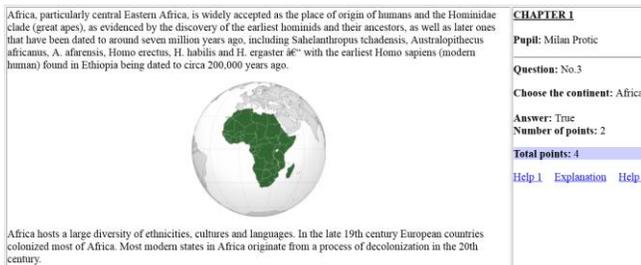


Figure 4: View of Explanation window.

On Fig 5. is shown view of the second step. Pupil Milan Protic has given true answer on the second question in Chapter 1, by clicked on "New Orleans" and gained 2 points.

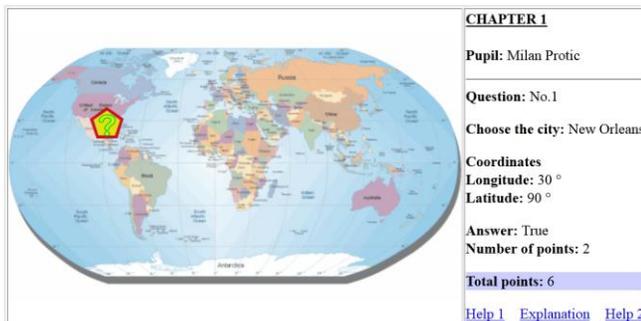


Figure 5: View of the second step: finding cities with given coordinates.

The third step is more difficult for pupils and their learning skills. In this level is shown world map with lines and names of bigger world known cities. On the map name of city are marked and pupils should put two coordinates for particular case into two text fields. After that, application check answer and if it is not correct, make focus to the place on map for given wrong coordinates. This act should make this mistake more visual instead to write usual information about wrong answer. At the same way, pupil can use help and explanation as in the first step. After three mistakes short help is automatically activated. On Fig 6. is shown view of the third step. Pupil Milan Protic has gave true answer on the third question in Section II by entered coordinates for *Hamburg* and gained 2 points.

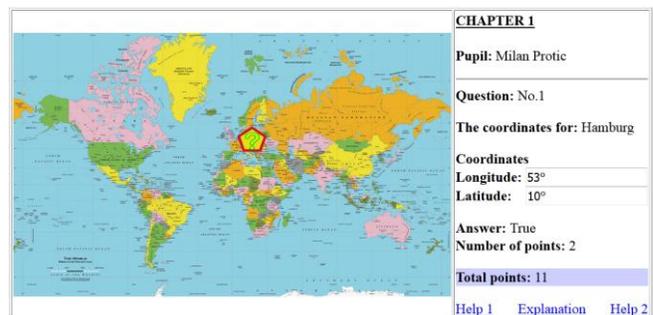


Figure 6: View of the third step: Finding coordinates for given city.

The fourth step includes knowledge about scale. In this phase pupil should calculate distance on map or map's scale for given distance and point location. These points and scale are change every time when previous question is answered correctly. Also, in every new question map and its scale are changed. On Fig 7. is shown view of the fourth step. Pupil Milan Protic has gave true answer on the fourth question in Section III by entered 410km for distance between "Belgrade" and "Budapest" and gained 3 points.

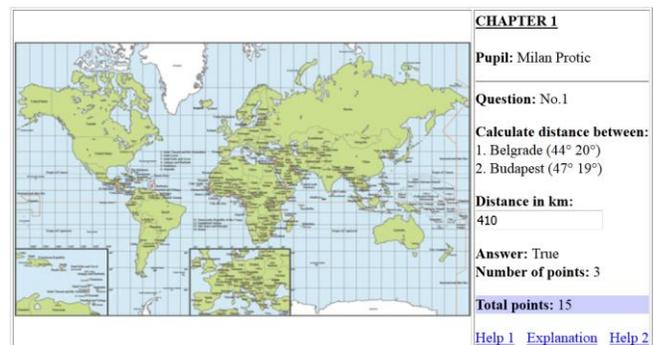


Figure 7: View of the fourth step: Finding distance for two given cities.

After these three steps authors predict set of lessons which are not included in regular learning strategy but bring some interesting material and demonstration for terms learned in previous steps. One of them is explanation about rotation, angles and 3D point representation, Fig 8. For this purpose is used one of available maps from other web sites, for example www.maps.com.

Other material in this step contains a lot of Internet presentation and pictures available on domestic and foreign web sites.

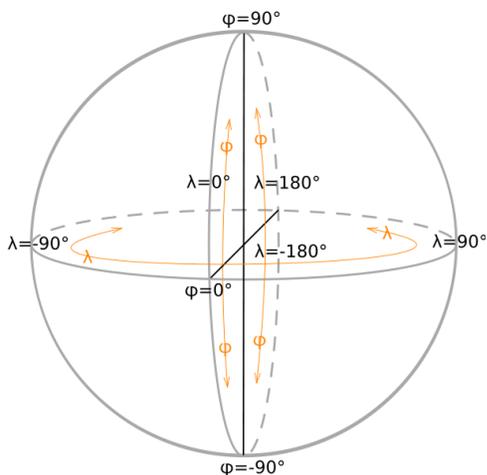


Figure 8: View of additional material connected with latitude and longitude.

All these multimedia materials are not completely finished and now are in experimental phase. Until now it is used only in local area network. For this purpose is used Macromedia's Flash for creating animations and interactive applications. All other code is written in Java for creating Java Applets in associating with database. We used MySQL database for collecting answers, points, login data and set of questions. All these applications are incorporated in web site. For reading are necessary to install Flash player, Java environment and provide web browser with Internet connection. Administrator's panel is not point of interests for the purpose of this paper.

This paper presents our previous work which is now improved and changed. All changes are addressed to administration interface, improved design of data base, security and a lot of reports intended for teachers. Also, after several year of implementing and testing this software we adopt user interface and design of views appropriate for pupils.

Additionally, we reorganize back-end code in object PHP with Model-View-Controller architecture, but all this information won't be shown here in order to primary objective of the application stay its application.

Conclusion

In this paper is represented a new e-learning implementation for improvement of teaching geography in primary school. With regard to the problems of pupils in fifth grade of primary school based on small correlation between knowledge mathematics and geography this paper offer additional possibility for learning on a new way. The goal of this project is creating different and more interesting materials from classic books and lessons and makes learning process easier. This is solving by creating multimedia materials and making this learning environment similar with games. The pupils should learn by playing and be motivated by competition results. Every wrong answer stimulates a pupil to read short or long explanation based on theory and go to the next question. Advantage of this project is visualization of terms and geographical concept which are based on mathematics and skills which are unknown for pupils in fifth grade.

The further work is addressed to make changes and support for custom user modification for different purposes in different subjects. On that way, pupils whose learned this platform in one subject will be familiar and motivated to continue explore other subjects and knowledge on some other way than traditionally learning process.

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