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WEBSITE ON MAP CONCEPTS FOR ALGERIAN PUPILS

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Abstract

The main objective is to provide a synthetic view of methods and solutions used to teach basic concepts related to maps in Algeria, based on the study of Geography textbooks and workbooks used by the pupils. We dedicate the first part of the thesis (background section) to the milestones in the history of cartography, with special emphasis on school cartography. After that, we conduct a brief overview that includes an explanation of exploring map concepts used in Algerian pupil's textbooks. Finally, E-learning methods and potential solutions used for web teaching are discussed. E-learning approaches (e.g., websites) are rich in content and have interactive visual interfaces, which can provide support for pupils in homework and leisure activities after school. Therefore, pupils can use their accounts to access the website and access educational content at home.

Chapter 1

Introduction

Structure of thesis

The thesis is organized as follows:

- **Chapter 1** introduction and history of school cartography.
- **Chapter 2** provides a general background of the teaching of Geographic concepts and maps uses in school textbooks for pupils in Algeria.
- **Chapter 3** explains the design and structure of our web site, which is given in terms of structure, user registration, and an overview of the web site conception.
- **Chapter 4** consists of the results, web content, technical (cartographic and programming) solution that we used in our research.

Today, maps can be found nearly anywhere and they are used in very different areas. Consequently, understanding how well education systems perform in teaching and acquiring map-reading skills is essential. During the first years of school, creating map awareness would enable students to become successful map users later on. By this reason, it is very important to disseminate children maps and to design better maps for children in the field of education. In addition to this, the training of teachers on map use is also crucial. First of all, the efficient use of maps relies on the adequacy of the map awareness of teachers and their experience. In addition to the accuracy of current maps, educators should be mindful and eager in their lessons to use and teach maps. Effective use of maps should be taught from the first years of basic education. For this reason, cartographers or map makers must promote the use and enjoyment of maps by children and young people, must increase understanding of children and young people's engagement with maps and must raise the standard of maps and atlases produced for children and young people.

School cartography between 16th and 20th centuries

For centuries maps have been used in teaching, to complement and illustrate the knowledge imparted in subjects related to Geography, but also in others that require spatial information in their content, such as History traditionally. Two of the first atlases expressly published for use by students are works of the German cartographer Johann Baptist Homann. The first saw light in 1710 under the title *Kleiner Atlas Scholasticus*, with 26 color maps (Figure 1).

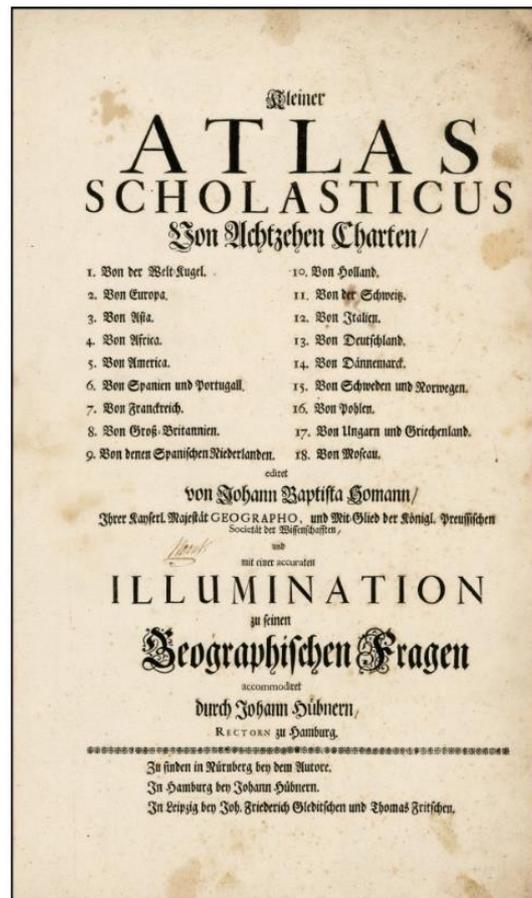


Figure 1 The title page and index from Homann's *Atlas Scholasticus*, 1710.

The second atlas was published in Nuremberg in 1719 and its Latin title is *Atlas Methodicus* with the subtitle “*Explorandis Juvenum Profectibus in Studio Geographico ...*”. The school atlases used a letter system on a blank map, which was coded as a separate list of keys. The method is based on a system developed by Johann Hubner and modified by Homann. The atlas includes four astronomical diagrams illustrating the system of Ptolemy, Tycho Brahe, Copernicus, and Descartes. The hand-painted arm of the Swiss cartographic family Schnyder de Wartensee is posted on the front.



Figure 2 The title page, Atlas Methodicus, 1719



Figure 3 The map of America, Atlas Methodicus, 1719

The 18th century saw a considerable evolution in the way Western society views the child. Medieval society was not aware of the specificity that distinguished the child from the adult. As soon as the child was old enough to live without the permanent care of his mother, he was swept into the world of adults, from whom he borrowed work, games, clothes, and writings.

Under the influence of the Jesuits, at the end of the 17th century, this vision of childhood gradually changed: the child became a being to be educated. The creation of colleges and "small schools" testify to this new interest. The child now has a world of its own, distinct from that of the adult. Educational practices will evolve on a larger scale throughout the eighteenth century. Teaching seeks to develop responsibility, spirit and taste in children. Its contents and methods are being questioned: attempts are being made to innovate, to make lessons more attractive to a young audience. They take new forms: dialogues, playlets, educational theater.

The Atlas of Children (Atlas des Enfants) published in 1774 by Jean-Marie Bruyset (Figure 4) is an excellent illustration of this evolution. Dedicated to young people, its content and form have been studied to make geography lessons more attractive. Each chapter, dedicated to a particular region of Europe or the world, is made up of questions and answers allowing students to practice.

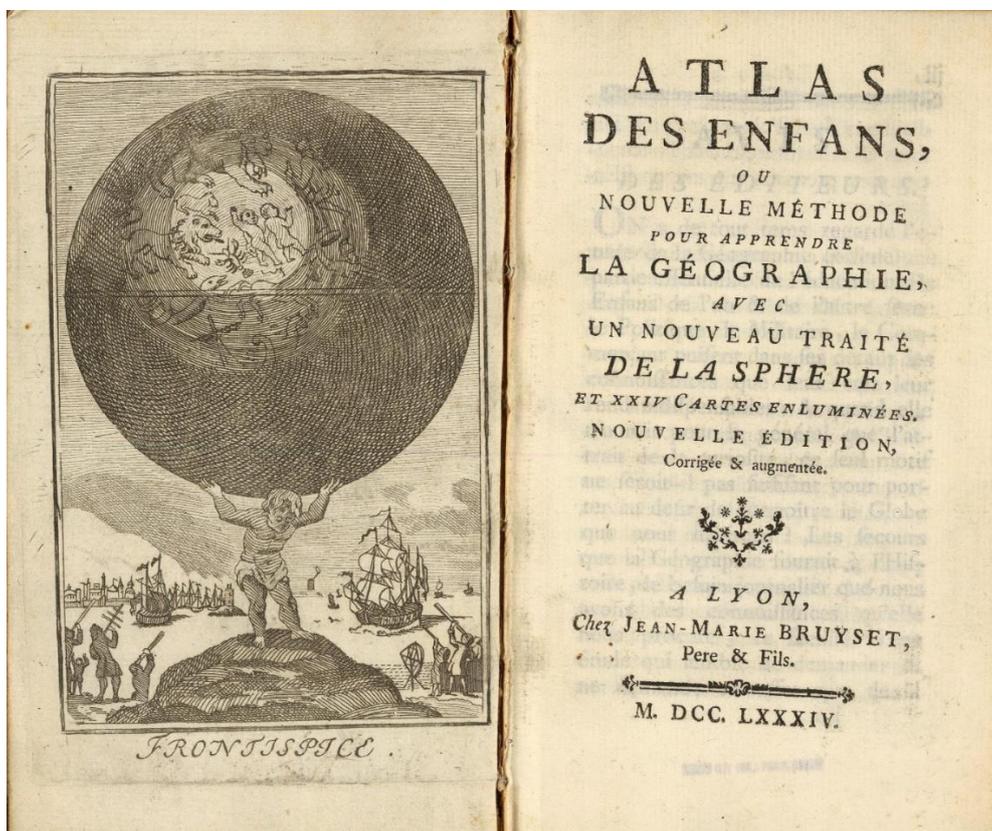


Figure 4 First page, Atlas de enfants, 1784 Edition

The content goes beyond the strict geographical theme: aspects as varied as climate, government, religion, and the character of the inhabitants, as well as the productions and the strengths of each state are also addressed. A geographical map completes each chapter. Names have been replaced by numbers or letters, both for simplification and training purposes.

The first school atlas in the United States was published in 1795: It was the General Atlas for Carey's Edition of Guthrie's Geography Improved, although according to Patton (1999) the maps of this atlas had already been published previously by Mathew Carey in atlases dedicated to adults.

The 19th century was a period of vital importance in the development of what we would later call cartography, and especially the publication of school atlases, was when the use of these atlases spread with greater force in many countries. As an example, I cite only two countries located on two different continents: among the countries of the European continent, I select France, which stood out for the variety and professionalism of the thematic maps that were included in the textbooks. The most internationally recognized author was the professor, geographer, economist and historian Pierre Émile Levasseur (1828-1911), who was later named honorary president of the French Geographical Society. Levasseur did not limit himself to illustrating and complementing the texts of his books with thematic maps, but he also created school atlases that were characterized by the fact that their introduction contained a very detailed graphic and textual presentation of the elementary concepts related to astronomy, maps and geography.

Another country with a highly diversified development of school atlases was the United States. During the 19th century, publishing houses were founded to publish this type of material, and names such as Sidney E. Morse, Nathaniel G. Huntington, AN (Jessie) Olney, and William C. Woodbridge, among others, were identified with the atlases published by them. I would mention three interesting details that corroborate the rise of American school atlases in this century: after his trip through South and Central America, Alejandro von Humboldt made the necessary measurements to create the world's first map of isotherms, which presented the variation of temperature on Earth. This map was drawn for the first time in 1823 by William C. Woodbridge (Figure 5) and was published in his 1826 school atlas (School Atlas designed to accompany Woodbridge's Rudiments of Geography). It preceded its publication in Europe, which occurs years later, in the famous Atlas Berghaus of 1838. This work by Woodbridge is considered a milestone in the history of American school cartography, since for the first time

it included three thematic maps: the already mentioned one of isotherms, another of animals of the world and one of morals and politics (Reyes, 2020a).

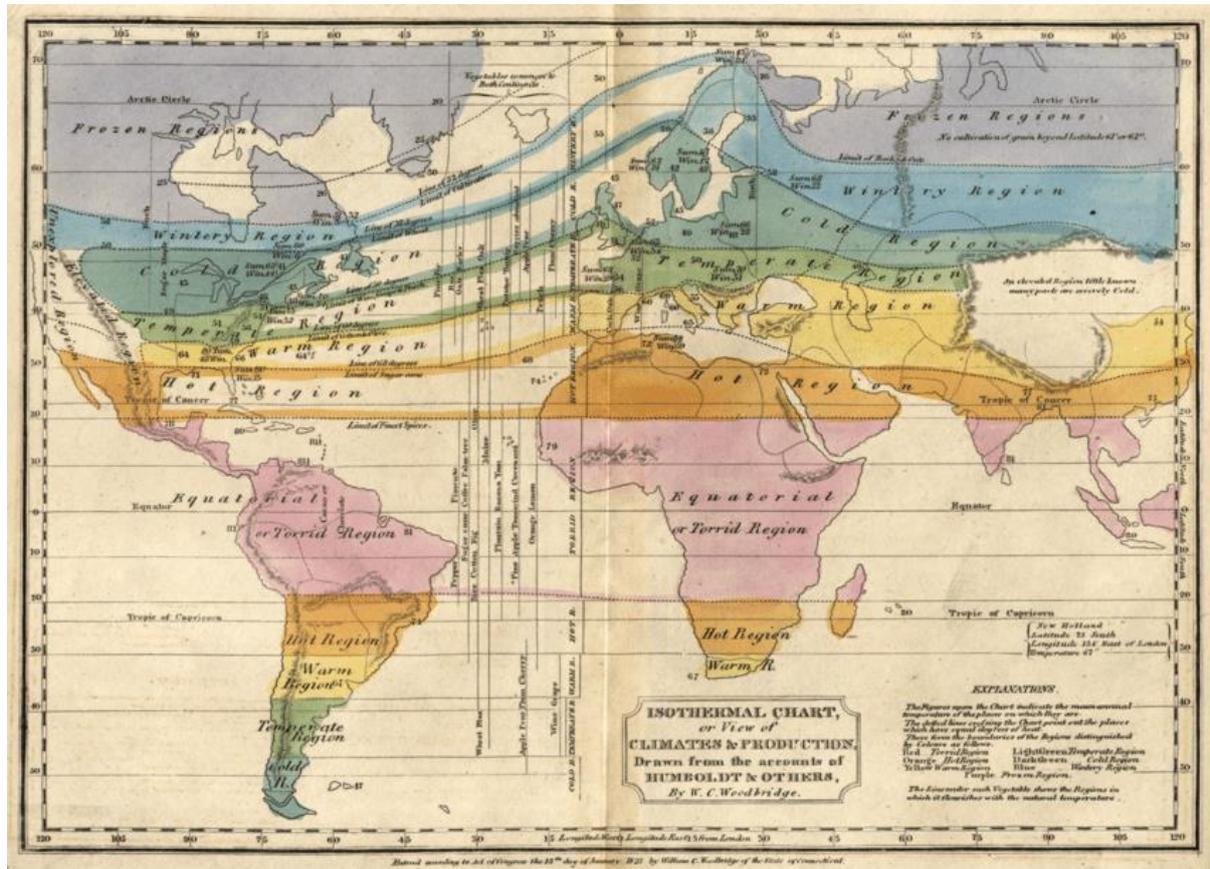


Figure 5 Isothermal map of the world William C. Woodbridge, 1823

The first works describing the results of research projects on school cartography began only to be published in the first half of the 20th century. One of the first articles was dated in 1933, when Helen M. White published the article entitled “Diagrammatic Map Making” in the Journal of Geography (USA), presenting different examples of maps made by teachers in their classes. The Hungarian-born American cartographer Erwin Raisz also mentioned her work in his "General Cartography", which was the first Cartography textbook published in the United States and the only one used in American universities for the next 15 years (Raisz, 1938).

Cartograms were popularized by Erwin Raisz, who published the first statistical cartograms of the United States. Raisz was a professor of Cartography at the Institute of Geographical Exploration at Harvard University and was most well-known for his hand-drawn physical relief maps. In 1934, Raisz published in the Geographical Review an article entitled “The rectangular statistical cartogram”, which popularized the use of cartograms as an educational tool for learning about geography (Figure 6).

Chapter 2

Exploring the map teaching for elementary and secondary schools in Algeria

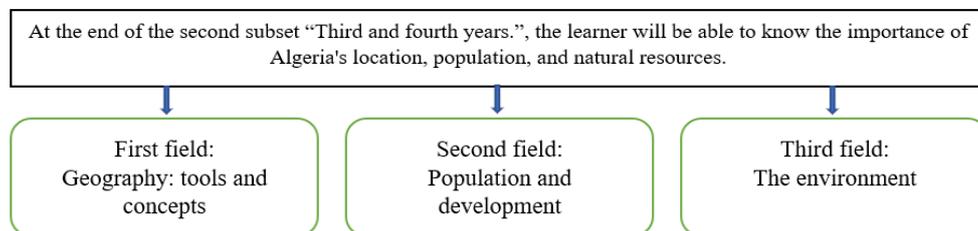
Presenting the Scholastic curriculum of elementary and secondary schools, which is provided by Ministry of National Education:

I. Elementary schools:

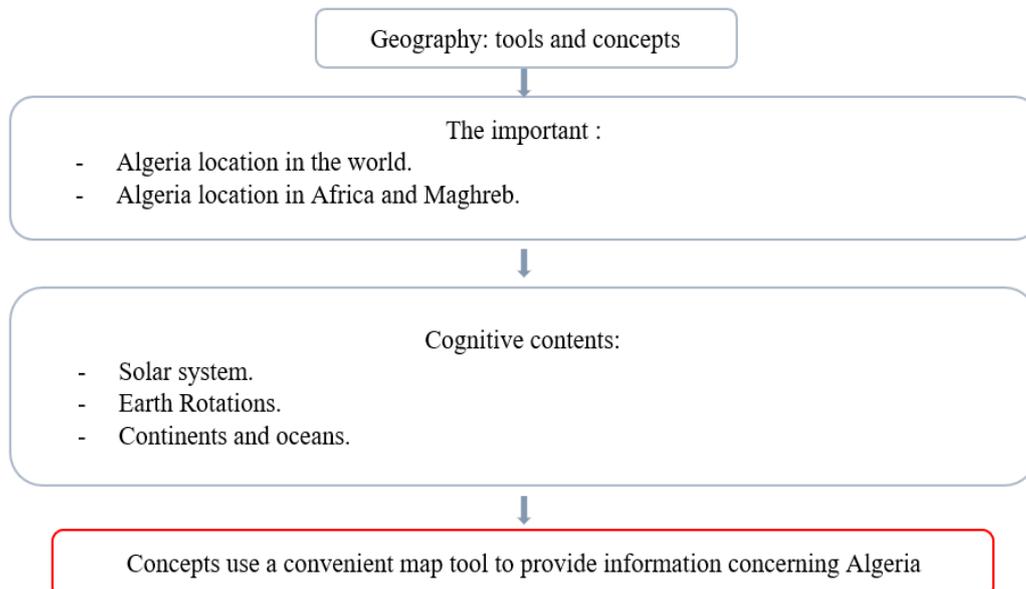
The reforms of 2003 divided each cycle of education into multiple subsets; Accordingly, the elementary education phase has been divided into three subsets, where:

- The 1st subset consists of the first and second years.
- The 2nd subset consists of the third and fourth years.
- The 3rd subset consists of the fifth year.

From the second subset students start to learn Geography, following pedagogic program oriented by the Ministry of Education. Pupils use two textbooks in the classroom: History and Geography for the third-year and History and Geography for fourth-year of elementary schools. Consulting these books, we explore the concepts that are used during the teaching activities of Geography (including map concepts):



Among these three fields, we will be concentrating on Geography tools and concepts:



1. Algeria in the world

“Textbook of History and Geography for fourth-year elementary schools, pages 72-79”

Before learning about Algeria location in the world, pupils learn concepts concerning the Earth in terms of its shape, dimensions and representations.

1.1. Earth

Earth is one of the planets of the Solar System, the textbook includes several figures to illustrate the text:

- Figure entitled “The Solar system” (Figure 7), the learner comes to know the existing planets and their rotation.
- Figure entitled “The Earth rotation” (Figure 8), the learner realizes that the Earth has two movements, the rotation around itself and takes a day, as well as translation around the Sun and takes a solar year.

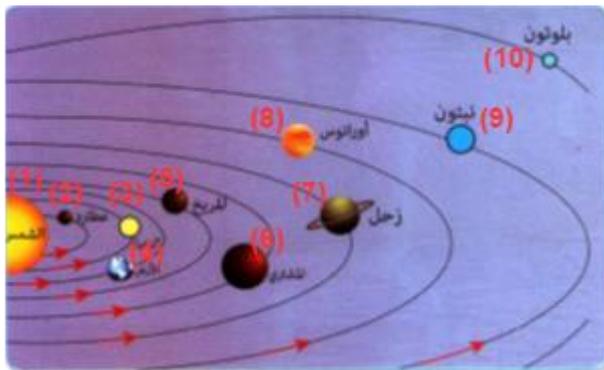


Figure 7 The Solar system, textbook of History and Geography for fourth-year elementary schools, p. 72



Figure 8 The Earth rotation, textbook of History and Geography for fourth-year elementary schools, p. 72

(1) Sun, (2) Mercury, (3) Venus, (4) Earth, (5) Mars, (6) Jupiter, (7) Saturn, (8) Uranus, (9) Neptune, (10) Pluton, (11) Rotation axis, (12) North Pole, (13) South pole, (14) Rotation direction.

Remarks and proposals for improvements:

Title of Figure 7 seems to give no enough information for the pupils; indeed, it is shown that the planets are moving toward the same direction (red arrow in the figure) however with different orbits, also we wanted to give the translation of Earth (Earth moving around the Sun),

which is not clear enough in the used figure. Such missing information could lead to the misunderstanding of the concepts, that's why we recommend the usage of the following figure:

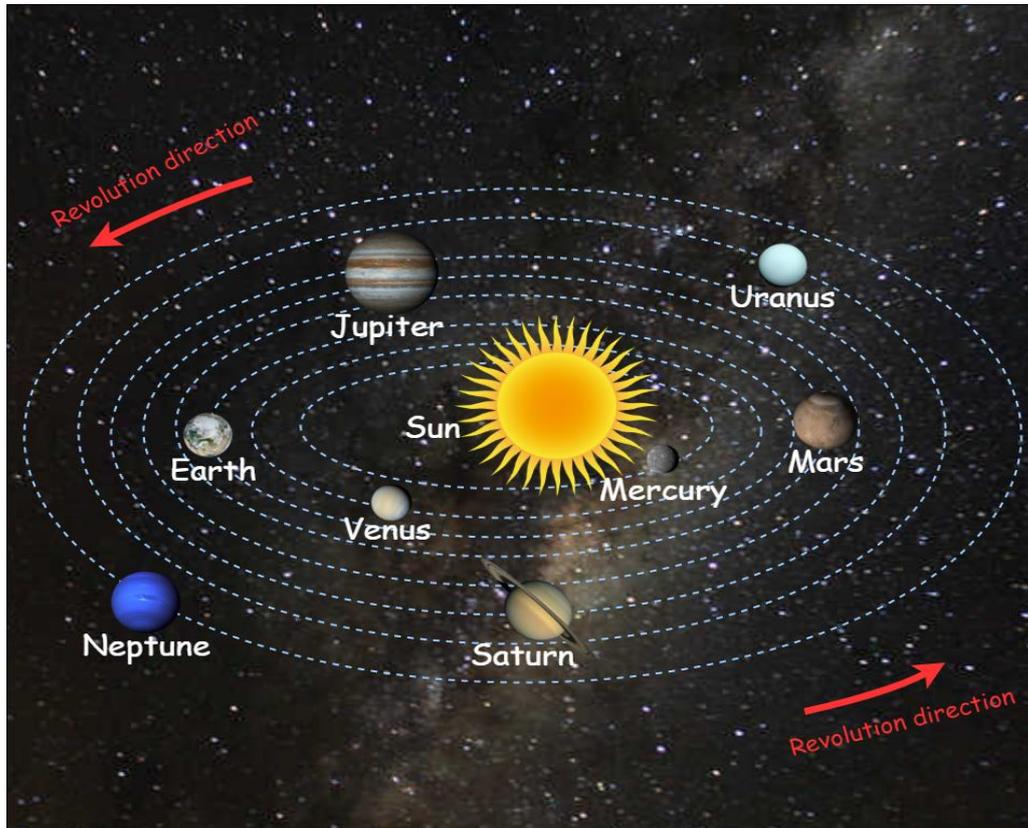


Figure 9 Proposed representation of Solar system

1.2. Map

Pupils, with the help of their teachers, learn that:

The map is a microcosm representing the Earth or part of its surface on a plane and includes basic elements as: the title - the direction - the legend - the scale. And as shown in the textbook they use the map of the world (Figure 10) to show how the spherical Earth (introduced in " The Earth" chapter) can be represented on a flat map.

The chapter also includes a vegetation map of Algeria (Figure 11), which gives an idea to the pupils that map can be used for the representation of specific, thematic data.

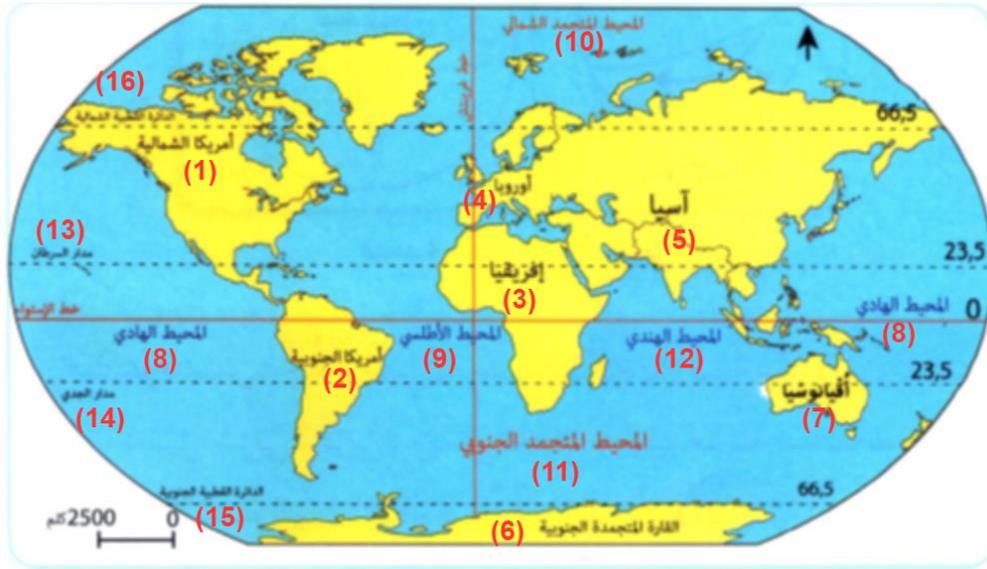


Figure 10 Map of world, textbook of History and Geography for fourth-year of elementary schools, p. 74

(1) North America continent, (2) South America continent, (3) Africa continent, (4) Europe continent, (5) Asia continent, (6) Antarctica continent, (7) Oceania, (8) Pacific Ocean, (9) Atlantic Ocean, (10) Arctic Ocean, (11) Antarctica Ocean, (12) Indian Ocean, (13) Tropic of Cancer, (14) Tropic of Capricorn, (15) Antarctic Circle, (16) Arctic Circle.

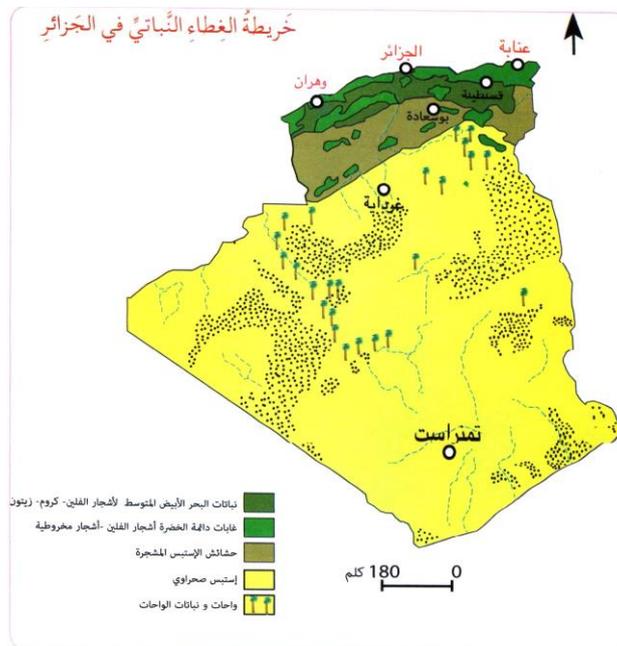


Figure 11 Algeria vegetation map, Book of History and Geography for fourth-year of elementary schools, p. 75

Remarks and proposals for improvements:

Figure 10 aims to give a wide sight about the map of the Earth. However, for pupils learning in the 2nd subset of the elementary cycle, the provided figure is not clear enough as it contains many unknown concepts for them at that stage: they don't have any background about geographic coordinates, Equator and meridian of Greenwich (represented with red lines), and dashed lines representing the tropics and circles, with the coordinates given in degrees. That's why using a simple and understandable figure with less information is preferred.

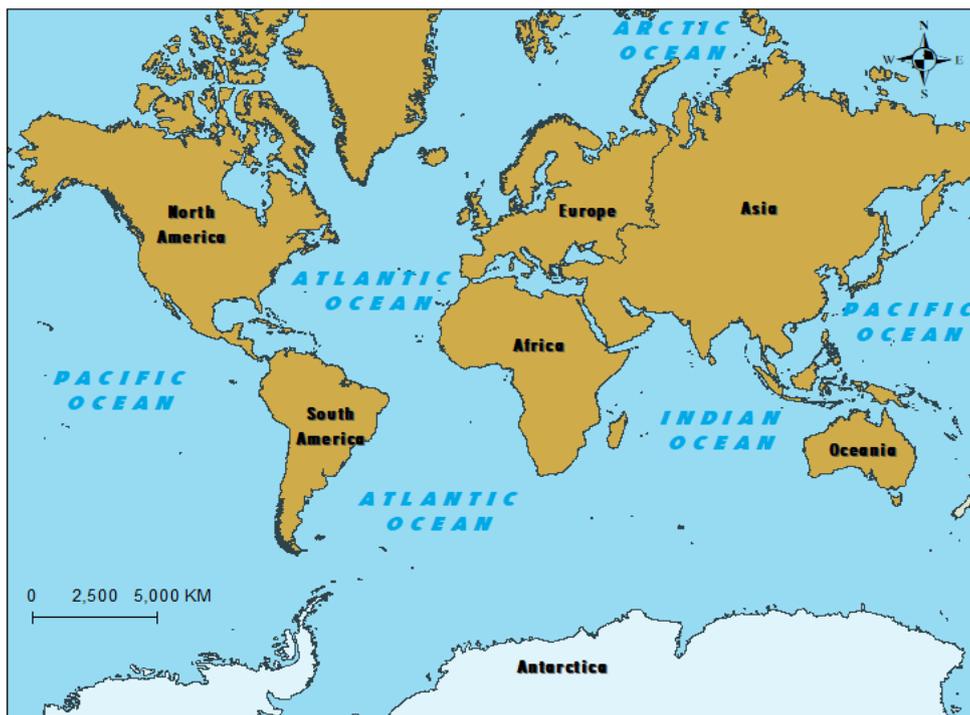


Figure 12 Proposed world map

1.3. Land and water on the globe

The distribution of land and water is explained in textbooks as following figures (Figure 13) and (Figure 14), and proportional circle that represents the distribution of land and water.

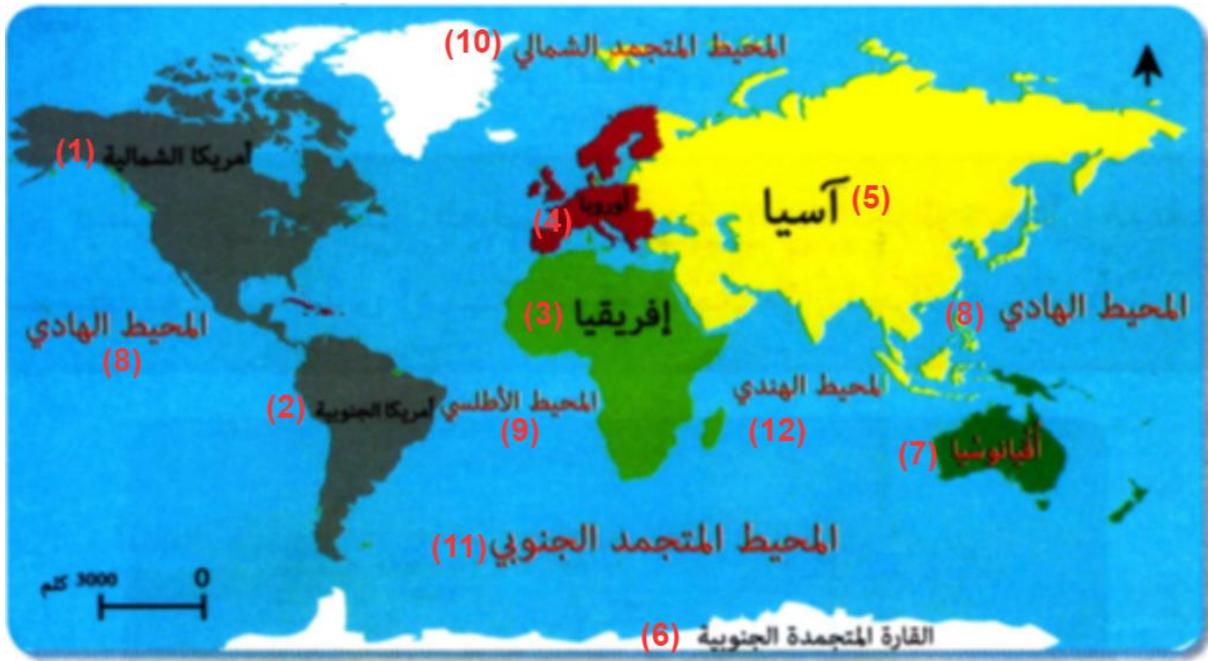


Figure 13 Continents and oceans in the world, textbook of History and Geography for fourth-year of elementary schools, p. 77

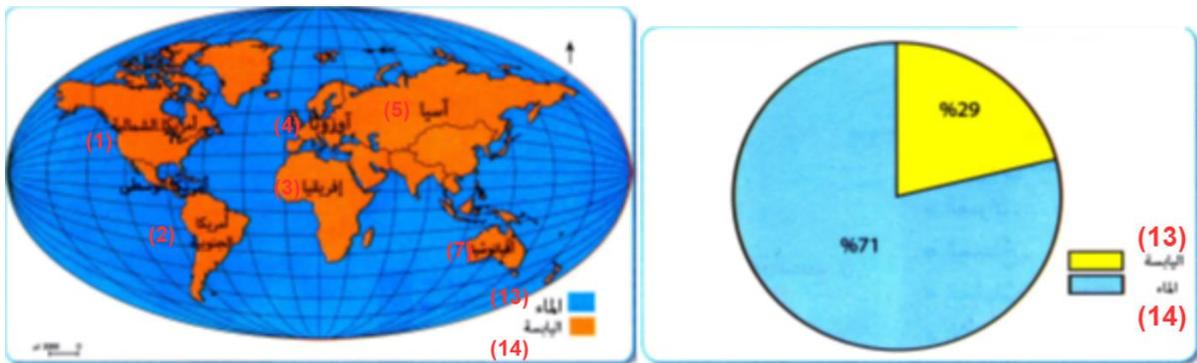


Figure 14 Land and water distribution in the world, textbook of History and Geography for fourth-year of elementary schools, p. 76

(1) North America continent, (2) South America continent, (3) Africa continent, (4) Europe continent, (5) Asia continent, (6) Antarctica continent, (7) Oceania, (8) Pacific Ocean, (9) Atlantic Ocean, (10) Arctic Ocean, (11) Antarctic Ocean, (12) Indian Ocean, (13) Water, (14) Land.

Remarks and proposals for improvements:

However, based on the colors used on the first world map (Figure 13), North and South America are shown to be a unique continent. We also noticed that the North Pole (white color) has the same color as Antarctica. By this reason, pupils might think that the North

Pole is related to or part of Antarctica. To avoid such a piece of misleading information, we propose the following figure as an alternative to both maps used in this chapter:

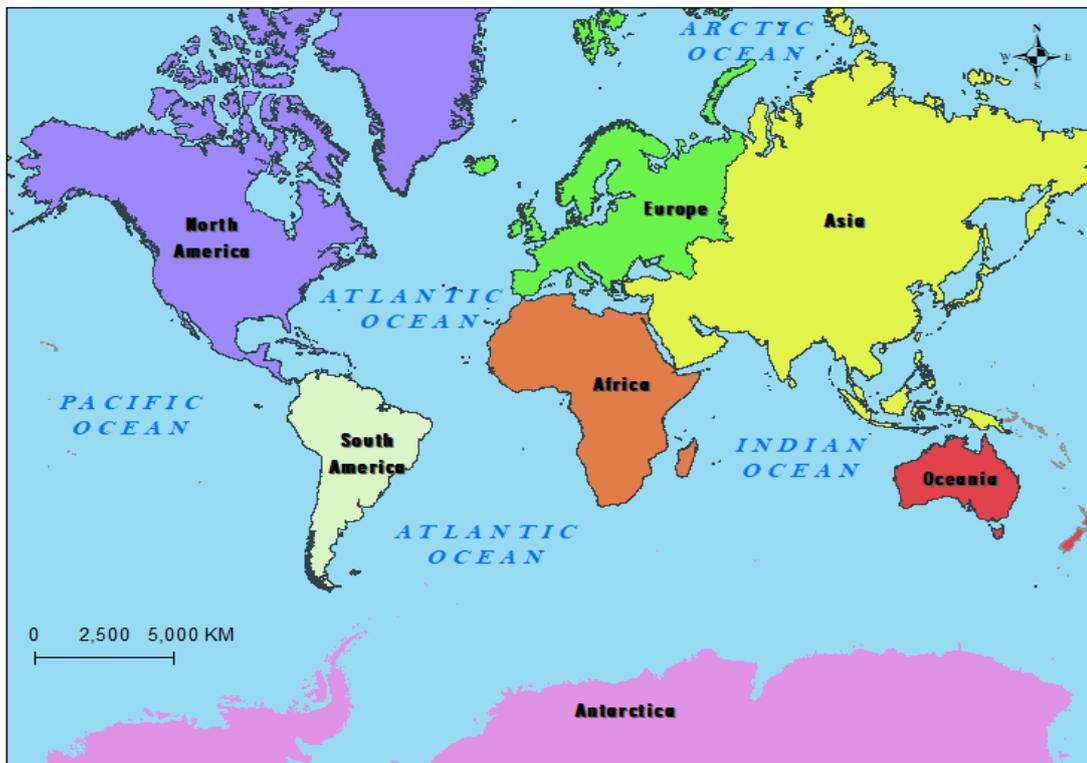


Figure 15 Map showing the continents and oceans in world map (proposal)

1.4 Algeria location in the world

The importance of the geographical location of Algeria in the world is expressed as that Algeria has a central position on the land surface, it can be seen in the textbook as follows:

- The location of Algeria using geographic coordinates (latitude and longitude) (Figure 16).
- World map showing the location of Algeria and distances to some capitals (Figure 17).

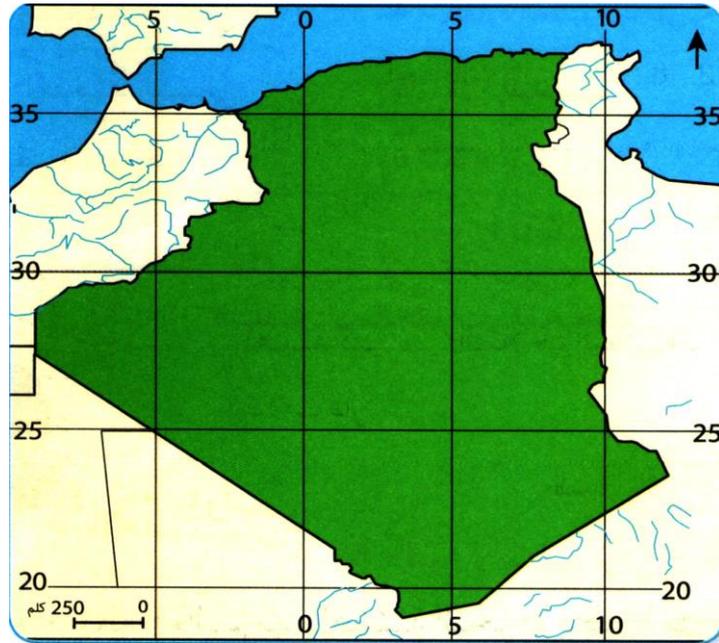


Figure 16 Algeria's geographic coordinates, textbook of History and Geography for fourth-year of elementary schools, p. 78

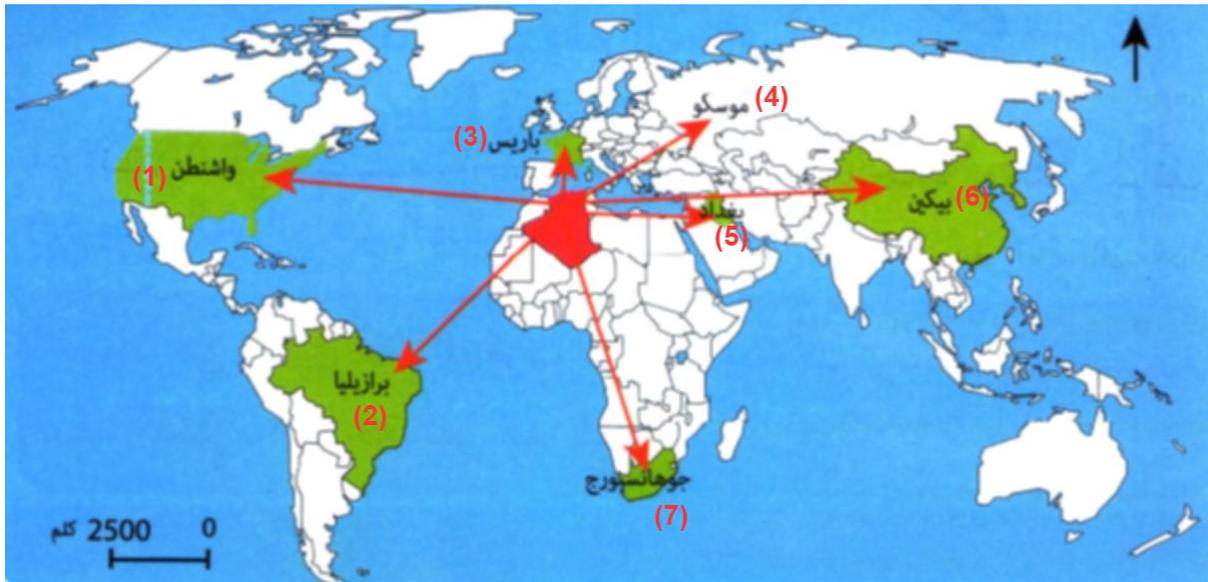


Figure 17 Algeria distance to some capitals, textbook of History and Geography for fourth-year of elementary schools, p. 78

(1) Washington, (2) Brasilia, (3) Paris, (4) Moscow, (5) Baghdad, (6) Beijing, (7) Johannesburg.

Remarks and proposals for improvements:

Figure 16 displays Algeria's geographic coordinates. However, they are not many details on the map. Pupils cannot see the whole coordinates of Algeria from such a grid.

Another remark is that all the borders of the neighboring countries are not visible. At same time, the hydrography is shown only in the neighboring countries. The content of the map should be uniform, so removing or providing them for all countries and Algeria is required.

We propose the next figure:

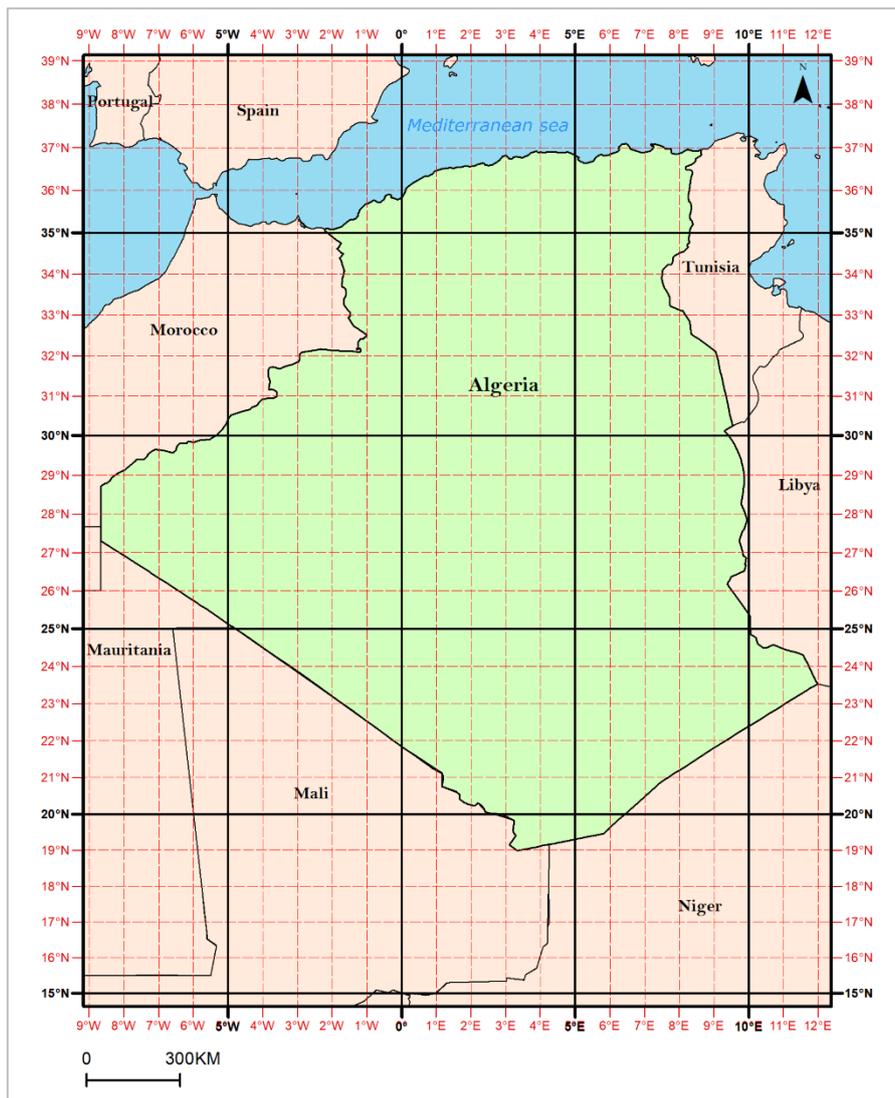


Figure 18 Proposed map of Algeria with geographic coordinates

Figure 17 shows the location of Algeria and distance to some capitals. However, instead of showing the capitals in the map, they emphasize the countries of the selected capitals. A better

solution would be to provide both, the country border alongside with the exact location of the capitals i.e., China can be filled with magenta, and the capital of China, Pekin will be presented by a specific symbol. Another mistake that we can see in Figure 17 is that Russia (Moscow) is not represented by the green color used for other countries (capitals). As a result, we propose the following map, which is the improved version of the actual one.

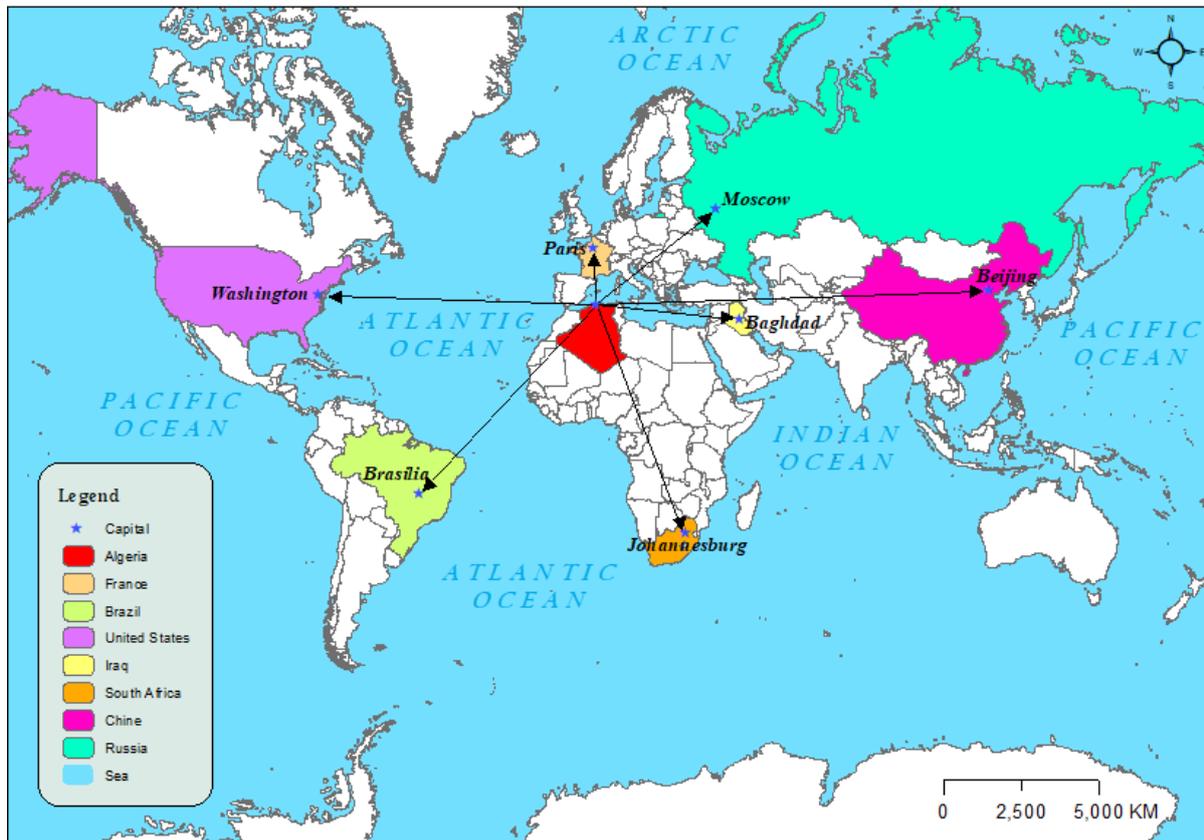


Figure 19 Algeria location between some capitals (proposed map)

2. Algeria in Maghreb and Africa continent

“Textbook of History and Geography for fourth-year elementary schools, pages 80-93”

2.1. Algeria location in Maghreb

Algeria is one of the countries of the Maghreb, with a privileged position in the region. Textbooks include:

- The map of Algeria in the Maghreb and a circle chart comparing the area of Algeria with the area of the Maghreb. Pupils understand that Algeria constitutes more than a third of the region and the country has borders with all the countries of the Maghreb (Figure 20).

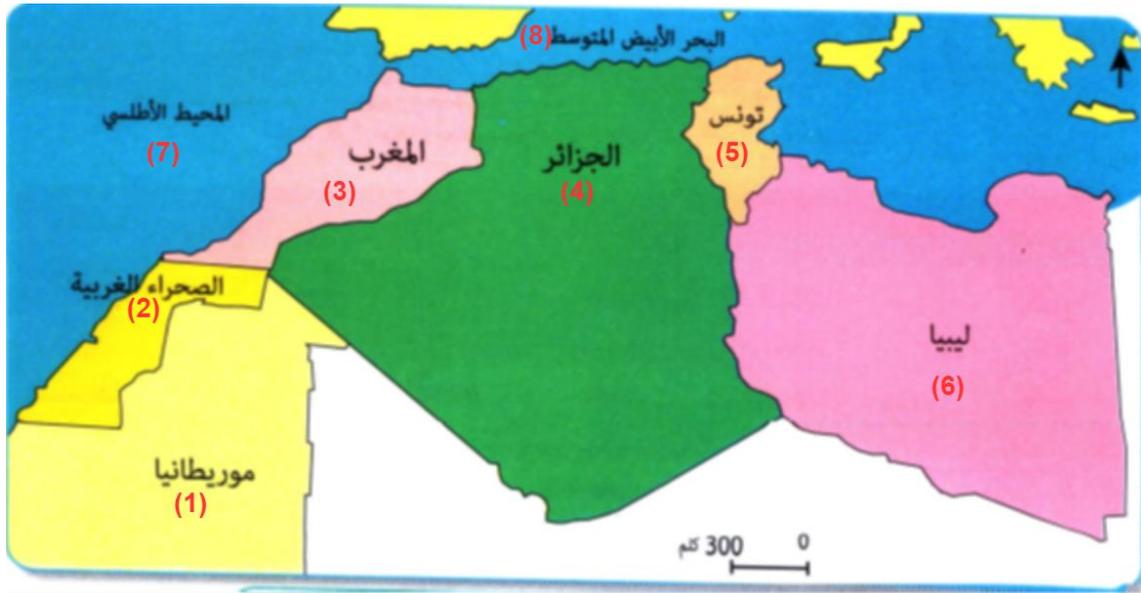


Figure 20 Algeria location in Maghreb, textbook of History and Geography for fourth-year of elementary schools, p. 80

(1) Mauritania, (2) Western Sahara, (3) Morocco, (4) Algeria, (5) Tunisia, (6) Libya,
(7) Atlantic Ocean, (8) Mediterranean Sea.

Remarks and proposals for improvements:

The used map shows the countries belonging to the Maghreb countries, however, using this type of figure is not recommended and the map should contain all the neighboring countries and emphasize the Maghreb countries with a specific color. As we can observe, Europe, Morocco, and the Western Sahara have the same or similar color. Therefore, using a unique color for each neighbor country is recommended, concerning the European continent and the neighboring countries that do not belong to the Maghreb countries could be filled using the same color. As result we proposed the figure below:



Figure 21 Algeria location in Maghreb (proposed map)

2.2. Algeria location in Africa continent

If Algeria, by virtue of its location, is the heart of the Arab Maghreb, then it also occupies a privileged position on the African continent, as pupils can conclude after consulting the following materials:

- A map entitled “Algeria location in Africa”. It is used to highlight the position occupied by the country in Africa, as it is located in its northwest region (Figure 22).
- A pie chart representing the area of Algeria in relation to the area of the African continent. Pupils learn that the large area of Algeria in Africa is ranking first with a rate of 8% (Figure 23).
- Table representing the length of Algeria's borders with neighboring countries (Table 1).



Figure 22 Algeria location in Africa, textbook of History and Geography for fourth-year of elementary schools, p. 82



Figure 23 Percentage of Algeria area to Africa, textbook of History and Geography for fourth-year of elementary schools, p. 83

(1) Atlantic Ocean, (2) Algeria, (3) Mediterranean Sea, (4) Asia Continent, (5) Africa continent, (6) Gulf of Guinea, (7) Indian Ocean, (8) Johannesburg, (9) Madagascar.

Algeria borders length 6343 KM		
1	Tunisia	965
2	Libya	982
3	Niger	956
4	Mali	1376
5	Mauritania	463
6	Western Sahara	42
7	Morocco	1559

English translation of Table 1

طول الشريط الحدودي البري للجزائر 6343 كلم		
965	تونس	1
982	ليبيا	2
956	النيجر	3
1376	مالي	4
463	موريتانيا	5
42	الصحراء الغربية	6
1559	المغرب	7

Table 1 Length of Algeria's borders with neighboring countries, textbook of History and Geography for fourth-year of elementary schools, p. 83

Remarks and proposals for improvements:

Figure 22 shows the location of Algeria in the African continent but doesn't show the other African countries, which could be misinterpreted by pupils. We proposed an Africa map with all African countries filled with the same color and emphasizing Algeria in the continent:



Figure 24 Algeria location in Africa (proposed map)

In the 3rd subset (5th year of elementary school) the students deepen their knowledge in Geography, following pedagogic program oriented by the Ministry of Education. Geographic knowledge is included in a separated part of the school textbook entitled “History and Geography for the fifth-year of elementary schools”.

At the end of the 3rd subset, the pupils acquire knowledge on the national geographical area and the administrative division using maps and images.

3. The administrative division of Algeria

“Textbook of History and Geography for fifth-year elementary school, pages 14-20”

Algeria is divided into 48 provinces. In the textbook we can find maps used to teach pupils the location and name of each province, which are divided in coastal, inland, and desert provinces.

A province includes several municipalities and their borders can be external, country or coastal boundaries.

The aim of the pedagogical program of the Ministry of Education is to improve the pupil's knowledge about provinces and municipalities.

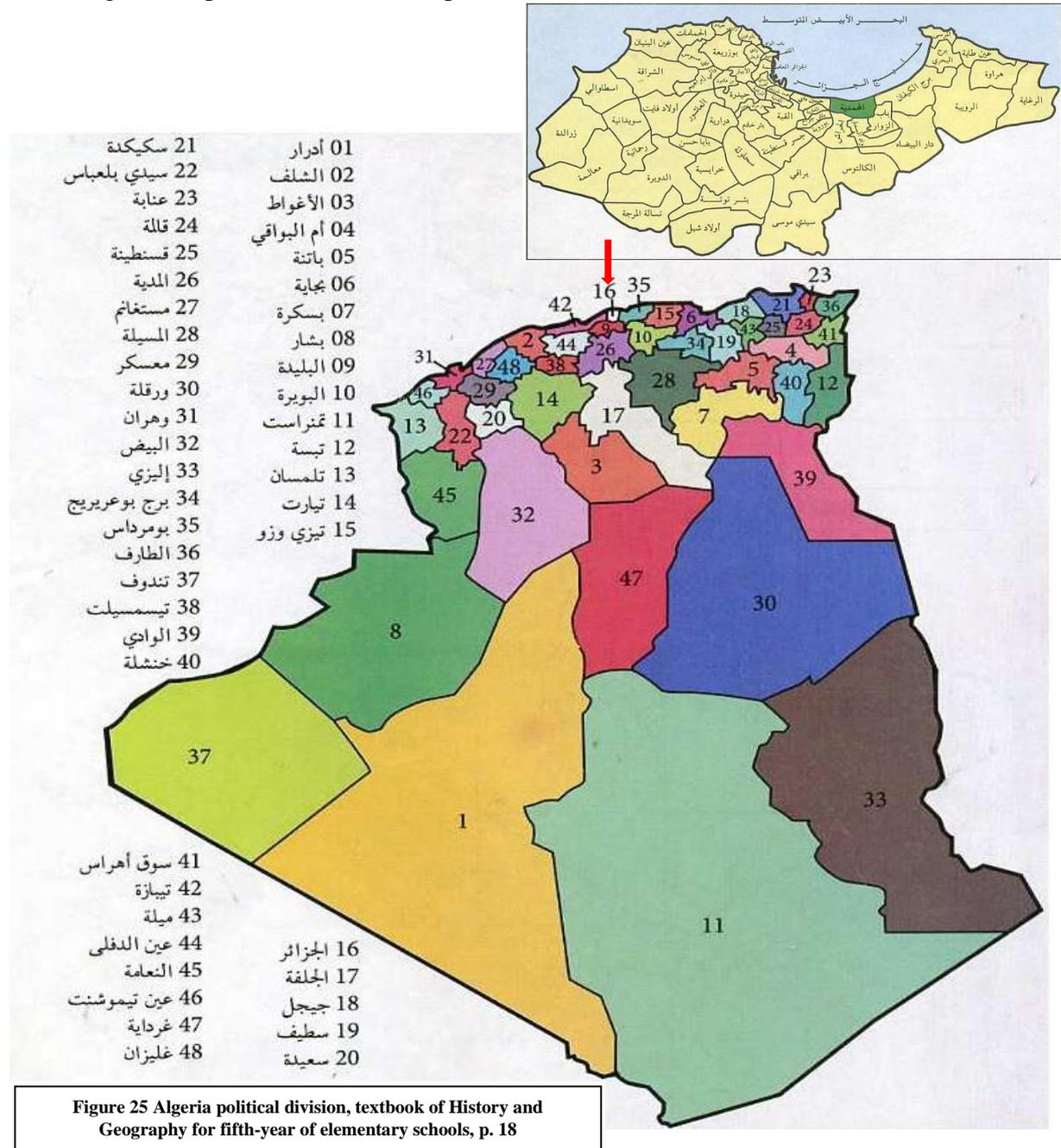


Figure 25 Algeria political division, textbook of History and Geography for fifth-year of elementary schools, p. 18

In the figure 25 numbers represent the names of the provinces and, the overview map on the right top shows the municipalities division for the province number 16.

4. Algeria: dimensions

“Textbook of History and Geography for fifth-year elementary school, pages 25-39”

Figure 26 includes the map that show the dimensions of Algeria and distances between cities. In this chapter we can also see two world maps with Algeria location between the continents (Figure 27) and the distances from the capital of Algeria to other capitals, which is given in kilometers (Figure 28).

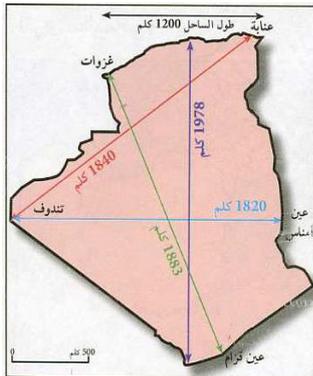


Figure 26 Algeria dimensions, textbook of History and Geography for fifth-year elementary schools, p. 25

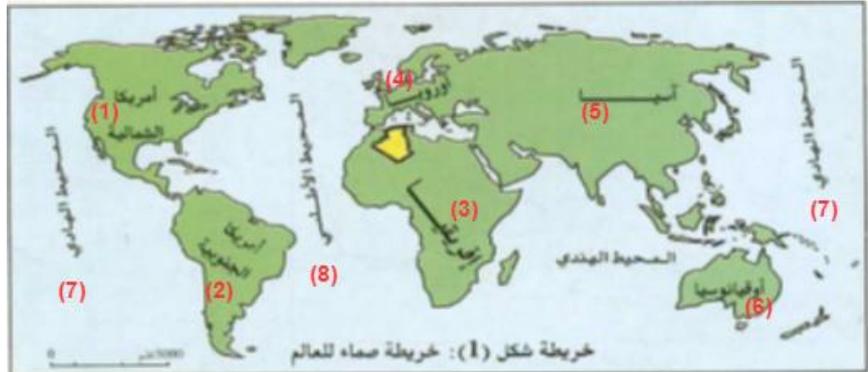


Figure 27 Algeria location between the continents, textbook of History and Geography for fifth-year elementary schools, p 32

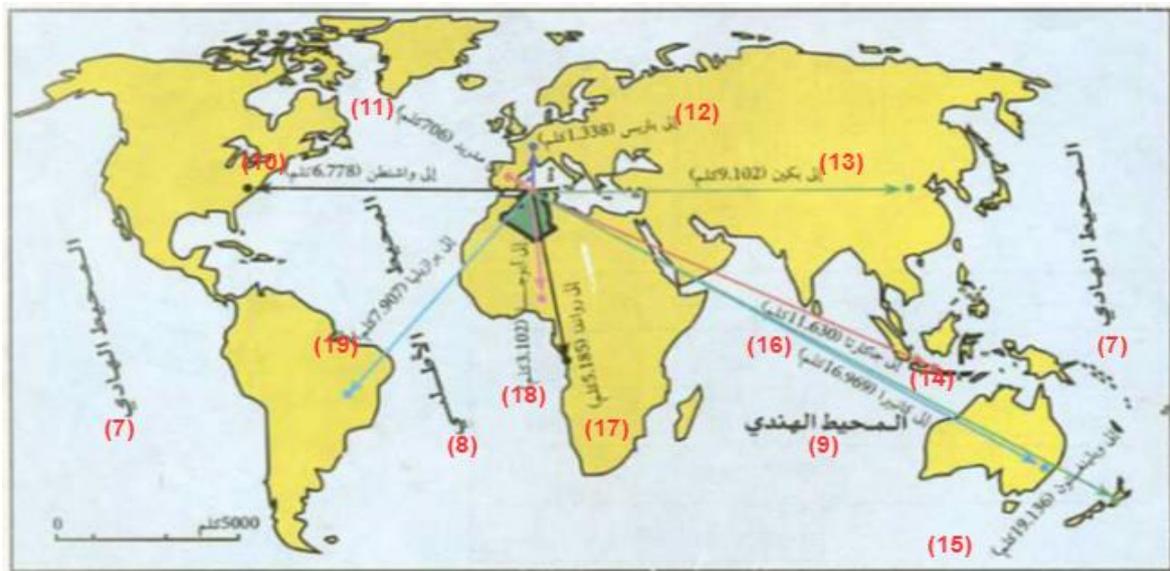


Figure 28 Distances between the capital of Algeria and other capitals, Book of History and Geography for fifth-year elementary schools, p. 33

- (1)North America continent, (2) South America continent, (3) Africa continent, (4) Europe continent, (5) Asia continent, (6) Oceania continent, (7) Pacific Ocean, (8) Atlantic Ocean, (9) Indian Ocean, (10)Washington, (11)Madrid, (12)Paris, (13)Beijing, (14) Jakarta, (15) Wellington, (16) Canberra, (17) Rwanda, (18) Abuja, (19) Brasilia.

Remarks and proposals for improvements:

In Figure 27, the borders of the continents as well as the color used are misleading. We should provide borders for each of the seven continents with a different color. We can see that Antarctic is missing from the figure. Our proposal is to include all the continents in the figure to have consistent maps for all the different academic years.

In Figure 28 there is missing information such as countries borders. Only one color (yellow) is used to fill the different continents that might be misunderstood by the pupils.

II. Secondary “intermediate” schools

The reforms of 2003 divided each cycle of education into multiple subsets; Accordingly, the secondary education phase has been divided into two subsets, where:

- The 1st subset consists of the first and second years of secondary schools.
- The 2nd subset consists of the third and fourth years of secondary schools.

Teaching geographic concepts in secondary schools follows the pedagogic program elaborated by the Ministry of Education. According to this program, a Geography textbook is published for secondary schools. We explore the concepts explained in the textbook:

1. Orientation

We can find Figure 29 in the Geography textbook, which gives the idea of the movement of rotation using sun. Pupils with the help of their teachers can understand the directions based on the apparent motion of the Sun.

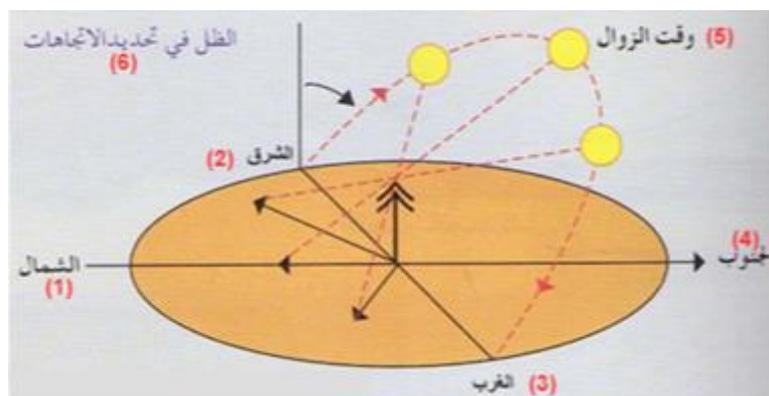


Figure 29 Orientation using the sun, textbook of Geography for first-year secondary schools, p.13.

(1) North, (2) East, (3) West, (4) South, (5) Noon, (6) Direction using the shadow.

Figure 30 from the textbook shows the four cardinal points: North, South, East, and West. The learner will be able to identify the different directions.



Figure 30 Main cardinal points, textbook of Geography for the first-year of secondary schools, p. 13

(1) North, (2) East, (3) West, (4) South.

Remarks and proposals for improvements:

As we can see in Figure 30, pupils can find few information that misses e.g., sub directions.

We proposed a more detailed figure:

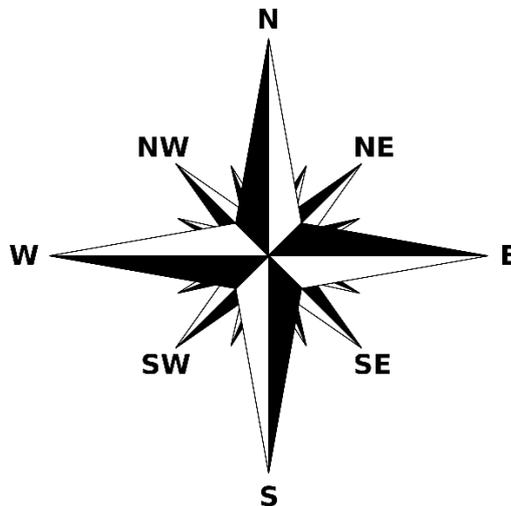


Figure 31 Geographic directions (proposed figure)

2. Coordinate system (Longitude and latitude)

Figures 32, 33 and 34 show that the Earth is divided with invisible lines (parallels and meridians, latitude and longitude), pupils can see different types of projections and can exercise determining the right location.

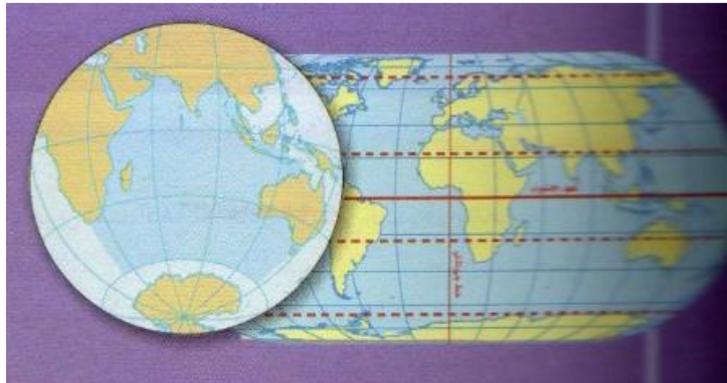


Figure 32 Projection of the Earth, Geography textbook for first-year of secondary schools, p. 17

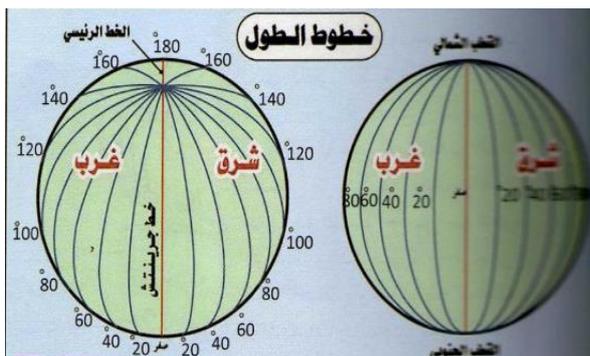


Figure 33 Longitude, Geography textbook for first-year secondary schools, p. 17

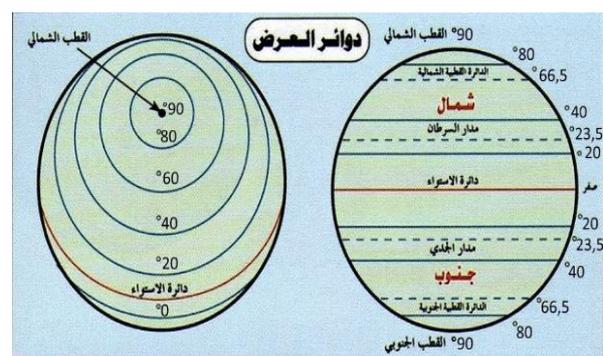


Figure 34 Latitude, Geography textbook for first-year secondary schools, p. 18

Figure 35 shows longitude and latitude on a world map emphasizing Algeria location by the orange color.

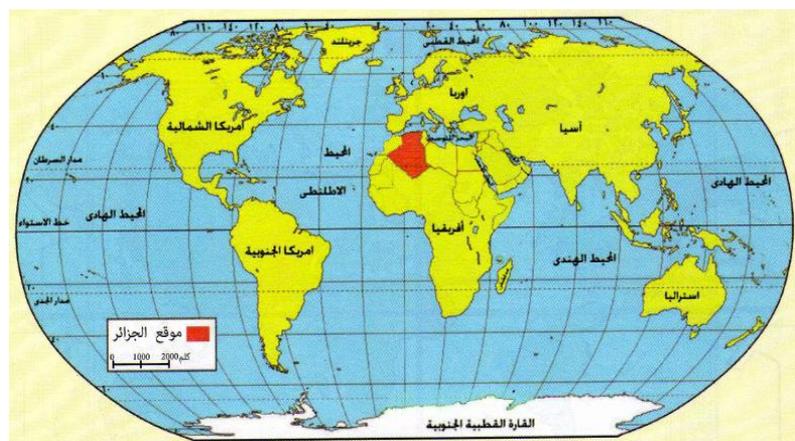


Figure 35 World map, Geography textbook for first-year secondary schools, p. 20

Remarks and proposals for improvements:

In Figure 35 degrees of longitude and latitude are missing, which is the main concept to be learned by pupils. Meridians and parallels are hidden on the continents, which doesn't make sense. There are only some countries shown in the map and the rest of them is omitted. We proposed a map that might be more understandable:

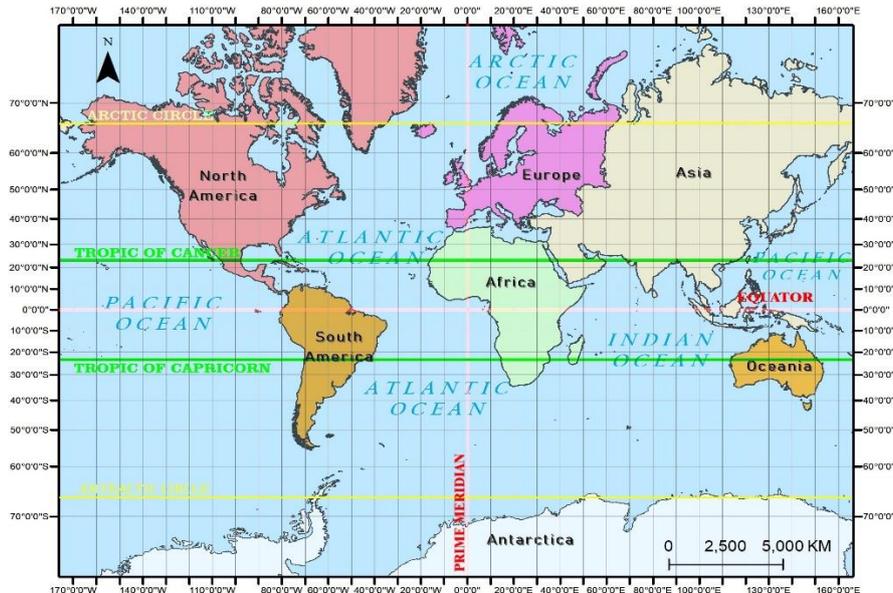


Figure 36 World map with parallels and meridians (proposal)

3. Map Symbols

Pupils can find Figure 37 in the Geography textbook that explain the meaning of symbols used in the maps and are used to visually represent a real-world phenomenon.



Figure 37 Map symbols, Geography textbook for first-year of secondary schools, p. 23

Oil		Airport		Country borders	
Gaz		River		Invisible borders	
Oil pipeline		Sub-river		Marine boundaries	
Oil refinery		Barrage		Administrative borders	
Mineral wealth		Channel		Road	
Manufacture		Water well		Unpaved road	
Field beans		Lake		Railway	
Fruits		Bog		Marine road	
Cash crops		Marsh		Cities	
Horticultural crops		Desert		Capitals	
Cattle		Oasis			
Sheep		Peak			
Goat					
Camel					
Fish					

Table 2 Map symbols (English translation)

Pupils can also find textual explanations on the map basics (Figure 38).

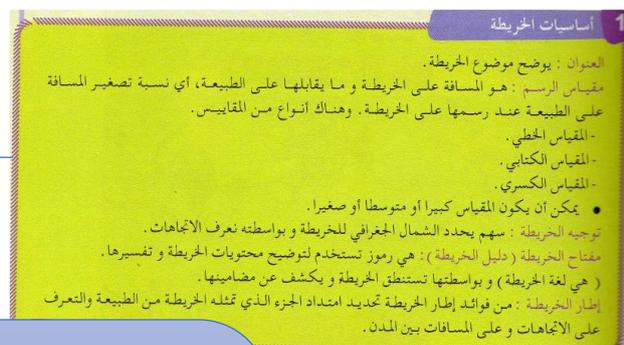


Figure 38 Map basics, Geography textbook for first-year of secondary schools, p. 23

Title: express the subject of the map

Scale: the ratio of the distance on the map to the corresponding distance on the ground. There are different types:

- Linear scale
- Fractional Scale
- Verbal Scale
- Scale can be large, medium or small

Map orientation: Arrow showing the geographic north.

Map legend: meaning of symbols used on the map. (map language) from that we can read the map.

Authors of the textbook used the “Mineral wealth in Australia” map (Figure 39) to show the use of symbols representing different minerals.



Figure 39 Mineral wealth in Australia, textbook of Geography for third-year of secondary schools, p 36

- (1) Charcoal, (2) Iron, (3) Natural gas, (4) Copper, (5) Bauxite, (6) Gold, (7) Silver, (8) Electric power, (9) Tin, (10) Zinc, (11) Uranium, (12) Nickel, (13) Tungsten, (14) Northern district, (15) Southern district, (16) Western district, (17) Pacific Ocean, (18) Indian Ocean, (19) Great Australian Bight, (20) Gulf, (21) Tasmania, (22) Victoria, (23) New South Wales, (24) Queensland.

Remarks and proposals for improvements:

In Figure 39, sometimes the color used is misleading, see e.g. the symbol 13 in the legend is filled with white color, while Australia is also filled with white on the map. That’s why we can’t see the symbol on the map, that is why we should use a different color. In addition, many of the symbols have the same shape, which can be difficult to differentiate, nor is it clear the difference between sea color and coordinate system. By these reasons we do not recommend this figure for pupils. We listed some examples of the use of symbols on maps that can be followed when creating new maps for the textbooks (Figures 40 and 41):

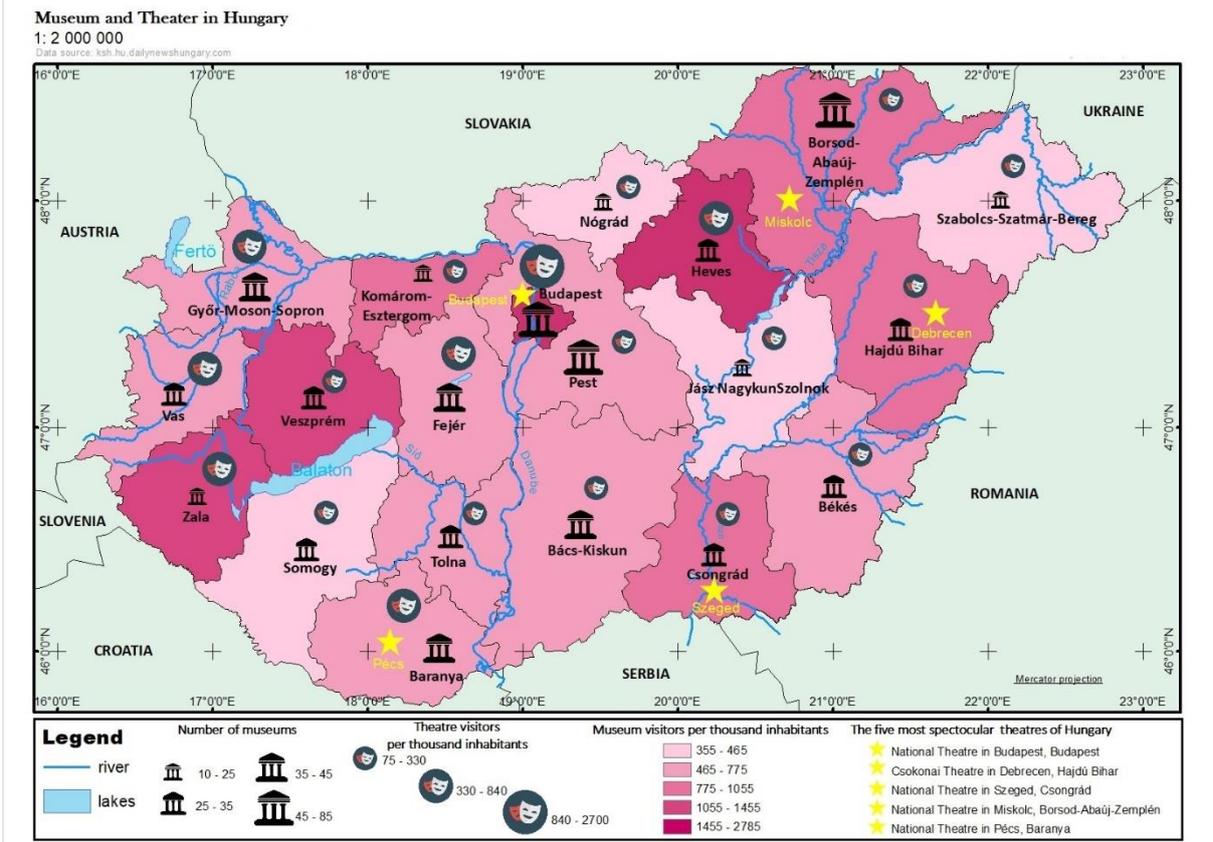


Figure 40 “Museum and Theater in Hungary” map

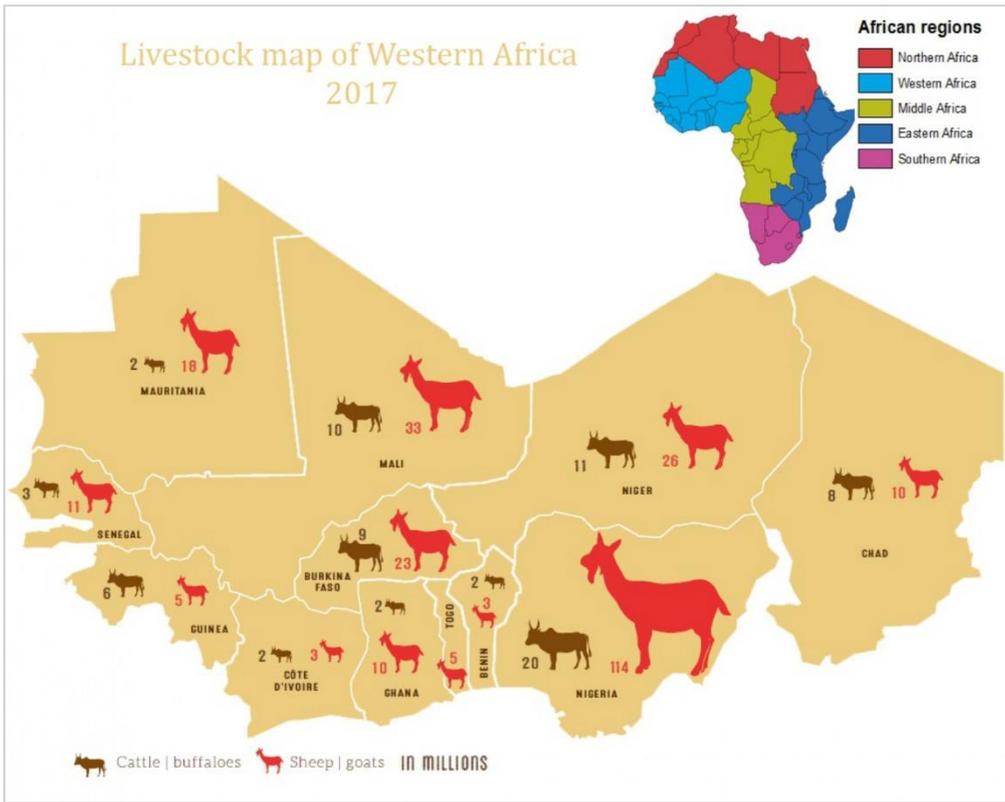


Figure 41 Livestock map of Western Africa

Chapter 3

Website structure

1. Home page

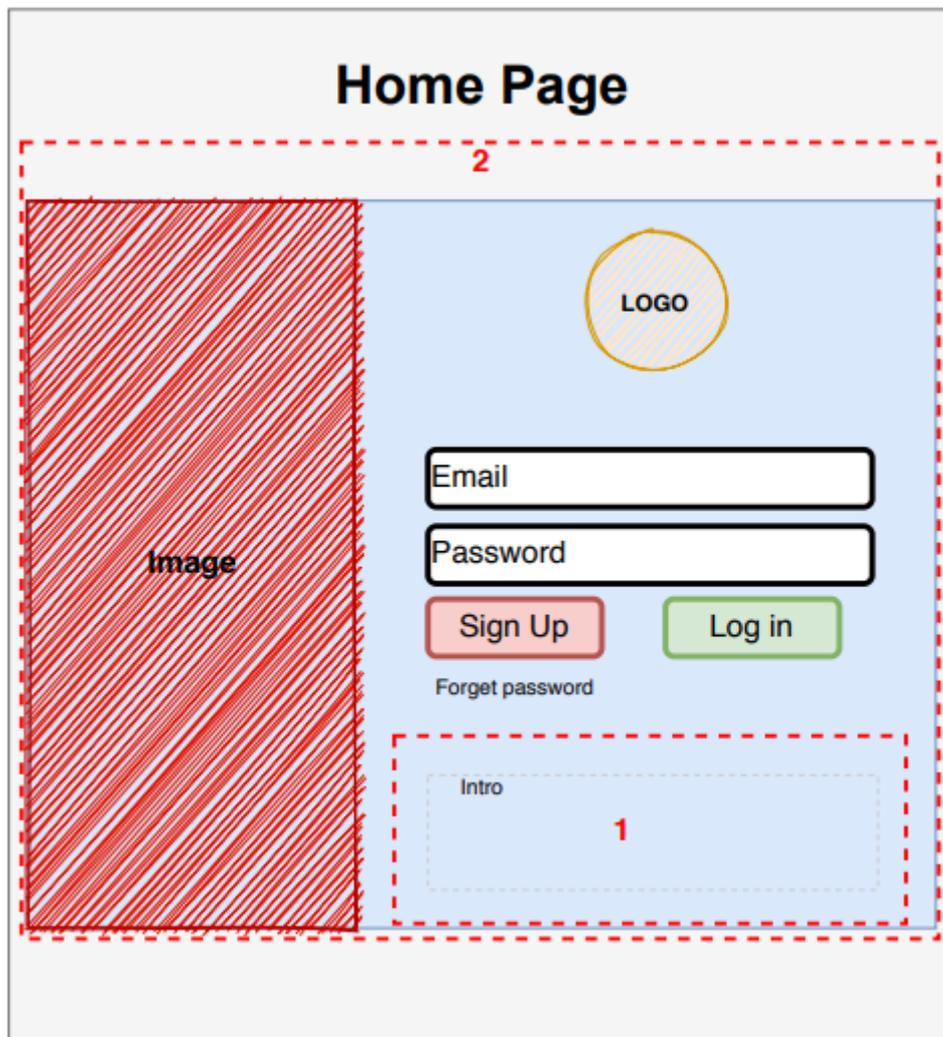


Figure 42 Kharitati Homepage

The initial homepage of our website carries two subcomponents (as illustrated in the figure above):

- (1) *An introductory speech*, the homepage profile plays a very important role in attracting interest and motivating visitors to remain interested, as most website visitors only spend

a few seconds evaluating a new website before deciding whether to further engage with the content or click the back button to check for other websites.

- (2) A **Login / Signup panel**, A login page or panel allows new users to signup for the website, which will let them take advantage of the hidden website features such as specific courses, quizzes, materials, and dedicated videos for learning purposes. Our login/signup panel contains two buttons. A new user has to utilize the red button that will automatically redirect him to the sign-up page, where he will be able to generate a new account. However, an already existing user will use the green button to login immediately to the website.

2. Sign up page

The diagram illustrates the layout of a sign-up page. It features a main title 'Sign up Page' at the top. A large red-hatched area on the left is designated for an image. The right side contains a logo, a 'Back to login' link, three input fields for 'User name', 'Email', and 'Password', a prominent red 'Sign Up' button, and an 'Intro' section at the bottom.

Figure 43 Kharitati Signup Page

As mentioned previously, a new user can create a new account by the mean of the signup page. As detailed in the figure above, each new user is required to provide his first and last names, a valid email, and a password. After filling up all the needed information and clicking the “Sign up” the user will be added to the user’s database and will be redirected to the main page of his newly created profile. In case the user already has an account, then using “Back to login” will redirect the user to the login page.

3. Main page

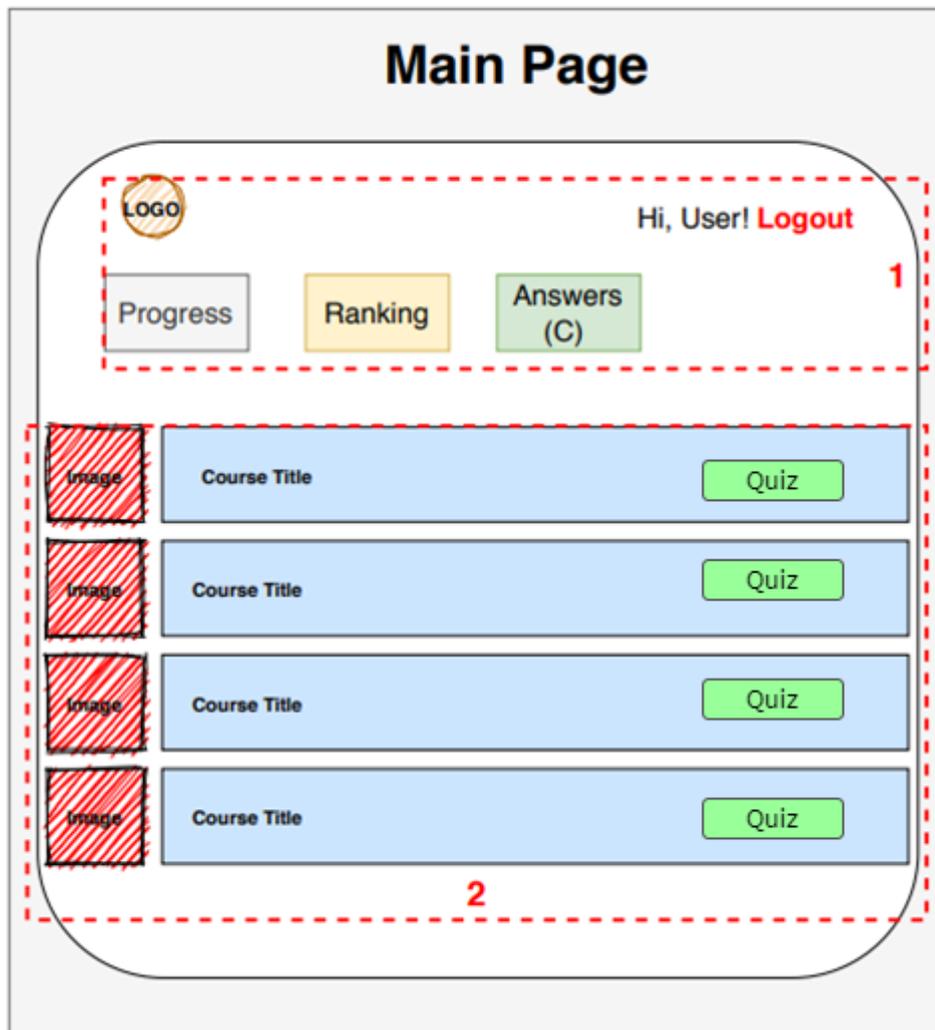


Figure 44 Kharitati Main Page.

The main page of our website carries two subcomponents (as illustrated in the figure above):

- (1) A header that gives an overview about the progress made by the user. Users attending the same course will be graded based on taken quizzes (Figure 46). This feature adds more competition between users. The rank would be based on the number of correct answers of each user in descending order.
- (2) The new user is asked to enroll for a specific course (either for elementary or secondary schools). Each subcomponent has its description (Course Title), a representative figure or logo (Image), and by clicking allows users to access the chosen course.

4. Course page

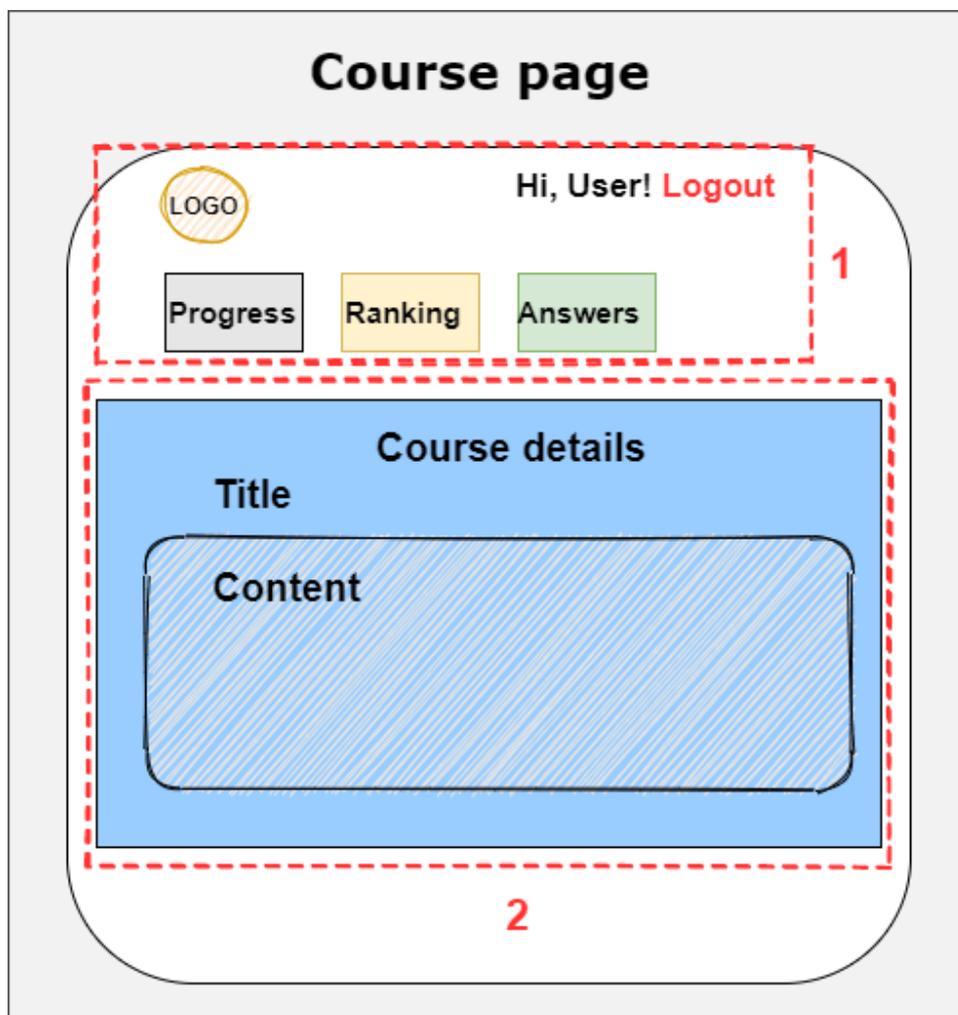


Figure 45 Kharitati Course Page

This page has three components, which are described as the following:

- (1) A header explained in the previous subchapter.
- (2) For each course, a course title is given alongside with its content (videos, images, etc...).

5. Quiz page

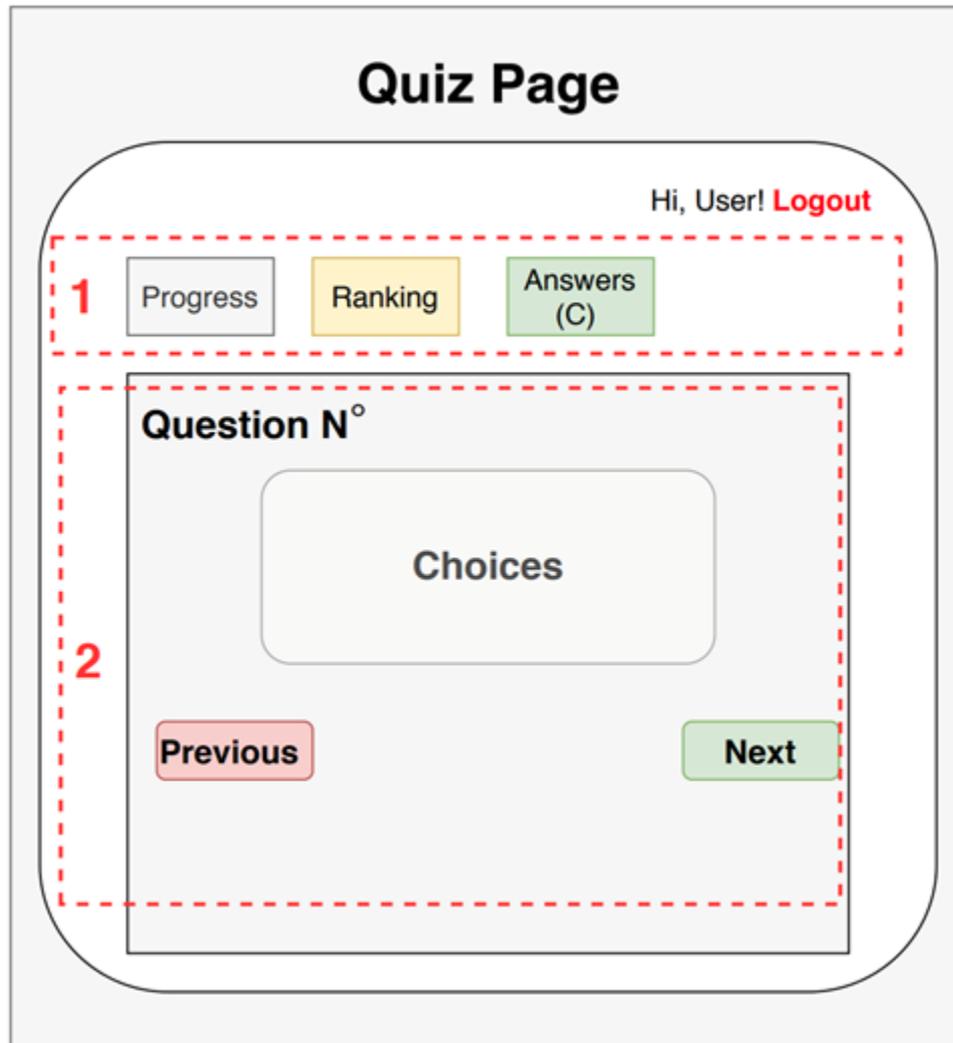


Figure 46 Kharitati Quiz Page

The quiz has two components:

- (1) A header that gives an overview about the progress made by the user (same as the one previously seen in Figure 44)
- (2) The quiz panel carries multiple questions with various choices, quizzes will help the users to test the knowledge that they have got from the studied courses.

Chapter 4

Research results

As we previously mentioned in Chapter 2, we studied how the teaching of Geography and map concepts is defined by the textbooks used in elementary and secondary schools. However, after a deep review of the content of the textbooks, we noticed that there are some notions, maps, definitions that are either hard to understand by pupils at that stage, the information presented are misleading or providing a lack of information. As a result, we tried to build a web application to assist pupils in their studies by introducing a concise syllabus, this syllabus highlights the most important information that pupils should know at that stage of education level. It is important to know that the online materials (syllabus) are based on the original textbooks, however, some notions, concepts, and maps have been updated and completed. The following section describes the content and materials included in the proposed E-learning platform.

1. Proposed materials for the E-learning platform

Mainly, three chapters are described as follows:

Chapter 1: Geography facts

In this field was defined and explored the study of geography. We chose this this theme as first, because it contains the basic knowledge that pupils have to know in elementary schools, based on the pedagogic program and before teaching map concepts.

- **Solar system**

The planets that orbit the Sun

- **Earth rotation and revolution**

This lesson explores the factors of daylight and temperatures on our planet, including explanations on rotation and radiation.

- **Land and water**

In this lesson, the pupils explore how much land and water are on our Earth globe.

- **Continents**

In this lesson, the pupils learn about the location of the seven continents, identify their locations and highlight some of their key characteristics according to a map.

- **Oceans**

In this lesson, pupils discover the five major oceans of planet Earth.

Chapter 2: Map basics

This field is important for pupils to get basic knowledge about maps and future map use, as well as give information on what is a map, its' parts and how to read it.

- **Map**

In this lesson, the pupils learn how maps use important features to represent real-life areas in a more manageable way, the parts of a map, and how it can help us to better understand the representation of land forms on maps.

- **Scale**

In this lesson, pupils will learn about map scale and the different types of scales.

- **Directions**

This lesson defines cardinal and intermediate directions, explains their meaning.

- **Map key / Map legend**

Pupils can learn why map keys are essential to understand maps and see some examples of the importance of map keys.

- **Coordinate system**

In this lesson, pupils know the geographic coordinate system.

Chapter 3: Algeria

Algerian pupils learn on the main characteristics and data related to their country.

- **Algeria**

In this lesson, the pupils will learn on Algeria and its' geographical location.

- **Algeria location in the Maghreb**

This lesson, defines which are the countries of the Arab Maghreb Unit, of which Algeria is also member.

- **Algeria's location in Africa**

In this lesson, pupils discover knowledge about the African continent, in which Algeria is located and they can find a map listing all the African countries.

Teaching by a web application has many advantages. Indeed, it is often easier to use E-learning platforms rather than textbooks as very young children find more attractive and interesting the learning activities by looking at pictures, videos, and diagrams that resemble the real world in which they live.

Textbooks are also limited to the information on their pages, whereas educational websites can link to a large number of other pages. A very good advantage for E-learning is that the content provided is dynamic, e.g., could be updated several times as much as needed with very small expenses, if we compare them with the textbooks, which have a static content and the cost of updating the content of these books is very high.

2. Detailed content of the website

The website is named **Kharitati**, which means “**my map**” in Arabic (خريطتي). My research is deeply concerned with maps, so it was only fitting naming the website after them. In addition, map in geography is the most common and useful tool, that is why I decided to give that name to my website,

The initial homepage is the gate of the website (Figure 47); a username and password are required to periodically perform user identification and authentication. However, if a new user would like to use the content of the E-Learning platform, he has to register himself.

As previously mentioned, a Login can provide full access to the entire website as user. Therefore, some parts of the website have restricted access as they are mainly used by the administrators that are responsible for maintaining and updating the content of the website. Other actions possible are the Logout from the website, this might be manual by the user, or they can occur automatically when certain conditions are met (such as closing the page, turning off the computer, end of the timeslot reserved for the session, etc.)

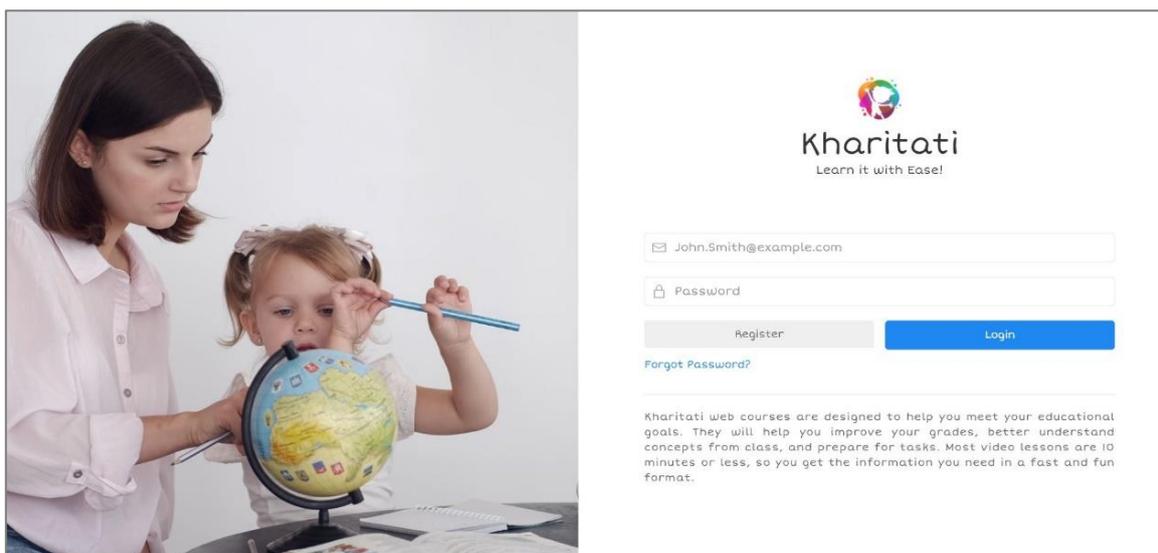


Figure 47 Kharitati Homepage

After the login process, the user will be redirected to the **Main page**, which shows the progress of the student, his ranking, correct answers and list of available and enrolled courses (Figure 48).

Progress element displays an indicator showing the completion in the progress of courses.

Rank element displays the ranks of a group of values based on the user's results and the correct answers given to the quiz.

Completed quiz shows how many quizzes you answered.

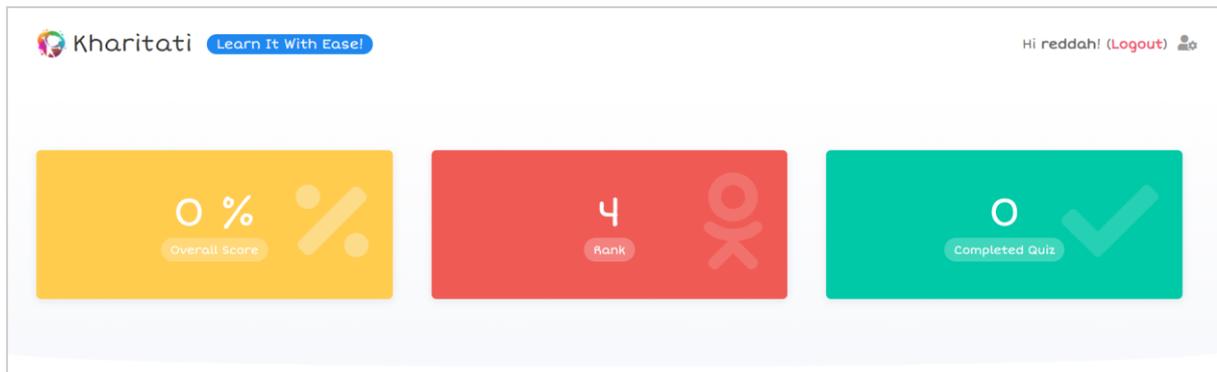


Figure 48 Kharitati Main page (1)

A list of available courses (shown in the figure below) allows pupils (users) to get enrolled in specific courses that contain rich content with very useful information as well as a quiz to test their knowledge after studying a specific course. It is not visible in the figure below, but by scrolling down, users can reach all the courses offered by the E-learning platform.

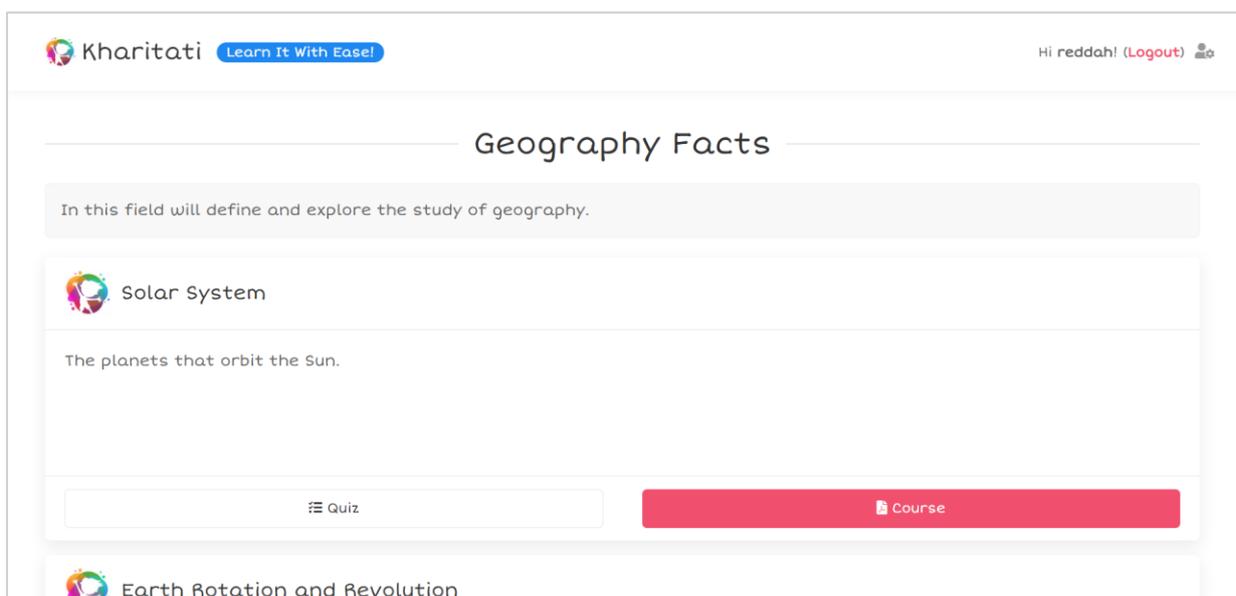


Figure 49 Kharitati Main page (2)

The **course page** is a course container, where the user can find the materials related to the selected theme. These materials could be either descriptive texts, formal definitions, informative figures (maps, images, animations, etc.) or video tutorials.

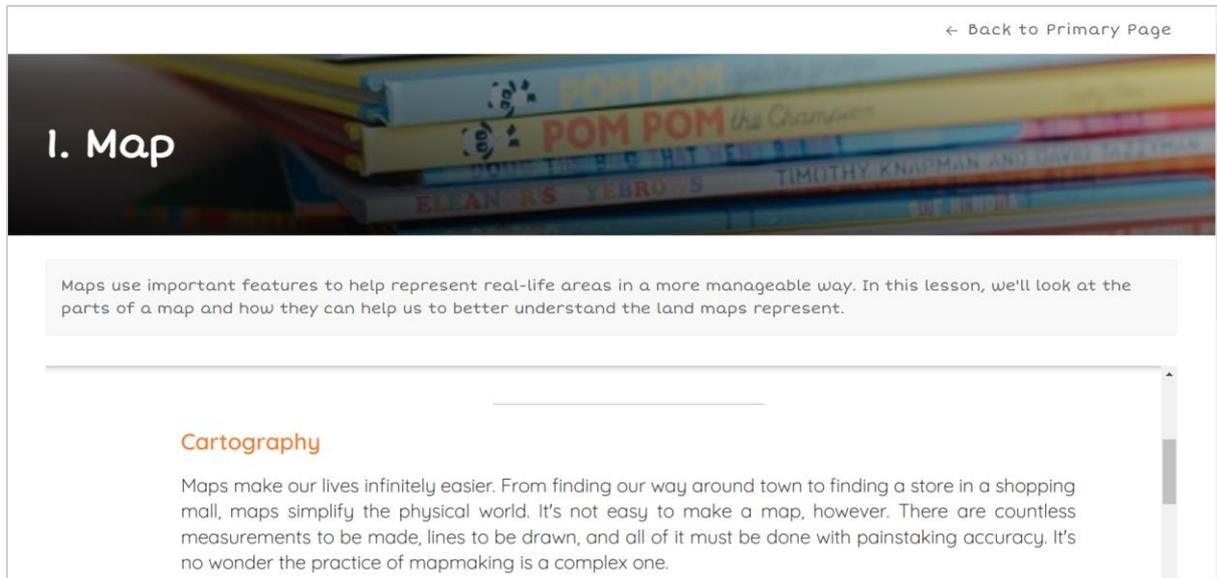


Figure 50 Kharitati Course page

As mentioned before, the **main task of Quiz page** is to give several questions for each course (Figure 51). These questions help pupils to check their progress on the topic or to find out what they did not understand, in this way they will either restudy the materials or ask crucial questions to their teachers.

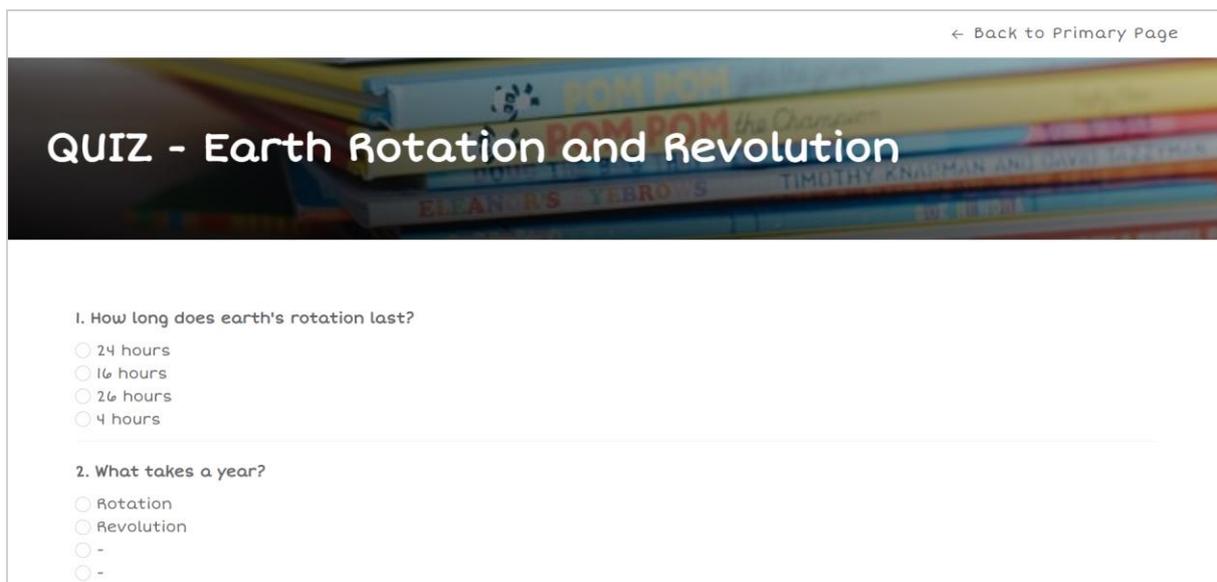


Figure 51 Kharitati Quiz page

Using the Admin console

The administrator of the website can use a specific environment to update the content. It can happen as follows:

After clicking on the “Admin console” button, several windows appear on the upper bar:

1) **Users** - It shows all the information about the users of this website, such as their full name, email address, number of quizzes completed etc. as we see in the figure below.

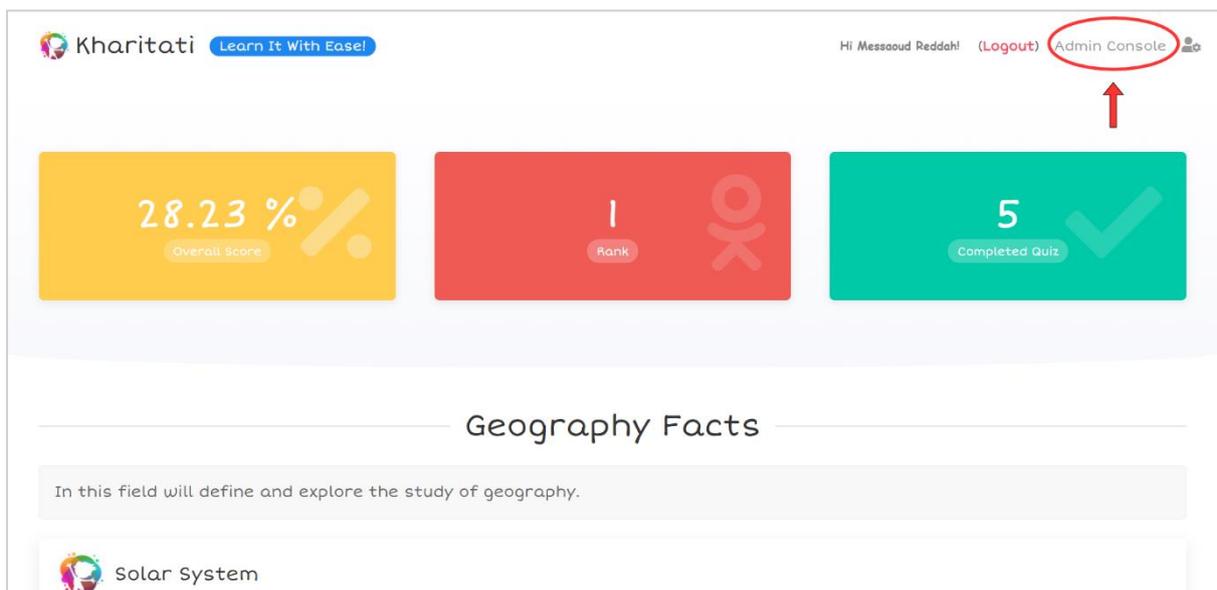


Figure 52 Admin consol page



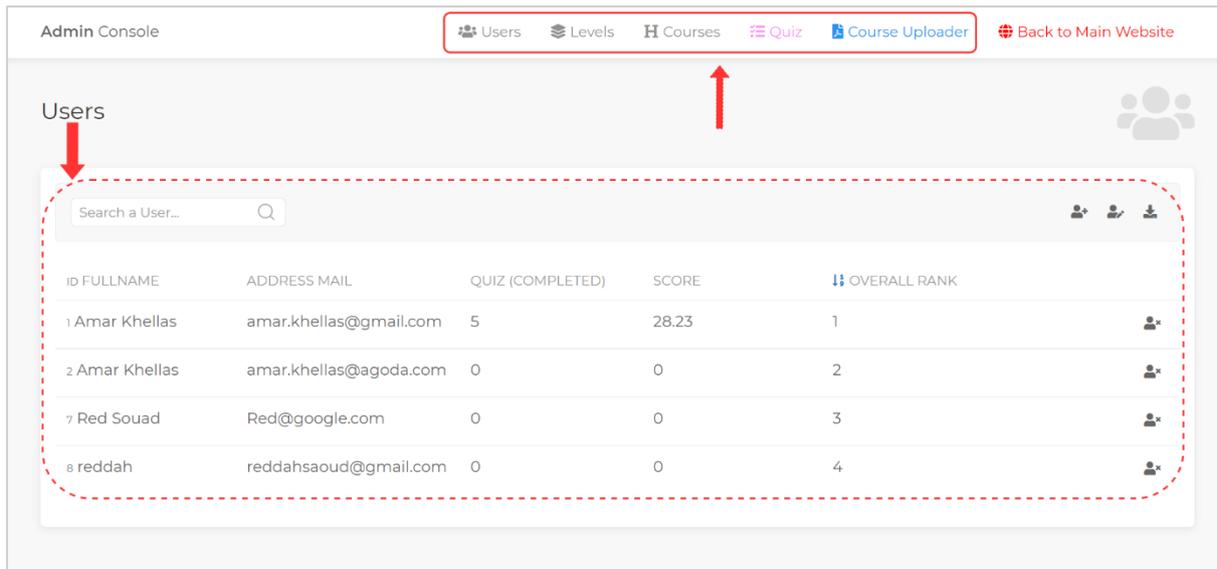


Figure 53 Users page in Admin console

2) Levels - In this window, Levels are specific topics on which information is presented.

All levels that are already listed with their descriptions. On the upper right side of the bar, we can see a “+” button, which gives access to add a new level, with its name and description as you can see in Figure 56.

We can change the levels with the “Edit” button. We can also export to Excel or CSV format the existing list of levels using the “Export” button.

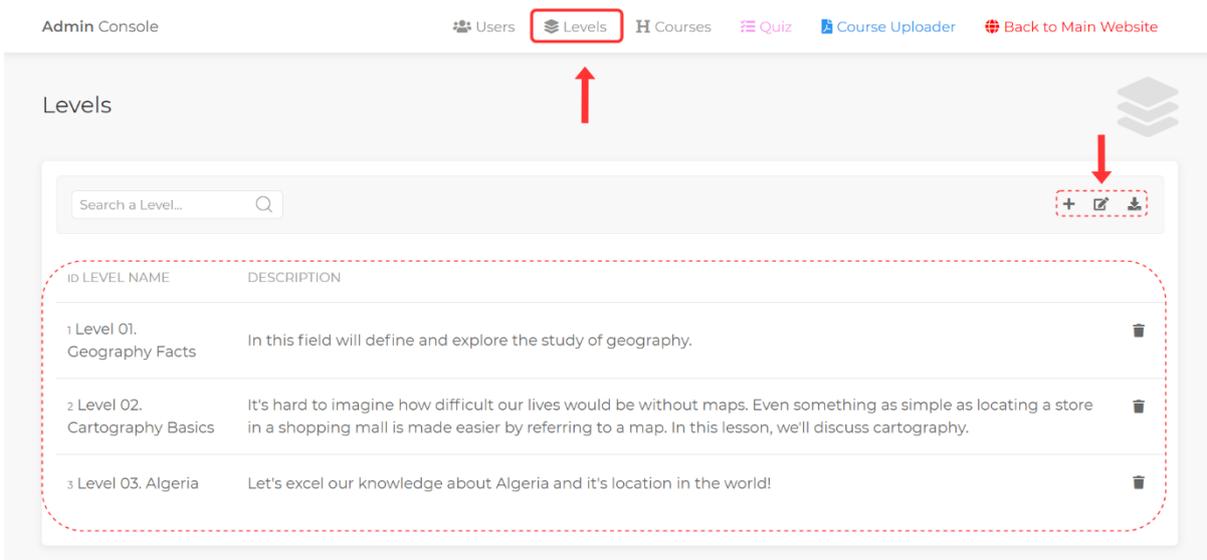


Figure 54 Levels page in Admin console

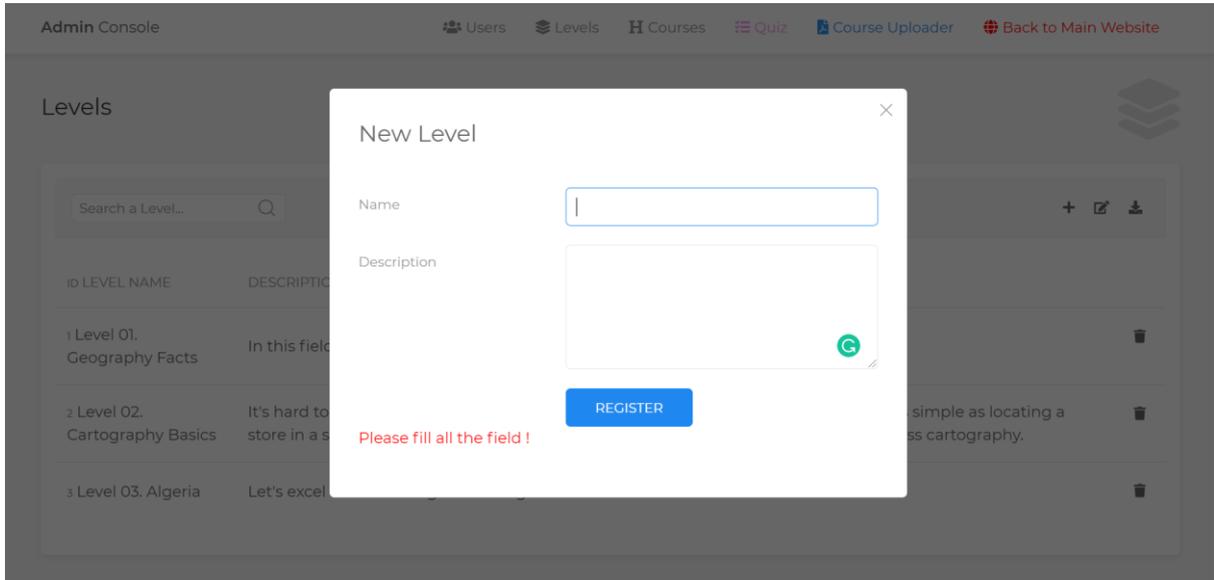


Figure 55 Levels page in Admin console

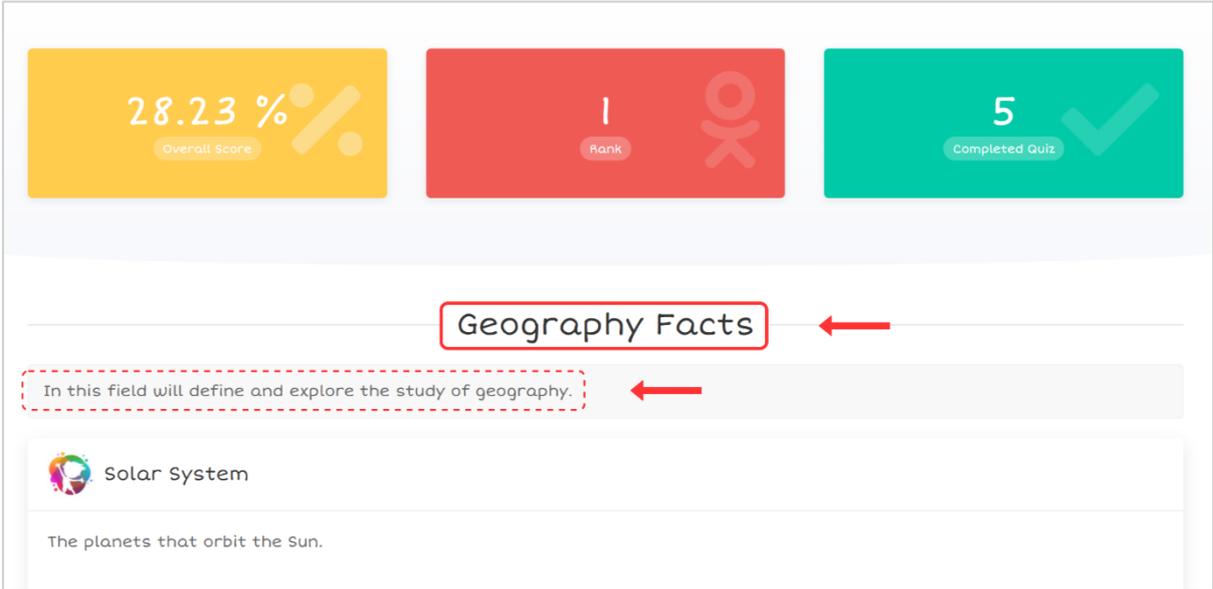


Figure 56 Levels page in Admin console

3) Courses - This window serves as a subsection to the “Levels” window. Here we can see names of the courses and their descriptions.

This window has similar buttons for editing and exporting as we previously described in Levels.

By clicking the “+” button we can see a pop-up menu (Figure 58). In this menu we can select a level, on which a course can be added with its name and description.

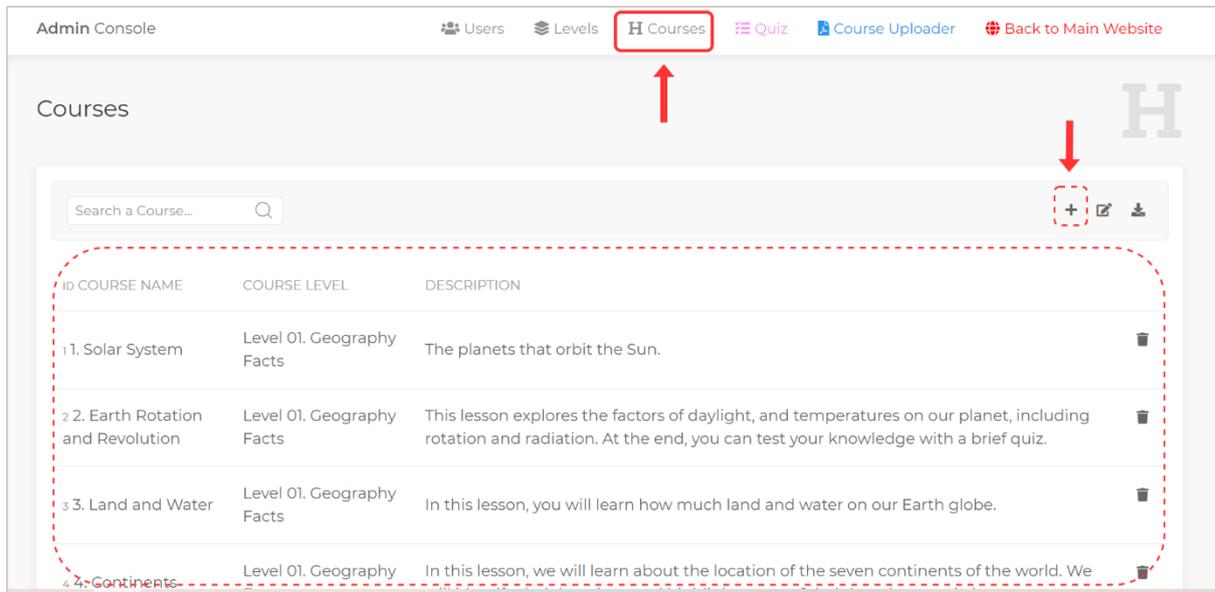


Figure 57 Courses page in Admin console

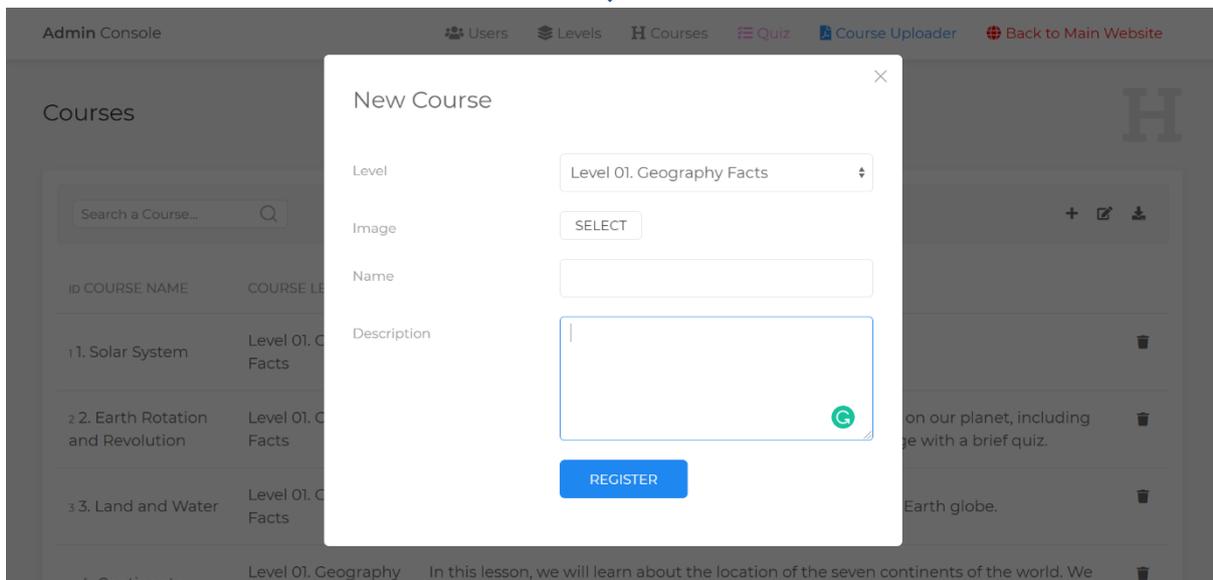


Figure 58 Admin “Courses” page

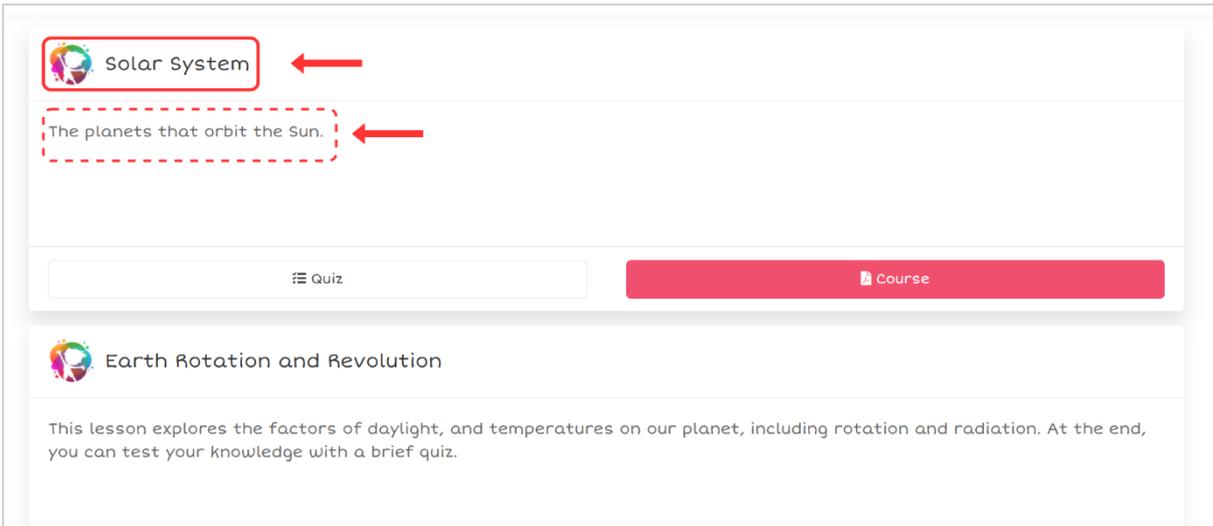


Figure 59 Courses page in Admin console

4) Quiz - In this window, the administrator can create a quiz containing several questions. For each question, the administrator should write possible answers with only one of them being correct.

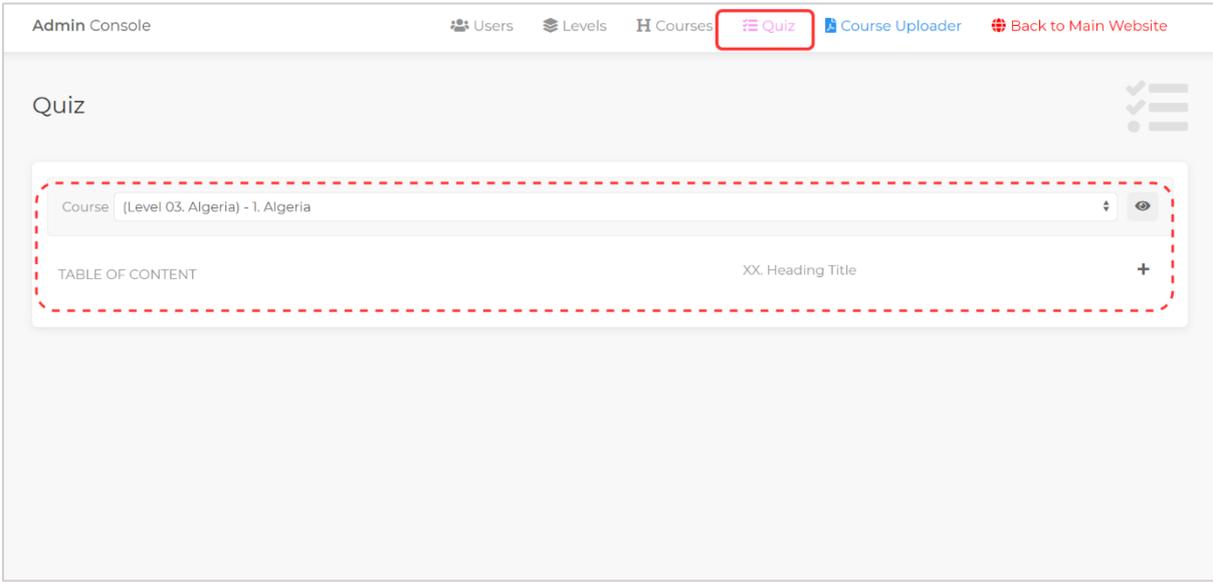


Figure 60 Quiz page in Admin console

5) Course uploader - In this window, the administrator can upload courses in pdf format to the level chosen from the list.

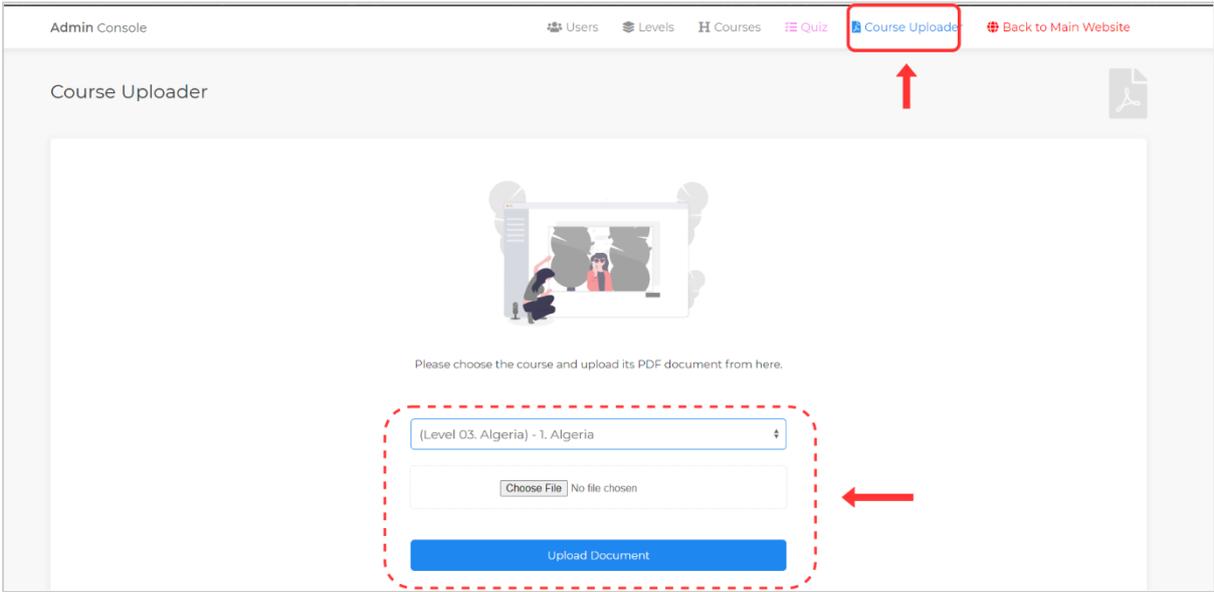


Figure 61 Course uploader page in Admin console

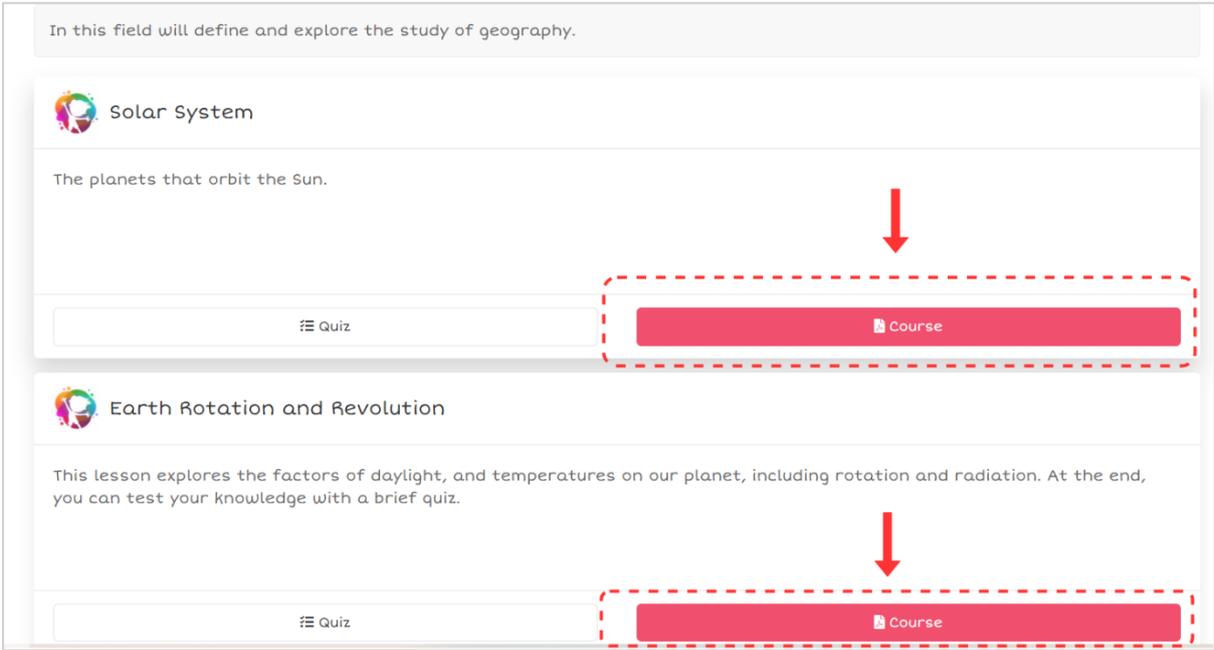


Figure 62 Course uploader page in Admin console

3. Technical solutions

During our research, we used ArcGIS and CorelDraw to create and edit maps, as well as HTML, CSS, and PHP languages to create the E-learning platform.

Cartographic solutions:

- **Maps created for the website:** the used software is ArcGIS Desktop, which requires choosing a base map and layers. Layers can include topics associated to different themes (land forms, population life, as well as images. After it, choosing style a (colors, size, etc.) of our layer, we presented the topic with several styles. Once the maps were created, we saved and exported it as JPEG or PDF files.
- **Graphic editing of maps:** We used CorelDraw software to improve the graphic quality of our maps.

Programing solutions:

- **Web programming:** Refers to the writing, marking, and coding involved in web development, including web content, web client, and server scripts.

Technically, it is divided into:

Front end development: HTML + JavaScript + CSS, we use “**UIKit**” framework which is predefined and ready to use web style framework as page layout, buttons, containers, etc.

Back end development: PHP + JavaScript, we use it for components and features that are indirectly assessed by a user through a front-end application or system, as a function, database communication, etc.

The website is stored in this server of Eötvös Loránd University and can be accessed by my domain name: <http://reddah.web.elte.hu/>

Summary

The purpose of this thesis entitled “**WEBSITE ON MAP CONCEPTS FOR ALGERIAN PUPILS**” is to illustrate and complete the content of the most important map concepts used in Algerian textbooks by creating maps and an E-learning platform. The thesis is composed of four chapters, each of them dealing with different aspects developed during the research. Chapter 1 is introductory and defines the background of school cartography. Chapter 2 explores the current map teaching for pupils and make proposals for improving it. this chapter is subdivided into elementary and secondary schools. Chapter 3 presents the structure of our website as the content as shown on the web. Finally, chapter 4 explains results, materials, and technical solutions that we used in our research.

As the final result of this research, an E-learning website has been created, which provides an outlet to teach basic map concepts for Algerian pupils.

Future plans

Our proposed E-learning platform is a very basic website that focuses on the most important map concepts used in Algerian textbooks. As a next step, we would like to extend its content in such a way that it would contain further notions and concepts that are missing from the actual textbooks and we can create an exclusive teachers' platform, where they can add more content. Further, we would like to include modern learning tools such as online chat rooms, which will allow active discussions and more participation among students. It also provides real-time feedback from the teachers, which is much faster than traditional communication where the student should visit teachers in their offices or send emails electronically. Finally, we plan to adjust the actual user interface by providing new themes, drawing tools, and 3D animations to attract pupils' attention.

Acknowledgments

I am fortunate to have had the opportunity to do my Master studies at Eötvös Loránd University, which was possible thanks to the Stipendium Hungaricum program.

I would like to express my gratitude to the following people for their contributions:

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His guidance helped me in all the time of research and writing of this thesis and during my studies as well.

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You are everything to me, Thank you for all your love and support.

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DECLARATION

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Budapest, 15, December, 2020

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