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Health education in the Moroccan life and earth sciences curriculum: the current situation and prospects for a preventive approach

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Abstract

The increasing frequency of illnesses linked to sedentary lifestyles and unhealthy behaviours has led to the evolution of increasingly complex health issues and heightened public interest in health. Today, more than ever, disease prevention through education is an important, if not crucial, issue for promoting health in schools on the one hand, and combating disease on the other. The aim of this study is to investigate the integration of health education themes into the Moroccan secondary school life and earth sciences curriculum, in order to analyze the pedagogical orientations in the life and earth sciences teacher's guides. The methodology adopted for this study consisted in evaluating the objectives relating to health education in college high school experimental science programs, so we developed a valid and reliable questionnaire with a Cronbach alpha index of $\alpha = 0.94$ for high school life and earth science teachers. The results show that there are no health-related objectives in the first year of secondary school in the teaching guidelines and textbooks for life and earth sciences, with a small percentage in the second year and one hundred percent of objectives in the final year. In addition, questionnaire results show that 95% of life and earth science teachers consider health education to be an important part of their basic training. Furthermore, 82% strongly agree that health education in life and earth sciences programs can prevent future illnesses. Finally, 65% believe that the current life and earth sciences curriculum does not include health education. In conclusion, the adoption of health education in life and earth sciences programs is a necessity today more than ever in order to avoid or delay disease.

Keywords: Education, health, curriculum, life and earth sciences

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1. Introduction

For a long time now, the debate on science and technology curricula and content has been constantly called into question in order to build an innovative school capable of constructing a precise educational pathway. Indeed, research into the content of science curricula aims to keep pace with technological advances, so that curricula can lead students towards the acquisition of technical and sustainable skills, and thus map out a concrete and real educational pathway [1].In Morocco, many transformations have taken place in various fields. Indeed, the school occupies a strategic position in the success of all socio-economic projects, thanks to the noble mission it fulfils in the training and edification of future citizens. Similarly, health remains an important asset and a priceless commodity. From this point of view, curricula reflecting the Kingdom's political, socio-economic and

pedagogical orientations must imperatively integrate the "health" dimension into all strategic visions of the education and training sector [2]. With the advent of the Covid-19 global crisis, the whole world prioritized the health sector in its strategic visions. Morocco, too, is making enormous efforts in this vital social sector. The school, too, as an environment for socializing and bringing together all school-age pupils, must play an ongoing role in educating and transmitting educational messages in favor of health and well-being [3].

In France, the school system stipulates that "health education is an integral part of the private education of the individual and of the citizen in general" (French Ministry of Education, 1998), in a global approach that encourages individuals through learning to live life to the full, in other words, it's about conserving human bodies rather than integrating normative precepts [4]. In Quebec, health education has its place in the learning and development of individuals through physical and sports education and health education. Subsequently, health education can be adopted as a disciplinary skill in which students can adopt a dynamic and harmonious pace of life, and it is the general object of training entitled health and well-being, which is the responsibility of the educational team. Quebec's vision of health education at school is to encourage learners to adopt healthy attitudes through a reflective approach on several levels: well-being and health, safety and accident prevention, and sexuality education [5].

Indeed, in Moroccan school curricula, health education appears in the form of themes, notably in natural science or life and earth science textbooks, enabling the prevention of a number of diseases, such as hand-washing rules, a varied and balanced diet, and mouth and teeth hygiene. However, several studies of these textbooks point to the dominance of the informative style in textbooks, followed by the injunctive style, which is limited in the problematization of learning situations, in particular the change of habits and attitudes linked to the preservation of health [6].

In addition, the incidence of a number of diseases has risen sharply in recent years:

- Diabetes, with its two types (type 1 and type 2);
- High blood pressure;
- Rising blood cholesterol levels;
- Cardiovascular disease;
- Mental illness;
- Kidney failure;
- Obesity;
- Sexually transmitted infections....

Most of these diseases can be prevented or delayed through health education from childhood onwards, and this can only be achieved through an educational strategy aimed at promoting health in schools [7].

In Morocco After analyzing the Life and Earth Sciences curricula of the qualifying secondary cycle, and the survey of the questionnaire intended for pupils in the qualifying secondary cycle, we were able to note the existence of behaviours in the face of health risks health risks, as well as behaviours that are not favorable to the environment [8]:

- 69% of study participants waste water in the shower, and are unaware of the importance of preserving water resources. Conservation of water resources. They need awareness raising and support courses and parallel activities to raise awareness of the importance of rational water use.
- 86% of learners need effective teaching strategies to change their perceptions of water and respect for the environment.
- 85% of learners are unaware of the effects of food pollution, which can expose them to health risks health risks, such as cholera or food poisoning. These learners need awareness of the dangers of polluted food and of Cholera.
- 57% of learners are at risk of typhoid fever due to poor behavior.
- 68% of learners risk contamination through transmission of the flu virus from an infected person, They need awareness campaigns to put an end to these health risk behaviors.

How can high school experimental science programs contribute to health education? How can life and earth sciences be used in health education? Can students adopt healthy attitudes towards their health by introducing life sciences for health into the school curriculum? The main aim of this study is to analyze the experimental science curricula of the secondary cycle in Morocco, in order to highlight the importance of the health dimension in the experimental science disciplines.

2. Materials and methods

2.1 Study design

The purpose of this evaluative study is to analyze pedagogical orientations through teaching guides and to analyze life and earth sciences textbooks, with a view to opening up perspectives for didactic research that show the important link between life and earth sciences programs and the health and environment dimension. Indeed, all scientific research requires a precise methodological approach to enable the researcher to collect, analyze and interpret data.

2.2 Study setting

In the present study, we analyzed teachers' guides for life and earth sciences in the secondary school cycle, as well as textbooks for the same discipline. We also developed a reliable and valid questionnaire for a sample of physics-chemistry teachers in the Rabat-Salé-Kénitra region of Morocco. This region is characterized by the presence of the kingdom's administrative capital, with four provinces and three prefectures according to the Moroccan administrative division. Educational provision in the region is diversified between the public and private sectors. According to 2020 statistics, the region's school-going population is 1.3 million, with 237,351 students enrolled in 544 secondary schools [9].

2.3 Methods and sampling

To better assess the place of health education in life and earth sciences programs, we began by analyzing the health-related objectives in the life and earth sciences teaching guides for the secondary college level.

With the intention of finding out the views of life and earth science teachers on the place of health education in experimental science curricula, we have drawn up a valid and reliable questionnaire by a scientific committee made up of life and earth science teachers in higher education. This questionnaire is distributed online using "Google form" to life and earth sciences teachers in the region studied, and comprises four parts: identification of participants, importance of the health dimension in experimental science curricula, integration of health education into basic teacher training and adoption of this teaching as a school subject.

2.4 Statistical analysis

All data collected were analyzed using (Statistical Package for the Social Sciences) SPSS software version 2.0.We used the alpha Cronbach (α) test to ensure the reliability of our questionnaire.

2.5 Ethical considerations

We have taken into consideration the anonymity, consent of the participants, and have obtained all necessary authorizations to carry out this study.

3. Results and Discussions

3.1 Analysis of pedagogical orientations

An analysis of the «AL MOUFID teacher's guide to life and earth sciences» for the first year of secondary school, in line with the Moroccan curriculum (Serial number: PIC earth and life sciences 0112320 - Approval date: August 13, 2020), shows that the curriculum is divided into two main parts, each of which is subdivided into chapters. The first unit is entitled "Relations between living beings and their interactions with the environment" and is itself subdivided into five chapters (Table 1).

The didactic approach of the first chapter aims to discover the constituents of an ecological environment, while the second chapter aims to teach students how different living beings breathe in different environments (aquatic and aerial). In addition, the third chapter deals with the ecological approach to nutrition, focusing on the study of feeding relationships and the flow of matter and energy [10]. The fourth chapter of this unit highlights the intersections between certain food chains, giving students an initial idea of the notion of "food webs", a more complex concept than that of "food chains". Finally, the last chapter deals with ecological balances. As part of this unit, teachers will have to explain several questions in relation to each chapter:

Chapter 1:

- Distinguishing between living and non-living things in a natural environment.
- Knowledge of the functional unity of living beings.

Chapter 2:

- Demonstration of gas exchange between living beings and their environment during respiration.
- Description of the breathing process in air and water.

Chapter 3:

- Characteristics of three diets: omnivorous, carnivorous and herbivorous.
- The fate and nutrition of green plants.

Chapter 4:

- Representing the food chain of living organisms.
- Modeling the flow of organic matter in a natural environment.

Chapter 5:

- Establishing an ecological balance in a natural environment.
- Proposing measures to maintain ecological balance.

In addition, the second unit attempts to solve scientific problems relating to external geological phenomena and water resources, by mobilizing acquired knowledge and skills. (Table 2).

We can see that in the first year of secondary school, it's mainly ecology and geology that are covered, so the health and well-being aspect is relatively absent in this year [11].

This reflects the absence of a health policy on the part of those responsible for education; in fact, the first unit can deal with a whole host of themes linked to health education, such as:

- Oral health and protection of the mouth and teeth;
- Hand washing and its importance in disease prevention;
- Introduction to a healthy and balanced diet;
- Human breathing and active and passive smoking.

During the second year of secondary school, the teaching instructions given in the "AL MOUFID life and earth sciences teacher's guide",

Compliant with the Moroccan PS (Serial number: PIC earth and life sciences 0112320 - Approval date: August 13, 2020), show that during this year the textbook is also divided into two major units, each subdivided into chapters.

The first part is entitled "Internal geological phenomena" and is subdivided into six chapters (Table 3).

This first unit deals with learning activities concerning internal geological phenomena, and aims to ensure that learners are able to understand scientific phenomena linked to internal geology, in particular plate tectonics. In other words, this part can no longer take on themes relating to health education [12].

By contrast, the second unit focuses on "Reproduction in living beings and heredity in man" (Table 4), and can provide health education in the broadest sense.

The first chapter of this unit deals with reproduction in animals, the second with reproduction in plants, while the third and fourth chapters deal with reproductive and hereditary aspects in humans.

Indeed, the didactic approach of the third chapter is designed to cover scientific concepts linked to health education, such as:

- Pregnancy and the production of gametes and sex hormones;
- The relationship between the uterine and ovarian cycles;

- Gestation and implantation;
- Preventive measures for good gestation;
- The importance of breastfeeding;
- The importance of birth control.

This chapter highlights a range of information for learners on topics related to health education. In addition, teaching instructions should encourage teachers to:

- Explain to pupils the physiological and psychological changes of puberty in girls and boys and how to remedy the influence of these changes on the normal life of schoolchildren, using appropriate teaching materials;
- Inform and prepare girls about the menstrual cycle and its clinical and psychological aspects;
- Provide learners with useful knowledge about pregnancy and the need for follow-up care in the health centers set up for this purpose;
- Provide information on diseases linked to poor hygiene in general and poor genital hygiene in particular;
- Briefly explain the transmission of sexually transmitted infections;
- Briefly inform students about the role of contraceptive methods and their effects;
- Introduce notions of childcare and birth preparation;
- The parameters that women should monitor during pregnancy (blood pressure, blood sugar, etc.) to avoid risky pregnancies;
- Explain briefly the main features of the pregnancy and childbirth-monitoring program introduced by ministry of health and social protection;
- Introduce the role of vaccination for pregnant women and their children;
- Emphasize the importance of breastfeeding for both mother and newborn.

Indeed, in the last two chapters of the second unit, teachers are asked to stimulate learners to ask themselves the following questions:

- What is the role of the testicles and ovaries in humans?
- How does fertilization take place in humans? In addition, how can we get pregnant?
- How does breastfeeding benefit mother, baby and family life in general?
- What contraceptive methods are used to space and regulate births?
- How are hereditary traits transmitted from one generation to the next?
- What are the consequences of consanguineous marriages?
- In the third and final years of secondary school, an analysis of "Professor AL MOUFID's teaching guide in life and earth sciences" for this year of secondary school, in line with the Moroccan PS (Serial number: PIC earth and life sciences 0112320 - Approval date: August 13, 2020), shows that the program for this year is perfectly suited to health education, with two units devoted to themes directly linked to health:

In principle, the third year is organized into units as follows:

First unit: "Nutritional functions and education".

Second unit: "Relational functions - Immunology".

Indeed, the first unit is subdivided into five chapters (Table 5). The didactic approach of the first chapter aims to reinforce the notion of digestion in pupils at the microscopic level, the second chapter aims to reinforce primary school knowledge of nutrition education, then the third chapter aims to place the learner at a higher level of formulation for the concept of respiration, The didactic approach of the fourth chapter highlights the main function of the circulatory system, while the fifth chapter completes the nutritional functions, as this function rids the body of waste products resulting from the catabolism of nutrients, and helps maintain the constancy of the body's internal environment.

In this unit, the teacher's guide encourages educators to stimulate students to:

- Know the main chemical components of food;
- Understand the transformation of food into nutrients in the digestive tract;
- The role of food in the body;
- Interpret the consequences of malnutrition;
- Identify the benefits of a balanced diet for the human body;
- Implement hygiene measures to ensure proper functioning of the digestive system;
- Understand the mechanism of respiratory exchange in the lungs;
- Preserve the proper functioning of the respiratory system;
- Learn about the constituents of urine and its origin;
- Know the kidney structure responsible for urine formation;

Similarly, the final section is subdivided into five chapters, the didactic approach used in the first of which guides teachers to give introductions to the nervous system, while the second studies the muscle in the context of relational functions, i.e. in relation to the nervous system as an effector organ of voluntary and reflex movements. Then, the third chapter aims to reinforce the principles of health education among students by highlighting microbial diversity and the distinction between pathogenic and non-pathogenic microbes [13]. The approach of the fourth chapter is based on the assimilation of fundamental concepts that help students build a clear conception of the functioning of the immune system as a system capable of distinguishing between pathogenic and non-pathogenic microbes.

Being a system capable of distinguishing between self and non-self and of eliminating the latter, in order to preserve the integrity of the body through the mobilization of a set of cells.

Finally, the last chapter of the secondary school life and earth sciences curriculum deals with HIV/AIDS, allergies and the problem of incompatibility during blood transfusions as cases to tackle problems that can be explained by the way the immune system works.

In fact, the third year of secondary school has proved to be very rich in subjects that can be exploited in health education:

- Immune problems linked to blood transfusion and the precautions to be taken to avoid these problems;
- Hygiene of the reproductive system;
- Allergy: symptoms and mechanisms;
- AIDS virus and contamination;
- Hygiene of the muscular system;
- Nervous system hygiene;

- Respiratory hygiene.

In addition, life and earth science teachers are expected to help students find answers to the following situations:

- How the nervous message is processed at the level of the sensory receptors;
- The steps involved in transmitting this message to the brain;
- Knowledge of the properties of skeletal muscles;
- Anatomical supports for skeletal muscle movements;
- Protecting and preserving our muscular system;
- The different types of microbes and how to differentiate between pathogenic and useful microbes;
- Non-specific or innate means and mechanisms of defense;
- What are the means and mechanisms of the specific immune response?
- What methods are used to strengthen the immune system.

Although this year's program is rich in topics that can be covered in a wide range of health education areas, it remains limited due to the lack of time and practical demonstration materials, as well as a lack of information among some teachers.

Practical demonstration materials, as well as the lack of information among some teachers.

We note that several areas of prevention and protection of the human body can be covered, including the following:

- Knowledge of mental health in the chapter devoted to the nervous system: depression, drug addiction, suicide attempts and other illnesses linked to this system;
- Muscle protection and sports activities (differentiating between swimming and weight training, for example);
- Types of microbes and the differentiation between viruses and bacteria, with a presentation of some of the diseases associated with these germs;
- The negative effects of self-medication and the indiscriminate use of antibiotics;
- The importance of blood donation, to encourage students in this culture.

2.2- Life and earth sciences and health education textbook

- **1st year life and earth sciences**

The life and earth sciences textbook for middle school consists of two units, each with chapters.
The first unit comprises five chapters.
The second unit comprises four chapters.
Analyzing the health-related objectives, we found the results shown in Table 6.

In the first year of secondary school, the earth and life sciences textbook contains no health-related objectives. In fact, out of a total of forty-nine objectives, none deals with health, prevention and protection. This introductory year can introduce students to a number of subjects relating to health and ecology, as long as it is aimed at the environment.

- **2nd year earth and life sciences**

Similarly, the earth and life sciences student manual for the second year of secondary school is divided into two units: the first deals with internal geological phenomena, while the second is devoted to reproduction in living beings and heredity in man [14].

The first unit is divided into six chapters, while the second is subdivided into four chapters (table 7).

This year, the second unit presents a number of objectives that can be exploited for health education. Indeed, eleven of the 48 objectives (23%) are health-related.

- **3rd year life and earth sciences**

Similarly, the life and earth sciences student handbook for the third year of secondary school is divided into two units: in this year, several objectives can educate well in terms of health and environmental protection, among which we cite the following:

- Highlight the properties of striated skeletal muscle and describe its structure;
- Explain the origin of the energy required for muscular contraction and diagram the structures involved in contraction;
- Carry out manipulations relating to the functioning of striated skeletal muscle and identify the harmful and beneficial effects to preserve the muscular system;
- Identify the body's defenses and distinguish between non-specific and specific immune responses;
- Describe the stages of a specific and non-specific immune response and explain the mechanisms of specific immune responses;
- Identify the methods used to strengthen the immune system and provide information on the mechanism of AIDS and changes in the defense system;
- Identify the problems associated with blood transfusion accidents and the rules to be observed, and establish the relationship between exchanges in the respiratory system;
- Explain the mechanism of respiratory gas exchange and highlight respiratory gas exchange at organ and cell level;
- Explain the origin of the energy used by cells, to be aware of the hygiene of the respiratory system;
- Identify the role of food in the body and establish the relationship between dietary deficiencies and certain diseases, in order to develop an awareness of the hygiene of the digestive system;
- Explain preventive measures to protect the body from AIDS, and describe the transmission mechanisms of the virus;

In this year, we found a considerable percentage of objectives related to health education (Table 8), although this year can very well educate about public health there are several obstacles according to teachers that prevent the transmission of knowledge and changing habits:

- Insufficient time for life and earth sciences;
- Lack of practical demonstration equipment (blood pressure monitors, bathroom scales, etc.);
- Lack of basic training for teachers;
- The difficulty of changing habits already acquired by learners.

- For all these reasons, life and earth sciences teachers argue that health education should be taught as a new school discipline in Morocco, with its own textbooks.

Generally speaking, health education is not a priority in high school experimental science textbooks, but it is in the third-year life and earth sciences textbook. In fact, learners can positively change their behavior towards their health and well-being.

The national charter for education and training stipulates that: The secondary school cycle is divided into three years and is aimed at pupils who have obtained a primary school certificate. In addition to furthering the general objectives of the previous cycles, the objectives of the secondary cycle are as follows:

Acquisition of knowledge of social and administrative organization, at local, regional and national levels;

Knowledge of fundamental human rights and freedoms and of the rights and duties of Moroccan citizens; Learning of basic scientific, technical, ecological, professional and sporting skills, linked to socio-economic activities adapted to the local and regional environment of the school - to all these objectives must be added the knowledge needed to protect health [15].

3.3 Questionnaire results

This survey showed the participation of 232 life and earth sciences teachers, i.e. middle school teachers (56%) and qualifying high school teachers (44%). Thus, the population of our study is mainly made up of former teachers: (47%) have an average age of over 45 years, (22%) have an average age between 36 and 45 years and (31%) are under 36 years old. The respondents to our survey, of whom (38%) are women and (62%) men; cover all the provinces and prefectures of the Rabat-Salé-Kénitra region, with (37%) teachers in rural areas and (63%) teachers in urban areas. The coefficient, Cronbach's α calculated from SPSS is equal to 0.94. On the other hand, (43%) consider that current life and earth sciences programs enable students to develop personal, social and civic skills, (31%) consider that these programs enable students to learn about their bodies, their health, their behaviors and their effects, and only (15%) consider that these programs enable students to acquire the means to take a critical look at their own environment, while (11%) declare that none of these propositions is correct [16].

In addition, (97%) strongly agree that strengthening teaching areas related to health education is a priority. Furthermore, (40%) strongly agree and (43%) agree that social pressure on core subjects leaves little room for health education, and the majority of teachers state that health education can be included in various disciplines such as life and earth sciences and physical education. The assessment of life and earth sciences teachers' level of competence in health education shows that (63%) have an average level, (22%) have a low level and only (15%) indicate a high level. Thus, 58% have never been trained in health education. On the other hand, 95% of respondents consider that training in health education is necessary.

Table 1: Chapters in the first unit of the teacher's guide (life and earth sciences) 1st year of secondary school

Unit 1	
Chapter 1	Observation of a natural environment
Chapter 2	Breathing in different environments
Chapter 3	Feeding
Chapter 4	Food relations and flows of matter and energy in the living environment
Chapter 5	Classification of living beings and natural balances

Table 2: Chapters in the second unit of the teacher's guide (life and earth sciences) 1st year of secondary school

Unit 2	
Chapter 1	Preparing for the geological outing
Chapter 2	Stages in the formation of sedimentary rocks
Chapter 3	Importance of fossils - The stratigraphic scale - The sedimentary cycle
Chapter 4	Water resources

Table 3: Chapters in the first unit of the teacher's guide (life and earth sciences) 2nd year secondary (unit 1)

Unit 2	
Chapter 1	Plate tectonics theory
Chapter 2	Seismic phenomena and their relationship with plate tectonics
Chapter 3	Volcanic phenomena and their relationship with plate tectonics
Chapter 4	Formation of magmatic rocks
Chapter 5	Tectonic deformations
Chapter 6	Formation of mountain ranges

Table 4: Chapters in the second unit of the teacher's guide (life and earth sciences) 2nd year of secondary school (unit 2)

Unit 2	
Chapter 1	Sexual reproduction in animals
Chapter 2	Reproduction in plants
Chapter 3	Human reproduction
Chapter 4	Heredity in humans

Table 5: Chapters in the first unit of the teacher's guide (life and earth sciences) 3rd year of secondary school

Unit 1	
Chapter 1	Food, digestion and intestinal absorption
Chapter 2	Nutritional education and digestive tract hygiene
Chapter 3	Breathing and respiratory hygiene
Chapter 4	Human blood and circulation
Chapter 5	Urinary excretion in men

Table 6: Percentage of objectives relating to health education in the life and earth sciences textbook 1st year of secondary school

Unit	Chapter	Total objectives	Total health education objectives	Percentage of 1 to 2
1	1	8	0	0%
	2	5	0	0%
	3	6	0	0%
	4	6	0	0%
	5	3	0	0%
2	1	6	0	0%
	2	5	0	0%
	3	4	0	0%
	4	6	0	0%
Total	9	49	0	0%

Table 7: Percentage of objectives relating to health education in the life and earth sciences textbook, 2nd year of secondary school.

Unit	Chapter	Total objectives	Total health education objectives	Percentage of 1 to 2
1	1	4	0	0%
	2	5	0	0%
	3	5	0	0%
	4	5	0	0%
	5	4	0	0%
	6	4	0	0%
2	1	5	0	0%
	2	5	0	0%
	3	6	6	100%
	4	5	5	100%
Total	10	48	11	22,91%

Table 8: Percentage of objectives relating to health education in the life and earth sciences textbook, 3nd year of secondary school.

Unit	Chapter	Total objectives	Total health education objectives	Percentage of 1 to 2
1	1	7	7	100%
	2	5	5	100%
	3	5	5	100%
	4	5	5	100%
	5	7	7	100%
2	1	6	6	100%
	2	6	6	100%
	3	7	7	100%
	4	5	5	100%
	5	4	4	100%
Total	10	48	11	100%

4. Conclusions

A study of the place of health education in experimental science textbooks through the objectives relating to health education shows that, there is discontinuity, even instability, in the objectives relating to health education, particularly in the life and earth sciences textbook, going from 0 objectives in the 1st year of secondary school, then 22.91% in the 2nd year of secondary school, to 100% in the 3rd year of secondary school.

To this end, the Ministry of Education must:

- Encourage research into the pedagogy of teaching health education in secondary schools.
- Implement a 3-year health education curriculum in a pilot region and evaluate students' knowledge and behavior (before and after), comparing with other regions.

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