

Degree IN TEACHER OF PRIMARY EDUCATION.
Subject: Didactics of Experimental Sciences
Course: 2019-20

Chapter 3. Nature Sciences in the Curriculum of Primary Education

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1. Introduction

The Real Decreto 126/2014, del 28 Febrero (LOMCE), which establishes the minimum education corresponding to Primary Education, regulates the curricular order of the Primary Education stage. It integrates the concept of key competences and establishes that it is essential for their acquisition by students because it determines any teaching action. The end of compulsory education must attain these competences, and therefore, the contribution to them from Primary Education onwards must be significant.

The inclusion of any curricular area in Primary Education is intended to contribute to achieving the general objectives of the stage, especially emphasised on the acquisition of key competences (Ley Orgánica 8/2013 del 9 Diciembre, artículo 2 del Real Decreto 126/2014 del 28 de Febrero). This law fixes the minimum teaching corresponding to this educational stage, although, as the autonomous communities control these educational competences, there is other legislation concerning Primary Education with scope of application for the Andalusian Autonomous Community (Decreto 97/2015 del 3 de Marzo, establishing the organisation and curriculum of Primary Education in the Autonomous Community of Andalusia). The LOE defined the basic competences, which are assumed by the current LOMCE with the denomination of **key competences**, which integrate knowledge, skills, abilities and attitudes to achieve the adequate performance of activities and tasks and the effective resolution of complex problems in specific contexts. In the curriculum, the key competences are seven, defined as:

1. Linguistic communication.
2. Mathematical competence and basic competences in science and technology.
3. Digital competence.
4. Learn to learn.
5. Social and civic competences.
6. Sense of initiative and entrepreneurship.
7. Cultural Awareness and Expressions.

In general terms, both establish that the purpose of Primary Education is to provide all children with an education to strengthen their personal development and well-being to acquire necessary cultural skills relating to oral expression and comprehension, reading, writing and calculation, as well as to develop social skills, work and study habits, artistic sense, creativity and affectivity.

Likewise, both laws emphasise the interdisciplinary vision of knowledge, highlighting the connections between the different areas and the contribution of each of them to the understanding of the phenomena studied. It is also committed to the principle of applicability of what has been learned to situations of daily life and to becoming aware of the problems and problems that affect all people.

2. Areas of knowledge of the curriculum

The Primary Education stage comprises six academic years, between the ages of six and twelve, and organised into areas, which will have a global and integrative character:

- **Areas of the block of core subjects in each of the courses:**

- a) Nature Sciences.
- b) Social Sciences.
- c) Spanish Language and Literature.
- d) Math.
- e) First Foreign Language.

- **Areas of the block of specific subjects in each of the courses:**

- a) Physical Education.
- b) Religion, or Social and Civic Values, at the choice of the parents or legal guardians.
- c) Depending on the regulation and programming of the educational offer established by each Educational Administration and, where appropriate, the offer of the educational centres, at least one of the following areas of the block of specific subjects:
 1. Artistic Education.
 2. Second Foreign Language.
 3. Religion, only if the parents or legal guardians have not chosen it in the choice indicated in section b).
 4. Social and Civic Values, only if the parents or legal guardians have not chosen it in the choice indicated in section b).

3. Structure of the curriculum

The regulations establish the following curricular structure:

- a) **Curriculum:** regulation of the elements that determine the teaching and learning processes for each of the teachings and educational stages.
- b) **Objectives:** refers to the goals that the student must achieve at the end of the educational process, as a result of the teaching-learning experiences intentionally planned for this

purpose. They facilitate the selection and organisation of the necessary didactic resources, and also, mark the criteria and contents of the evaluation. Frequently, we refer to the general objectives, whether of educational stage, area of knowledge or by area of knowledge by cycles, but we can also consider the so-called didactic objectives, which indicate the capacities to be developed through the contents and are established by the teacher. These didactic objectives must be clearly stated, include transversal contents, refer to the different types of contents, and be flexible to be able to adapt to the individual characteristics of the students.

- c) **Competences:** they refer to the ability to apply the contents of each educational stage to achieve the proper implementation of activities and the sufficient resolution of complex problems.
- d) **Contents:** a set of knowledge, skills, abilities and attitudes that contribute to the achievement of the objectives of each teaching and educational stage and the acquisition of competences.
- e) **Methodology:** a set of strategies, procedures and actions organised and planned by the teaching staff, consciously and reflexively, to enable students to learn and achieve the objectives set.
- f) **Evaluation criteria:** they are the specific reference for evaluating student learning. They describe what we want to value and what students must achieve, both in terms of knowledge and skills; they respond to what we want to achieve in each subject.
- g) **Evaluable learning standards:** specifications of the evaluation criteria that define learning outcomes, and specify what the student should know, understand and know how to do in each subject. They should be observable, measurable and assessable, and allow for the graduation of the performance or achievement achieved. Their design should contribute to facilitating the design of standardised and comparable tests.

The curriculum is the set of all these elements corresponding to the different areas of knowledge, together with the contribution of these areas to the acquisition of key competences.

3.1. General objectives in primary education

The curriculum includes a series of general objectives to be developed throughout the educational stage through different areas of knowledge. In summary:

- a. To know and appreciate the values and norms of coexistence, to learn to act by them, to prepare oneself for the active exercise of citizenship and to respect human rights, as well as the pluralism proper to a democratic society.
- b. Develop habits of the individual and teamwork, effort and responsibility in the study, as well as attitudes of self-confidence, critical sense, personal initiative, curiosity, interest and creativity in learning, and entrepreneurial spirit.
- c. Acquire skills for the prevention and peaceful resolution of conflicts, which allow them to develop with autonomy in the family and domestic environment, as well as in the social groups with which they relate.
- d. To know, understand and respect different cultures and differences between people, equal rights and opportunities for men and women and non-discrimination against people with disabilities.
- e. To know and use the Spanish language appropriately and, if there is one, the co-official language of the Autonomous Community and to develop reading habits.
- f. To acquire in at least one foreign language, the basic communicative competence that allows them to express and understand simple messages and to cope with everyday situations.
- g. To develop necessary mathematical skills and to begin solving problems that require basic calculation operations, geometric knowledge and estimates, as well as being able to apply them to everyday life situations.
- h. To know the fundamental aspects of Nature Sciences, Social Sciences, Geography, History and Culture.
- i. Be initiated to manage the Information and Communication Technologies developing a critical spirit before the messages they receive and elaborate.
- j. To use different representations and artistic expressions and to begin in the construction of visual and audiovisual proposals.
- k. To value hygiene and health, to accept one's own body and that of others, to respect differences and to use physical education and sport as a means to promote personal and social development.
- l. To know and value the animals closest to the human being and to adopt ways of behaviour that favour their care.
- m. To develop their affective capacities in all areas of personality and their relations with others, as well as an attitude against violence, prejudices of any kind and sexist stereotypes.

- n. Promote road safety education and attitudes of respect that have an impact on the prevention of traffic accidents.

3.2. Objectives of the area of Natural Sciences

O.CN.1. Use the scientific method to plan and implement simple projects, devices and appliances, through observation, hypothesis and practical research, in order to draw conclusions that, at the same time, allow reflection on their learning process.

O.CN.2. Analyse and select information about the elementary properties of some materials, substances and objects and facts and phenomena of the environment, to establish various hypotheses, checking their evolution through the planning and implementation of projects, experiments and everyday experiences.

O.CN.3. Recognize and understand basic aspects of the functioning of the human body, establishing a relationship with the possible consequences for individual and collective health, valuing the benefits of acquiring healthy daily habits such as physical exercise, personal hygiene and balanced nutrition for an improvement in the quality of life, showing an attitude of acceptance and respect for individual differences.

O.CN.4. To interpret and recognise the main components of ecosystems, especially in our autonomous community, analysing their organisation, their characteristics and their interdependent relationships, seeking explanations, proposing solutions and acquiring behaviours in everyday life of defence, protection, recovery of the ecological balance and responsible use of energy sources, through the promotion of values of commitment, respect and solidarity with the sustainability of the environment.

O.CN.5. To know and value the heritage of Andalusia and actively contribute to its conservation and improvement.

O.CN.6. Participate in working groups putting into practice values and attitudes of scientific thought, encouraging entrepreneurship, developing their sensitivity and responsibility for individual and collective experiences.

O.CN.7. Understand the importance of scientific progress, in order to assess its impact and significance in improving the daily lives of all people and in the progress of society as a whole.

O.CN.8. Use information and communication technologies to obtain information, as a learning tool, to share knowledge and to value their contribution to improving the living conditions of all people, as well as to prevent risk situations arising from their use.

3.3. Key competences as a curricular reference framework

Key competences are the backbone of the educational process. The competence-oriented curriculum states that the purpose of compulsory education is for students to acquire the necessary tools to understand the world around them and become people capable of actively and critically intervening in society. A competency-based curriculum means teaching to learn and learning throughout life. Both the objectives and the selection of content seek to ensure the development of necessary skills. The evaluation criteria serve as a reference to assess its progressive degree of acquisition. Necessary skills are the basis of personal development and knowledge construction so that their acquisition allows them to understand and express reality, activate learning, and live and inhabit the world. In the LOE, the definition of key competences is: “those that allow young people to achieve their fulfilment, exercise active citizenship, successfully enter adult life and be able to develop lifelong learning”. All students must reach these competences at the end of compulsory education, and therefore, the contribution to them from Primary Education must be significant. Spanish curriculum includes seven key competences:

1. **Competence in linguistic communication:** is the result of the communicative action within particular social practices, in which the individual interacts with other interlocutors orally and through texts in multiple modalities and formats.
2. **Competence in Mathematics, Science and Technology:** Consists of the ability to use and relate numbers, basic operations, symbols and forms of mathematical expression and reasoning. Involves the ability to apply mathematical thinking and mathematical tools to describe, interpret and predict different phenomena in context.
3. **Digital competence:** It involves creative, critical and safe use of information and communication technologies, in order to achieve the objectives related to work, employability, learning, use of free time, and inclusion and participation in society.
4. **Learn to learn competence:** is vital for lifelong learning taking place in different contexts, both formal and non-formal or informal ones. The development of this competence allows the students the ability to start, organise and persist in learning. It requires the ability to feel motivated to learn and the need to foster organisation and learning management.

5. **Social and civic competences:** involve the skills and abilities necessary to use their knowledge and attitudes towards society, from different points of view, in a dynamic, changing and complex conception, to interpret social problems in diverse contexts; to build responses, take decisions and solve conflicts. Also, to interact with other people and groups according to norms based on mutual respect and democratic convictions.
6. **Sense of initiative and entrepreneurship competence:** Ability to transform ideas into actions. That means becoming aware of the situation to be solved, know how to choose, plan and manage their knowledge, and the necessary skills or abilities and attitudes with self-criteria, to achieve the desired objective.
7. **Cultural Awareness and Expressions competence:** It involves knowing, understanding, appreciating and valuing the different cultural and artistic demonstrations, with a critical eye and with an open and respectful attitude, using them as a source of enrichment and personal enjoyment, and considering them as part of peoples' wealth and heritage.

4. Mathematical competence and basic competences in science and technology. (Scientific competence)

They are related to school knowledge that must allow students to understand society and the world in which it develops. It must allow students to interpret and appropriate knowledge about facts and processes, to predict consequences and to reflexively direct actions for the improvement and preservation of their living conditions, those of other people and those of other living beings. In short, to make responsible use of natural resources, care for the environment, make rational and responsible consumption and protect individual and collective health as key elements of people's quality of life.

It is an interdisciplinary competence insofar as it implies skills to develop adequately, with autonomy and personal initiative in very diverse areas of life and knowledge (health, productive activity, consumption, science, technological processes). It requires the application of basic concepts and principles that allow the analysis of phenomena from the different fields of knowledge involved. It is also implicit to be aware of the influence of the presence of people in space, of their settlement, of the modifications they introduce and the resulting landscapes, as well as the importance that all human beings benefit from development and that development must seek the conservation of resources and natural diversity and maintain global and intergenerational solidarity. It also incorporates identifying and posing relevant problems;

making direct and indirect observations; posing and contrasting solutions, attempts or hypotheses; identifying available knowledge, and communicating conclusions.

This competence also provides the skills required to demonstrate a critical spirit in the observation of reality and the analysis of informative and advertising messages, as well as responsible consumption habits in everyday life. It also involves the differentiation and valuation of scientific knowledge alongside other forms of knowledge and the use of values and ethical criteria associated with science and technological development.

As mentioned in the above paragraphs, the responsible use of natural resources, care for the environment, rational and responsible consumption and the protection and promotion of individual and collective health as key elements of the quality of life of individuals and societies are part of this key competence.

For the adequate development of competences in science and technology, it is necessary to address scientific knowledge or knowledge related to physics, chemistry, biology, geology, mathematics and technology derived from interconnected concepts, processes and situations. It also requires the development of skills to use and manipulate technological tools and machines, as well as to use scientific data and processes to achieve an objective, i.e. to identify questions, solve problems, reach a conclusion or make decisions based on evidence and arguments.

These competences also include attitudes and values related to the assumption of ethical criteria associated with science and technology, interest in science, support for scientific research and the appreciation of scientific knowledge. Also, these attitudes and values are related with a sense of responsibility about the conservation of natural resources and environmental issues and the adoption of an appropriate attitude to achieve a healthy physical and mental life in a natural and social environment.

Specifically, the Natural Sciences area contributes substantially to the basic competence in science and technology since its contents are focused on the interaction of human beings with the world around them. Competence is built through the appropriation of concepts and skills that allow interpreting the physical world nearby, as well as the approach to certain features of the method with which is built the scientific knowledge: knowing how to define problems, estimate possible solutions, develop strategies, design small research projects, analyse results and communicate them.

The Natural Sciences area, on the other hand, helps students to build a knowledge of reality that, starting from their own experiences, perceptions and representations, is progressively more

objective and shared, as well as providing them with the necessary tools to understand, explain and act in that reality. It also contributes significantly to education for sustainability, developing skills and competencies that promote the responsible use of natural resources, conservation of natural diversity, rational consumption, protection of individual and collective health, equitable distribution of wealth, and global and intergenerational solidarity.

The Natural Sciences area offers the possibility of using mathematical tools in significant contexts of use, such as map reading; comprehension and realisation of scales; reading, representation, interpretation and communication of graphs; use of measurement units, thus contributing to the development of mathematical competence.

5. References

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