

# STUDY GUIDE

## Didactics of the Natural Sciences

Degree in Primary Teacher Training  
Bilingual Programme  
C.U. Cardenal Cisneros  
Universidad de Alcalá

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Academic Year 2025-26  
3<sup>rd</sup> Year – 1<sup>st</sup> Term

## STUDY GUIDE

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|----------------|----------------------------------------------------------------------------------------|
| Subject:       | Didactics of the Natural Sciences                                                      |
| Code:          | 520011                                                                                 |
| Studies:       | Degree in Primary Teacher Training<br>Bilingual Programme                              |
| Department:    | Teaching specific sciences                                                             |
| Character:     | Compulsory formation                                                                   |
| ECTS:          | 6                                                                                      |
| Year and Term: | 3rd Year / 1st Term                                                                    |
| Lecturer:      | Jesús Aguado                                                                           |
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| Language:      | English                                                                                |

### 1. INTRODUCTION

Since bilingual education became popular in Spain, the learning of English as a Foreign Language has evolved dramatically from being a subject in the school curriculum to being considered as a real communication tool to create meaning in most content areas. This shift must be considered in the training of future Primary Education teachers.

The subject "Didactics of the Natural Sciences" provides a valuable set of knowledge, resources and skills to future teachers, especially oriented towards the area of knowledge of Science in Primary education.

When carrying out any academic work, it is important to consult the teaching staff about the permitted use of artificial intelligence (AI) tools. If it is not expressly stated in the guide or instructions of the specific activity or practice, it is understood that AI should not be used in any case. It is reminded that the improper use of these technologies, such as the generation of work without express authorisation, may contribute to academic fraud. Therefore, it is recommended to review the University's regulations regarding the use of AI, to always act responsibly and transparently in the learning process and to consult the teaching staff with any doubts in this regard.

#### Prerequisites and Recommendations

It is fundamental to be competent at the subjects: Science of Energy and Matter and Ciencias de la Tierra y de la Vida.

Students should have a B1 level of English. The subject will work on developing their competence in the English language (More information can be found here: [http://www.coe.int/T/DG4/Portfolio/?L=E&M=/main\\_pages/levels.html](http://www.coe.int/T/DG4/Portfolio/?L=E&M=/main_pages/levels.html))

## 2. COMPETENCES

### Generic Competences:

At the end of this study programme, students will be able to:

1. Adquirir y comprender los conocimientos necesarios de las distintas áreas de estudio que conforman el título de tal forma que capaciten para la profesión de Maestro en Educación Primaria. (Competencia Nº 4 de las competencias transversales del título de grado)
2. Ser capaces de recoger e interpretar datos relevantes de las distintas áreas de estudio de emitir juicios que incluyan una reflexión sobre temas relevantes de índole socioeducativa, científica y ética. (Competencia Nº 6 de las competencias transversales del título de grado)
3. Adquirir las habilidades de aprendizaje necesarias para ampliar sus estudios con autonomía. (Competencia Nº 8 de las competencias transversales del título de grado)
4. Conocer las áreas curriculares de la Educación primaria, la relación interdisciplinar entre ellas, los criterios de evaluación y el cuerpo de conocimientos didácticos en torno a los procedimientos de enseñanza y aprendizaje respectivos. Competencia propia nº 1 del título de grado
5. Mantener una relación crítica y autónoma respecto de los saberes científicos (Competencia Nº 8 de las competencias propias del título de grado).
6. Valorar la responsabilidad individual y colectiva en la consecución de un futuro sostenible (Competencia Nº 9 de las competencias propias del título de grado).
7. Reflexionar sobre las prácticas de aula para innovar y mejorar la labor docente. Adquirir hábitos y destrezas para el aprendizaje autónomo y cooperativo y promoverlo entre los estudiantes (Competencia Nº 10 de las competencias propias del título de grado).

### Specific Competences:

At the end of the process, students will be able to:

|                         |                                                                                                                                                                    |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Competencia nº 1</b> | Comprender los principios básicos y las leyes fundamentales de las ciencias experimentales (Biología, Geología, Física y Química).                                 |
| <b>Competencia nº 2</b> | Conocer el currículo escolar de las Ciencias de la Naturaleza                                                                                                      |
| <b>Competencia nº 3</b> | Reconocer la mutua influencia entre ciencia, sociedad y desarrollo tecnológico, así como las conductas ciudadanas pertinentes, para procurar un futuro sostenible. |
| <b>Competencia nº 4</b> | Plantear y resolver problemas asociados con las ciencias en la vida cotidiana                                                                                      |
| <b>Competencia nº 5</b> | Desarrollar y evaluar contenidos del currículo mediante recursos didácticos apropiados y promover la adquisición de competencias básicas en los estudiantes        |

### 3. CONTENTS

| Theoretical contents                                                                                                                                                                                                                                                                                                                                               | Practical contents                                                                                                                                                                                                          | credits                                                      |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|
| <p>Section 1: Science teaching at school:</p> <ul style="list-style-type: none"> <li>• A conceptual introduction to the Natural Sciences</li> <li>• think like a scientist</li> <li>• Scientific procedures</li> <li>• Scientific attitudes</li> </ul>                                                                                                             | <p>Reading and analysis of scientific articles</p> <p>class discussions</p> <p>Design of school scientific investigations.</p>                                                                                              | <ul style="list-style-type: none"> <li>• 1,5 ECTS</li> </ul> |
| <p>Section 2: Proposals for the teaching of Sciences:</p> <ul style="list-style-type: none"> <li>• Difficulties in teaching science</li> <li>• Proposals for teaching science in primary education: experimentation in the primary classroom</li> <li>• Design of didactic proposals</li> <li>• Analysis of the science curriculum in Primary Education</li> </ul> | <p>Design of an educational proposal and implementation in a school</p> <p>Design and implementation of a PBL proposal</p> <p>Reading and analysis of scientific articles</p>                                               | <ul style="list-style-type: none"> <li>• 1,5 ECTS</li> </ul> |
| <p>Natural resources for natural sciences:</p> <ul style="list-style-type: none"> <li>• The importance of observation in the science teaching process</li> <li>• awakening ecological awareness in children</li> </ul>                                                                                                                                             | <p>activity on observation and measurement of the natural environment</p> <p>Reading and analysis of scientific articles</p> <p>Analysis and implementation of educational proposals of scientific museums</p>              | <ul style="list-style-type: none"> <li>• 1,5 ECTS</li> </ul> |
| <p>Materials and resources for Natural Sciences:</p> <ul style="list-style-type: none"> <li>• Analysis and implementation of different resources</li> </ul>                                                                                                                                                                                                        | <p>Reading and analysis of scientific articles</p> <p>Analysis and implementation of crosscurricular proposals</p> <p>Analysis of different materials such as: short videos, collections of natural objects, text books</p> | <ul style="list-style-type: none"> <li>• 1.5 ECTS</li> </ul> |

## 4. TEACHING -- LEARNING METHODOLOGY. FORMATIVE ACTIVITIES

The teaching-learning methodology will be active and dynamic, having as its main aim to create a communicative atmosphere and to involve students actively in high-order thinking processes. Thus, students will be improving their competence in the English language as well as reflecting on this progress, enabling them to transfer their learning experience to their teaching practice.

| P/A                   | Modality                        | Scenario                                                                                                          | Description                                                                            |
|-----------------------|---------------------------------|-------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
| FACE TO FACE SCHEDULE | Conceptual contents             | Classroom                        | Explanation and exposition of the theoretical contents by the teacher.                 |
|                       | Practical contents              | Science Lab and usual classroom  | Development of practical activities in the Science Lab and in the classroom.           |
|                       | Topics of work for the seminars | Classroom                       | Proposal and follow-up of the activities and assignment entrusted.                     |
| TUTORIALS             | Tutorial                        | Office                         | Orientation and individual counselling.                                                |
| TRABAJO AUTÓNOMO      | Work in group                   |                                | Development of the practical activities in groups.                                     |
|                       | Individual work                 |                                | Studying, preparing the exam, searching resources, developing and studying activities. |

In this subject, some classes will be conducted as interdisciplinary learning experiences in collaboration with other subjects from the semester study programme

The subject is associated with the Development of Academic Skills in CUCC Degree Degrees program, specifically with **oral presentations**, so, it includes activities that will be evaluated therein and that are explained later

### 4.1. Credits distribution

Total number of hours (6 ECTS): 150

|                                              |                                                                                                                                                 |
|----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| Number of hours of classroom attendance: 50  | <b>30</b> hours of whole-group lessons<br><b>15</b> hours of practical lessons<br><b>3</b> hours of seminars<br><b>2</b> hours assessment tasks |
| Number of hours of independent learning: 100 | <b>100</b> hours                                                                                                                                |

## 4.2. teaching-learning process, materials and didactic resources

The teaching-learning process of this subject follows the European Credit Transfer and Accumulation System (ECTS), which measures not only lesson attendance but also the hours devoted to the subject by the learner. The total amount of time that the learner has to devote to this formative programme to achieve its aims is 150 hours, of which only 48 are referred to as lesson attendance, receiving input from the lecturer. These 48 hours are divided into three distinctive classroom organizations:

- **Theoretical classes** (30 hours): lectures, summaries and outlines of basic contents from each module, discussion and analysis activities, and activities aimed at deepening and reinforcing theory.
- **2. Practical classes** (15 hours): case study, problem solving, research projects, use of Information and Communication Technologies (ICT), group work, formative outings, participation in socio-educative activities, etc.
- **3. Seminars** (3 hours): co-operative learning activities, debates, oral defence of written assignments, group and personal tutor sessions.

The remaining 102 hours are attached to the learning process of the subject, including autonomous work, self-study and group study.

Apart from the above detailed **50** hours of lesson attendance, the student must also complete **100** hours of independent work at home, which will include finishing activities from class, preparing presentations, reading articles, doing some research, organising information, and revising the subject contents. They could also attend tutorial hours to have their doubts and questions answered by the teacher.

Some of the learning sessions will be carried out in an interdisciplinary way with other subjects that belong to the study plan in the same four-month period.

This subject is linked to the “Plan de Destrezas Académicas” in which the academic research projects will be developed.

### Materials and resources

Students will handle a variety of materials, which sometimes will be explained and quoted in the lecture notes, or will be worked by using primary sources. Notes and activities will be available at our Virtual Community <http://campus.cardenalcisneros.es> We will also handle internet resources to have access to videos related to different topics. If possible, contact with experts will be also encouraged.

## 5. ASSESSMENT: Assessment criteria, Calification criteria and Assessment system

### Assessment criteria:

1. Understand the fundamental concepts that support teaching and learning of Science in primary education
2. Observation and analysis of data and natural samples with rigor and effectiveness
3. Develop methodological proposals for Science teaching in primary education
4. Analyse educational materials and methods for the teaching and learning process in Science at primary education.
5. Show interest in the learning process and be participative during the class sessions

As an added criterion and following the **Common European Framework of Reference for Languages: Learning, Teaching, Assessment** nomenclature, the CUCC has set the entrance level to the **Bilingual Programme** at B1. It is necessary to remind learners in the Bilingual Programme that they are supposed to show their progress in their command of the English language through the course. This implies that both written and oral assignments are expected to show an adequate progression in the command of the English language. This includes correct use of oral and written English (spelling, syntax, pronunciation, register, etc.), as this language will be the communicative tool in the classroom and learners will be expected to have a high linguistic and communicative competence in English in their future professional careers as Primary teachers.

### Calification criteria:

| Competences                                                                                                                                                  | Assessment criteria                                                                                                                                                                                                                                                                                                                                        |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Understand the basic principles and fundamental laws of CC. experimental                                                                                     | <ol style="list-style-type: none"> <li>1. Understand the fundamental concepts that support teaching and learning of Science in primary education</li> <li>5. Show interest in the learning process and be participative during the class sessions</li> </ol>                                                                                               |
| Know the school curriculum of Natural Sciences.                                                                                                              | <ol style="list-style-type: none"> <li>1. Understand the fundamental concepts that support teaching and learning of Science in primary education</li> <li>3. Develop methodological proposals for Science teaching in primary education</li> </ol>                                                                                                         |
| Propose and solve problems associated with science in everyday life                                                                                          | <ol style="list-style-type: none"> <li>2. Observation and analysis of data and natural samples with rigor and effectiveness</li> <li>5. Show interest in the learning process and be participative during the class sessions</li> </ol>                                                                                                                    |
| Recognize the mutual influence between science, society and technological development, as well as relevant citizen behaviors, to pursue a sustainable future | <ol style="list-style-type: none"> <li>1. Understand the fundamental concepts that support teaching and learning of Science in primary education</li> <li>5. Show interest in the learning process and be participative during the class sessions</li> </ol>                                                                                               |
| Develop and evaluate curriculum content through appropriate teaching resources and promote the acquisition of basic skills in students.                      | <ol style="list-style-type: none"> <li>2. Observation and analysis of data and natural samples with rigor and effectiveness</li> <li>3. Develop methodological proposals for Science teaching in primary education</li> <li>5. Analyse educational materials and methods for the teaching and learning process in Science at primary education.</li> </ol> |

## Resultados de aprendizaje

Los resultados de aprendizaje recogidos en la memoria de verificación del título de Maestro de Educación Primaria correspondientes a esta asignatura son:

| Learning outcomes: Didactics of the Natural Sciences                                                                                       | Code          |
|--------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| To state and apply the basic principles and concepts of the experimental sciences in everyday and teaching contexts.                       | <b>RACE 1</b> |
| To develop methodological proposals and educational materials for the teaching and learning of experimental sciences in primary education. | <b>RACE 2</b> |
| To identify the connections between natural sciences, society, technology, and the environment, and their impact on daily life.            | <b>RACE 4</b> |

## Assessment procedure

In order to pass the subject, students must demonstrate through certain assessment criteria, that they have achieved all of the competences set out in this study guide. Students are required to complete all of the assessed work presented in this study guide and to have, at least, a mark of 5 in every assessment work. This includes continuous and final assessment, both in the ordinary and extraordinary examination periods.

**Attendance to seminars and group presentations is a compulsory and essential part of the continuous evaluation. If a student fails to attend two of these sessions without presenting an absence note, he/she must sit the final evaluation exam.**

**Complete or partial coping of any activity or project is forbidden and it implies to fail the subject. This includes continuous and final assessment, both in the ordinary and extraordinary examination periods**

The assessment system is based on the “Normativa reguladora de los procesos de evaluación de los aprendizajes” of the University of Alcalá. Available for download from this Link:

<https://www.uah.es/export/sites/uah/es/conoce-la-uah/organizacion-y-gobierno/.galleries/Galeria-Secretaria-General/Normativa-Evaluacion-Aprendizajes.pdf>

These regulations establish the following:

1. This subject has one ordinary examination in January and another extraordinary examination in June.
2. The ordinary examination follows the criteria set in the continuous assessment system.
3. If any student cannot follow the continuous assessment proposed for the ordinary examination in February/May, he/she should ask for a final assessment exam to the course coordinator. This proposal has to be asked in the first two weeks of the term and will be approved or rejected by the University College headmaster.
4. The extraordinary examination is set for the students who were unable to pass the ordinary examination.
5. The description of both the continuous and the final assessment are detailed in this study guide.

For further explanations about assessment regulations in the University of Alcalá, please visit the following website:

In order to pass the subject, students must demonstrate through certain assessment criteria that they have achieved all of the competences set out in this study guide. Students are required to complete all of the assessed work presented in this study guide. This includes continuous and final assessment, both in the ordinary and extraordinary examination periods

| Assessment criteria                                                                                             | Criteria description                                                                                                               | %  |
|-----------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|----|
| Understand the fundamental concepts that support teaching and learning of Science in primary education          | The students are able to express and to define the basic concepts accurately.                                                      | 35 |
| Observation of the natural samples and data analysis with exactitude and efficiency                             | The students are able to collect natural samples and analyse relevant data                                                         | 25 |
| Develop methodological proposals for Science teaching in primary education                                      | The students develop materials and proposals for their didactic use                                                                | 20 |
| Analyse educational materials and methods for the teaching and learning process in Science at primary education | The students analyse in detail didactics materials and proposals related to science concepts                                       | 10 |
| Show interest to the learning process and be participative during the class sessions                            | The students do activities, they answer questions and help their partners to solve some didactic problems during the class session | 10 |

### Continuous evaluation system

| Report criteria                                                                                                 | Research work / projects in groups | Practical activities in the classroom | Content examination | %          |
|-----------------------------------------------------------------------------------------------------------------|------------------------------------|---------------------------------------|---------------------|------------|
| Understand the fundamental concepts that support teaching and learning of Science in primary education          | X                                  | X                                     | X                   | 35         |
| Observation of the natural samples and data analysis with exactitude and efficiency                             | x                                  | x                                     |                     | 25         |
| Develop methodological proposals for Science teaching in primary education                                      | X                                  | X                                     | X                   | 20         |
| Analyze educational materials and methods for the teaching and learning process in Science in primary education | X                                  |                                       |                     | 10         |
| Show interest in the learning process and to be participative during the class sessions                         | X                                  | X                                     |                     | 10         |
| <b>TOTAL</b>                                                                                                    | <b>40</b>                          | <b>40</b>                             | <b>20</b>           | <b>100</b> |

### Final evaluation system

| Report criteria                                                                                                         | Research work / projects individually | Content examination | %  |
|-------------------------------------------------------------------------------------------------------------------------|---------------------------------------|---------------------|----|
| Understand the fundamental concepts that support teaching and learning of Science in primary education                  | X                                     | X                   | 35 |
| Identify the linkages between Natural Sciences, society, technology and the environment and its impact on everyday life | X                                     |                     | 15 |
| Observation of the natural samples and data analysis with exactitude and efficiency                                     | X                                     | X                   | 10 |
| Develop methodological proposals for Science teaching in primary education                                              | X                                     | X                   | 20 |

|                                                                                                                 |           |           |            |
|-----------------------------------------------------------------------------------------------------------------|-----------|-----------|------------|
| Analyze educational materials and methods for the teaching and learning process in Science in primary education | X         |           | 10         |
| Show interest in the learning process and be participative during the class sessions                            | X         |           | 10         |
| <b>TOTAL</b>                                                                                                    | <b>80</b> | <b>10</b> | <b>100</b> |

During all assessment tasks, the guidelines established in the University of Alcalá Coexistence Regulations must be followed, as well as the possible implications of irregularities committed during those tasks, including the consequences for committing academic fraud, according to the Disciplinary Regulations for Students of the University of Alcalá.

The teaching-learning methodology and the evaluation process will be adjusted when necessary, with the guidance of the CUCC Guidance Service and/or the Unit for Attention to Diversity of the UAH to apply curricular adaptations to students with specific needs, upon submission of documentation certifying such need.

## 6. BIBLIOGRAPHY

The following references will constitute the basic bibliography for the course. **More specific textbooks or journal articles will be provided throughout the term for each of the units of the syllabus.**

(Carbonell Sebarroja, 2015; de Cock & Pereira, n.d.; Pastor & Santiesteban, 2020; PPDQ, 1969)

### Basic bibliography

- Bruchner. P. (2017). Bosquescuola. Guía para la educación infantil al aire libre. Rodeno.
- Carbonell Sebarroja, J. (2015). Pedagogías del siglo XXI. Alternativas para la innovación educativa. Educatio Siglo XXI, 33.
- Chalmers, A. F. (1999). What is this thing called science? 3e edition. In Hackett Publishing Compagny (Vol. 73, Issue 3). <https://doi.org/10.1097/00132586-196404000-00001>
- Collado Salas, S., & Corraliza, J. A. (2016). Conciencia ecológica y bienestar en la infancia: Efectos de la relación con la Naturaleza. Pedagogía Social. Revista Interuniversitaria, 28.
- De Cock, L., & Pereira, I. (n.d.). Las pedagogías críticas. Editorial Popular.
- Heike Freire. (2011). Educar en verde (1st ed.). GRAO.
- Jiménez Aleixandre, M. P., Caamaño, A., Oñorbe, A., Pedrinaci, E., & De Pro, A. (2003). Enseñar Ciencias.
- L'Ecuyer, C. (2012). Educar en el asombro. Mendeive, 18(4).
- Martí, J. (2012). aprender ciencias en la educación primaria (grao, Ed.; primera).
- Pastor, M. M., & Santiesteban, A. (2020). Didácticas epecíficas aplicada a través del patrimonio local (1st ed., Vol. 1). Ediciones Paraninfo, S.A.
- Pedrinaci, E., Caamaño, A., Cañal, P., & de Pro, A. (2016). El desarrollo de la competencia científica: 11 ideas clave. Revista de Investigación, 40(87).
- PPDQ, E. P. (2001). El legado pedagógico del siglo XX para la escuela del siglo XXI. In P.P.D.Q. Boletín (Issue 49). <https://doi.org/10.17227/ppdq.2012.num49.1413>
- Wilson, R. A. (1993). Fostering a sense of wonder during the early childhood years.