

**Teaching Experimental Sciences**

Code: 102089  
ECTS Credits: 5

Degree	Type	Year	Semester
2500798 Primary Education	OB	3	1

**Contact**

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**Use of Languages**

Principal working language: catalan (cat)  
Some groups entirely in English: Yes  
Some groups entirely in Catalan: Yes  
Some groups entirely in Spanish: No

**Teachers**

Conxita Marquez Bargallo  
Carme Grimalt Alvaro  
Victor Lopez Simo

**Prerequisites**

It is advisable to have passed the module "Teaching and Learning about the Natural, Social and Cultural Environment in Primary Education".

**Objectives and Contextualisation**

This module forms part of the Programme of Primary Teacher Education and is intended to deepen the content knowledge and competencies necessary to teach the module "Environmental Knowledge" in primary schools.

This module puts an emphasis on the scientific ideas that should be discussed with primary school students (what we call "content knowledge of school science"). This module also looks at pedagogical approaches that promote an understanding of science as an activity that integrates inquiry, modelling and communication.

The objectives of the module are:

- 1) To identify and discuss basic content knowledge of school science - key ideas - that are studied in primary education.
- 2) To embed pedagogical approaches that promote an understanding of school science as an activity that integrates inquiry, modelling and communication (doing, thinking and talking).
- 3) To become familiar with, design and evaluate teaching activities that promote students' development of scientific competencies in primary school.

**Competences**

- Design and regulate learning spaces in contexts of diversity that take into account gender equality, equity and respect for human rights and observe the values of public education.
- Design, plan and evaluate education and learning processes, both individually and in collaboration with other teachers and professionals at the centre.
- Develop the functions of tutoring and guidance of pupils and their families, attending to the pupils' own needs. Understand that a teacher's functions must be perfected and adapted in a lifelong manner to scientific, pedagogical and social changes.
- Foster reading and critical analysis of the texts in different scientific fields and cultural contents in the school curriculum.
- Know and apply information and communication technologies to classrooms.
- Know the curricular areas of Primary Education, the interdisciplinary relation between them, the evaluation criteria and the body of didactic knowledge regarding the respective procedures of education and learning.
- Know the school curriculum for these sciences.
- Maintain a respectful attitude to the natural, social and cultural environment to foster values, behaviours and practices that attend to gender equality, equity and respect for human rights.
- Make changes to methods and processes in the area of knowledge in order to provide innovative responses to society's needs and demands.
- Raising and solving problems related to everyday life.
- Reflect on classroom experiences in order to innovate and improve teaching work. Acquire skills and habits for autonomous and cooperative learning and promote it among pupils.
- Understanding the basic principles and fundamental laws of the experimental sciences (physics, chemistry, biology and geology).
- Value science as a cultural event.
- Work in teams and with teams (in the same field or interdisciplinary).

## Learning Outcomes

1. Apply knowledge of science education to critically analyse the curriculum and establish interdisciplinary relations with other curricular areas.
2. Being able to apply scientific knowledge in order to understand and act on the phenomena in everyday life.
3. Being able to evaluate teaching units as a way of guiding the processes for improving the quality of teaching.
4. Being able to use basic models of the experimental sciences in order to interpret and act on the phenomena in everyday life.
5. Being able to use the diversity of cognitive-linguistic skills to reflect on the processes of teaching/learning in the sciences.
6. Being capable of developing innovative didactic units for teaching and learning the scientific content in the area of Environmental Studies that incorporate attention to diversity and the interdisciplinary focus of the curriculum.
7. Demonstrate a critical ability to use a range of cognitive linguistic skills to reflect on processes in the teaching and learning of science.
8. Demonstrate an understanding of science as part of cultural heritage.
9. Demonstrate that attitudes regarding human rights as knowledge and tools for coexistence, as well as gender equality, are identified, practiced and defended.
10. Demonstrate that attitudes regarding sustainability of the natural environment are identified, practiced and defended.
11. Demonstrate the ability to incorporate the above values in the school curriculum.
12. Demonstrate the ability to work in teams when designing a curriculum.
13. Identifying the purposes, content and structure of the experimental sciences in the environmental studies curriculum in primary education.
14. Meaningfully apply ICT resources to educational proposals.
15. Propose new methods or well-founded alternative solutions.

## Content

1. Learning and teaching about the Earth and its changes in primary school. What are the key ideas?

What does the official curriculum include? What are the most common students' previous ideas? How to make them evolve?

2. Learning and teaching about materials and their changes in primary school. What are the key ideas?

What does the official curriculum include? What are the most common students' previous ideas? How to make them evolve?

3. Learning and teaching about physical systems in primary school. What are the key ideas? What does the official curriculum include? What are the most common students' previous ideas? How to make them evolve?

4. Learning and teaching about the living beings in primary school. What are the key ideas? What does the official curriculum include? What are the most common students' previous ideas? How to make them evolve?

5. Transversal issues: Attitudes towards science, gender and science, field trips, interdisciplinarity

## Methodology

Whole group sessions:

Teacher presentations about basic content knowledge. These sessions are offered to the whole group and allow for discussion of the main contents promoting students' active participation. These sessions include activities that can be performed individually, in pairs or in small groups of students, and then, the results of their reflections and discussions are shared with the rest of the group.

Seminars:

Work spaces in small groups (1/2 out of the whole group) supervised by the teacher. These sessions are aimed at embedding the contents studied in whole group sessions. Seminars are held at Lab. Lab coat required. Attendance is mandatory

Tutorials

Tutorials to address queries and questions about the topics studied during the course in order to prepare for the written exam or the assignments to be submitted. Exam review.

Students' work:

Students' elaboration of papers, seminar reports, and tasks related to the whole group sessions. Students' search for information and materials, study and preparation for exams, readings.

Transnatura Project.

Transnatura is the title of the multidisciplinary project designed by the teaching teams of four of the subjects in 3rd year of the Degree in Primary Education. It consists of a two days trip and a night out in nature aimed at providing an intense and formative experience in the natural environment which, besides working specific objectives of each of the disciplines, it also facilitates the approach of transversal aspects such as sustainability, healthy living, coexistence and the relationship between school and nature, among others. Subjects involved: Didactics of Experimental Sciences, Learning and Development II, Visual Music Education and learning, Physical Education and its DidacticsI.

The departure will be held on 13 and 14 October for groups 21 and 31, and on 20 and 27 October for groups 41 and 71, so it's an overnight stay. Attendance is mandatory. In case someone is unable to attend it, he/she will have to prove the reason for missing it and perform a compensatory work previously agreed with the teaching team. The activities carried out during the trip will be part of the continuous evaluation of the different subjects. At the beginning of the course each teacher will specify the learning evidences and the corresponding evaluation criteria.

The 1st class starts at 8 or at 16h (whole group class). Details chronogram is published in Campus Virtual.

Annotation: Within the schedule set by the centre or degree programme, 15 minutes of one class will be reserved for students to evaluate their lecturers and their courses or modules through questionnaires.

## Activities

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
Seminars	15.5	0.62	
Whole group sessions	22.5	0.9	
Type: Supervised			
Tutorials	25	1	
Type: Autonomous			
Students' work	62	2.48	

## Assessment

The evaluation of the Science Education course consists of 3 evaluative activities:

1. Individual exam: final evaluation test where to develop different issues related to both conceptual and pedagogical aspects worked throughout the course. The exam corresponds to the 50% of the final grade. It is necessary to have a minimum grade of 5 to be able to calculate the average of the course.
2. Activities of scientific competence: individual activity that must be delivered on paper at the beginning of the lectures. In these activities we will ask you to answer questions related to the scientific contents of each block, in order to be able to evaluate how you have understood the different block and what doubts you have. 25% of the final grade. Not recoverable.
3. Didactic reflection activities. Group activity where you will put into practice what you learned both conceptually and didactically. 25% of the final grade. Not recoverable. In order to be able to deliver these activities it is necessary to have done a compulsory tutoring with your working group.
4. Finally, throughout the course, some activities that are compulsory will be requested, despite not having an specific associated grade.

In case of not passing the exam or in case the overall average is under 5, it is necessary to take the recovery exam. If the recovery exam is passed, the overall grade of the subject will be a 5.

As a guideline, and according to the number of credits of the course, you should invest 62h of personal work to the course, according to the following proposal:

Final exam		10h
Scientific competence activities*	Geology block	6h
	Chemical block	6h

	Biology block	6h
	Physical block	6h
Didactic reflection activities*	Chemistry block	14h
	Biology block	14h

## DATES FOR EVALUATIVE ACTIVITIES

### GROUP 21 AND 41

Final exam		22/12/22
Scientific competence activities*	Geology block	29/09/22
	Chemical block	27/10/22
	Biology block	17/11/22
	Physical block	15/12/22
Didactic reflection activities*	Chemistry scape	3/11/22
	Biology block	24/11/22

Retaking examen: 6/2/23 12h

### GROUP 31 AND 71

Final exam		19/12/22
Scientific competence activities*	Geology block	3/10/22
	Chemical block	24/10/22

	Biology block	21/11/22
	Physical block	12/12/22
Didactic reflection activities*	Chemistry scape	31/10/22
	Biology block	28/11/22

Retaking examen: 6/2/23 12h

\* These dates may vary if due to unplanned circumstances the timeline must be modified.

All the assessment tasks carried out throughout the course must be submitted before the deadline established in the subject program by the professor.

The grades on each paper and the exam will be available 1 month after their submission at most.

The attendance to the outdoor visit is compulsory. Students must attend a minimum of 80% of seminars.

In case of failing the final exam or average final grade, the final mark will be 4.5 (if the average grade is equal or higher than this grade) or the average grade itself (if it is lower than inferior 4.5).

To pass this subject, students must show a good general communicative competence, both oral and writing, and should master the working languages included in the teaching guide. Therefore, in all (individual and group) tasks, linguistic accuracy, appropriate writing and presentation formal aspects will be taken into consideration.

Students should be able to express themselves fluently and accurately and show a high degree of understanding of academic texts. Any task can be handed back (without any assessment) or failed if the professor considers that it does not fulfil these requirements.

Take into consideration that, in the case of the Catalan language, in 1st and 2nd grade students are required to have a linguistic competence equivalent to Level 1 for Pre-school and Primary Education Teachers; and from 3<sup>rd</sup> grade on students must have proved a linguistic competence equivalent to Level 2 for Pre-school and Primary Education Teachers (more information on these levels at

<https://www.uab.cat/web/estudiar/graus/graus/competencia-linguistica-1345737529755.html>

In accordance with UAB regulations, plagiarism or copy of any individual or group paper will be punished with a grade of 0 on that paper, losing any possibility of remedial task. During the elaboration of a paper or the individual exam in class, if the professor considers that a student is trying to copy or s/he discovers any kind of non-authorised document or device, the students will get a grade of 0, without any chance to take a make-up exam.

For further general details, the so-called General assessment criteria and guidelines of the School of Educational Sciences.

## Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Cientific competence activities	25%	0	0	14, 8, 10, 13, 15, 2, 6, 4, 5

Didactic reflection activities	25%	0	0	14, 1, 7, 11, 12, 8, 10, 9, 13, 15, 2, 3, 4, 5
Written exam about content knowledge	50%	0	0	1, 7, 11, 8, 13, 15, 2, 3, 4, 5

## Bibliography

### Relevant bibliography

Furman, M. (2016) Educar mentes curiosas: la formación del pensamiento científico y tecnológico en la infancia. Es pot descarregar des de <https://expedicionciencia.org.ar/wp-content/uploads/2016/08/Educacion-Mentes-Curiosas-Melina-Furman.pdf> \*

National Research Council (2012) A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas. Es pot descarregar gratuïtament des de [nap.edu/13165](http://nap.edu/13165)

Skamp, K. (2014). *Teaching primary science constructively*. 5<sup>th</sup> Edition. Cengage Learning.\*

### Basic Bibliography

Arcà, M. (1990). *Enseñar Ciencias. ¿Cómo empezar? Reflexiones para una educación científica de base*. Barcelona: Paidós.\*

Driver, R. I alt (1989) *Ideas científicas de la infancia y la adolescencia*. Madrid. Morata.\*

Giordan, A. (1988). *Los orígenes del saber: de las concepciones personales a los conceptos científicos*. Sevilla: Díada Editores.

Giordan, A. (2001). *El meu cos, la primera maravella del món*. Barcelona: la Campana

Izquierdo, M.; Aliberas, J. (2004) *Pensar, actuar i parlar a la classe de ciències*. Bellaterra: Servei de Publicacions UAB

Izquierdo, M (ccord) (2011). *Química a Infantil i Primària*. Ed Graó\*

Jorba, J.; Sanmartí, N. (1994) *Enseñar, aprender y evaluar: un proceso de regulación continua*. Madrid: Centro de Investigación y Documentación Educativa

Márquez, C, Prat, A (coord.) (2010). *Competencia científica i lectora a Secundària. L'ús de textos a les classes de ciències*. Barcelona: Dossiers Rosa Sensat, 70\*

Martí, J. (2012). *Aprender ciències a l'educació primària*. Barcelona: Graó

NGSS Lead States (2013). Next Generation Science Standards: For states, by states. Washington, DC: The National Academy Press.

Pujol, R.M. (2001). Les ciències, més que mai, poden ser una eina per formar ciutadans i ciutadanes. *Perspectiva escolar*, 257, 2-8.\*

Ramiro, E. (2010). *La Maleta de la ciència: 60 experiments d'aire i aigua i centenars de recursos per a tothom*. Barcelona: Graó.

Pujol, R.M. (2003). *Didáctica de les Ciències en la educació primària*. Madrid: Síntesis\*

Sanmartí, N. (2007). *10 ideas clave. Evaluar para aprender*. Barcelona: Graó\*

Skamp, K. (2012). *Teaching primary science constructively*. 4<sup>th</sup> Edition. Cengage Learning.\*

### Official documents

Al web següent i trobareu el currículum vigent així com d'altres documents d'orientació curricular

<https://xtec.gencat.cat/ca/curriculum/primaria/>

Innovation and research journals (open acces or UAB acces)

Alambique. <http://alambique.grao.com>

Enseñanza de las ciencias. Revista de Investigación y Experiencias Didácticas. <https://ensciencias.uab.es/> (en obert)

Ciències: Revista del Professorat de Ciències d'Infantil, Primària i Secundària. <https://revistes.uab.cat/ciencies> (en obert)

Aula de Innovación Educativa

Perspectiva Escolar

Infancia y Aprendizaje

Webs of interest

CDEC (Centre de Documentació i Experimentació en Ciències) <https://serveiseducatiu.xtec.cat/cesire/>

Projecte Primary Science (1995). Nuffield Foundation.  
<http://www.nationalstemcentre.org.uk/elibrary/collection/448/nuffield-primary-science>

Projecte Seeds of Science, Roots of Reading. University of California Berkeley  
<http://www.scienceandliteracy.org/>

Aplicatiu de Recobriment Curricular (materials didàctics del CDEC) <http://apliense.xtec.cat/arc/cercador>

Guies Habitat per a l'educació ambiental  
<https://www.sostenible.cat/article/guia-habitat-activitats-per-a-leducacio-ambiental>

Grup Kimeia, [grupkimeia.blogspot.com.es](http://grupkimeia.blogspot.com.es)

Other

Harlen, W. (2010). Principios y grandes ideas de la educación en Ciencias.  
[http://www.gpdmatematica.org.ar/publicaciones/Grandes\\_Ideas\\_de\\_la\\_Ciencia\\_Espanol.pdf](http://www.gpdmatematica.org.ar/publicaciones/Grandes_Ideas_de_la_Ciencia_Espanol.pdf)\*

Mapes conceptuais de continguts en progressió d'aprenentatge (del Science Continuum P10, Victoria, Australia)

<https://www.education.vic.gov.au/school/teachers/teachingresources/discipline/science/continuum/pages/concep>

Couso, D., Jimenez-Liso, M.R., Refojo, C. & Sacristán, J.A. (Coords) (2020) *Enseñando Ciencia con Ciencia*. FECYT & Fundacion Lilly. Madrid: Penguin Random House. Document en línia:  
<https://www.fundacionlilly.com/es/actividades/citas-con-la-ciencia/inde>

& Sacristán, J.A. (Coords) (2020) *Enseñando Ciencia con Ciencia*. FECYT & Fundacion Lilly. Madrid: Penguin Random House. Document en línia:  
<https://www.fundacionlilly.com/es/actividades/citas-con-la-ciencia/index.aspx>\*

\* llibres escrits per dones

## Software

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