

Teaching Experimental Sciences

Code: 102089
ECTS Credits: 5

Degree	Type	Year	Semester
2500798 Primary Education	OB	3	1

The proposed teaching and assessment methodology that appear in the guide may be subject to changes as a result of the restrictions to face-to-face class attendance imposed by the health authorities.

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 Márquez Bargalló
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 teachers 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

Our teaching approach and assessment procedures may be altered if public health authorities impose new restrictions on public gatherings for COVID-19

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. Virtual methodology.

Seminars:

Work spaces in small groups (1/3 out of the whole group) supervised by the teacher. These sessions are aimed at embedding the contents studied in whole group sessions. These sessions also include a compulsory field trip.

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 Didactics I.

The departure will be held on 19 and 20 October for groups 21 and 31, and on 26 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. An alternative activity will be considered depending on COVID-19 situation.

Details regarding timetables, price, itinerary and luggage will be provided at least 10 days before the departure.
COVID 19 EXCEPCIONAL SITUATION

Due to the pandemic situation, at the beginning of September the lists of seminars A and B will be published on the Campus Virtual (in alphabetical order). Only changes that are exchanged between students will be accepted and must be maintained throughout the course. The changes must be communicated to the teaching staff responsible before the course starts:

Grup 21- Anna Marbà Tallada

Grup 31 & 41- Carolina Pipitone Vela

Group 71 - Víctor López Simón

Before the course start, a vote will be proposed to decide whether the seminars will be rotating or not (that is, if the A will always at 16 or not).

The 1st class schedules are:

Group 31: Monday, September 14, 8h Seminar A and 10.45 Seminar B in the laboratories. Lab coat required

Group 71: Monday, September 14 at 16h Seminar A and 18.45 Seminar B in the laboratories. Lab coat required

Group 21: Thursday, September 17, 8h Seminar A and 10.45 Seminar B in the laboratories. Lab coat required

Group 41: Thursday, September 17 at 4:00 p.m. Seminar A and 6:45 p.m. Seminar B in the laboratories. Lab coat required

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

To calculate the average mark of this subject, three grades will be considered:

- average grade of individual tasks (compulsory delivery)
- average grade of group tasks (compulsory delivery)
- exam grade (minimum of 5).

To be allowed to sit the exam, students who have failed some of the (individual or group) tasks must ask for a tutorial to discuss them.

In case of failing the exam, it will be possible to sit a make-up exam on the date and time established by the professor. To be allowed to sit the make-up exam, students must have sat the first exam and must have submitted all the requested tasks (individual and group) and have attended the tutorial to discuss the tasks that have been failed. In case of passing this second exam, the maximum total grade of this subject is 5.

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. Otherwise, the grade will be considered as "not taken".

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 3rd 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 <http://www.uab.cat/web/els-estudis/-competencia-linguistica-1345698914384.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.

EVALUATION DATES

Exam

Group 21 & 41 - December the 16th (10 AM & 4 PM respectively).

Group 31 & 71 - December the 20th (10 AM & 4 PM respectively).

Re-takin exam: February 3th 12h all groups

Assessment task

Individual task related to chemical content.

Individual task related to biology content.

Group task related to geological content and transnatura trip (Núria).

All these activities must be delivered one week after the ending of the block content.

You can't retake these tasks.

Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Group reports, design or evaluation of teaching activities and other tasks	25%	0	0	14, 13, 15, 6, 4, 5
Individual tasks related to the whole group sessions, seminars and field trips.	25%	0	0	14, 1, 7, 11, 12, 8, 10, 9, 13, 15, 2, 3, 6, 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/Educar-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

Skamp, K. (2014). *Teaching primary science constructively*. 5th Edition. Cengage Learning.*

Basic Bibliography

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Domènech, J. (2019) [Aprentatge Basat en Projectes, Treballs pràctics i Controvèrsies. 28 experiències i reflexions per a ensenyar Ciències](#). Rosa Sensat: Barcelona.

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). *Aprendre 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.

Ruiz Martin, H. (2020). *¿Cómo aprendemos?* Barcelona: Graó

Pujol, R.M. (2003). *Didáctica de las Ciencias en la educación primaria*. Madrid: Síntesis*

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

Skamp, K. (2012). *Teaching primary science constructively*. 4th Edition. Cengage Learning.*

Documents oficials

Currículum de l'àrea del medi natural, social i cultural. DECRET 119/2015, de 23 de juny, d'ordenació dels ensenyaments de l'educació primària. <http://portal.dogc.gencat.cat/utillsEADOP/PDF/6900/1431926.pdf>

Annex I. Competències bàsiques. Currículum educació primària - Decret 142/2007 DOGC núm. 4915
<http://www.xtec.cat/alfresco/d/d/workspace/SpacesStore/c54ef8e6-58a5-4e21-9987-35144cbb88b9/competencie>

Revistes d'Innovació i Recerca en Ensenyament i Aprenentatge de les Ciències

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

Enseñanza de las ciencias. Revista de Investigación y Experiencias Didácticas.
<http://www.raco.cat/index.php/ensenanza>

Ciències: Revista del Professorat de Ciències d'Infantil, Primària i Secundària.
http://crecim.uab.cat/revista_ciencies/

Revistes d'Innovació i Recerca en Ensenyament i Aprenentatge en general (inclouen ciències)

Aula de Innovación Educativa <http://aula.grao.com/>

Perspectiva Escolar <http://www.rosasensat.org/perspectiva/>

Infancia y Aprendizaje

http://www.fia.es/online/framehomepage.php?sos=win

Webs of interest

CDEC (Centre de Documentació i Experimentació en Ciències), <http://srvcnpbs.xtec.cat/cdec/>

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

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

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

Next Generation Science Standards <https://www.nextgenscience.org/>

Guies Habitat per a l'educació ambiental <http://80.33.141.76/habitat/>

Leer.es <http://www.leer.es>

Grup Kimeia, grupkimeia.blogspot.com.es

Tresor de recursos. Web amb molt recursos i documents per l'ensenyament-aprenentatge de les ciències
<https://tresorderecursos.com/>

Other

Harlen, W. (2010). Principios y grandes ideas de la educación en Ciencias.
http://www.gpdmatematika.org.ar/publicaciones/Grandes_Ideas_de_la_Ciencia_Espanol.pdf*

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

<http://www.education.vic.gov.au/studentlearning/teachingresources/science/scicontinuum/conceptmaps.htm>

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/index.aspx>*

* llibres escrits per dones

Software

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