Teaching Innovation and Introduction to Educational Research on Teaching Biology and Geology

Code: 45577
ECTS Credits: 10

2025/2026

Degree	Type	Year
Formación de Profesorado de Educación Secundaria Obligatoria y Bachillerato, Formación Profesional y Enseñanza de Idiomas	OP	1

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Teachers

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Teaching groups languages

You can view this information at the end of this document.

Prerequisites

None

Objectives and Contextualisation

The aim of the course is to introduce future science teachers to the field of science education, as well as to the current curricular documents.

Throughout the module, the most relevant research findings on the teaching and learning process of science will be discussed, and resources will be presented to help integrate this knowledge into the design of their own teaching materials, as well as into the evaluation of open-access materials.

Learning Outcomes

1. CA15 (Competence) Create learning situations that promote inclusive competency-based learning in biology and geology, including inquiry, modelling and argumentation activities in significant personal, social and global contexts.

2. CA16 (Competence) Build educational and training assessment into the teaching and learning activities of biology and geology designed as a tool to check and regulate learning by applying rubrics and using self-assessment and co-assessment, among others.
3. CA17 (Competence) Manage the teaching action in the school and the classroom, taking into account the characteristics of dialogic interaction, the intentionality of the questions and the role of teachers in activating and regulating learning in biology and geology.
4. CA18 (Competence) Build a professional identity by integrating values and professional commitment in an education that contributes to the development of a sustainable, egalitarian, diverse and just society that respects human rights in the planning, design, adaptation, implementation and evaluation of sciences.
5. KA11 (Knowledge) Select the basic aspects of the curriculum and the professional and teaching knowledge of the content to plan learning situations, action strategies and evaluation strategies suitable for the teaching of biology and geology from the perspective of the Universal Design of Learning.
6. KA12 (Knowledge) Identify the scientific, social and artistic knowledge necessary to analyse and design interdisciplinary classroom projects that integrate the biology or geology curriculum with other subjects.
7. SA17 (Skill) Apply the gender equity perspective to educational action in the science classroom, through an intersectional lens, recognising the problems of the scientific-technological field.
8. SA18 (Skill) Base the teaching action of design, implementation and evaluation of competency-based learning activities and situations on the knowledge and strategies of science and biology and geology teaching.

Content

Introduction to Science Education (4 ECTS - 11 sessions)

- Introduction to didactics and the teaching profession. Reflection on the teaching profession and the challenge of teaching science in the 21st century.
- What is science? Epistemology and the nature of scientific knowledge, and its relationship with science education.
- Scientific practice. Should science be taught to everyone? Which science?
- Modelling. Teaching and learning science as a process of constructing scientific models.
- Prior ideas. Students' alternative conceptions.
- Inquiry. What is the role of inquiry in the science classroom?
- Argumentation. What does it mean to argue in a science class? How is it connected to critical thinking?
- Sequencing of activities. Is there a way to logically organise activities?
- Regulation of learning. Regulating vs grading.
- Contextualisation of learning. Context as an essential element in knowledge construction.
- Different ways of organising Learning Situations: Projects, Case studies, etc.

Teaching Innovation and Introduction to Research (6 ECTS - 17 sessions)

Teaching Innovation

- Curriculum and lesson planning.
- Assessment for learning.
- Assessment criteria.
- Universal design.
- Language and science.
- Good questions.
- Critical thinking.
- Scientific identity.
- Digital tools.
- Artificial intelligence.

Introduction to Research

- Reflective practice: reflection on practice and its relationship with educational innovation.

- Classroom observation: objectives, observation models, and instruments.
- Methodological foundations for innovation and educational research.
- Current trends in research in science education.

Activities and Methodology

Title	Hours	ECTS	Learning Outcomes
Type: Directed			
On-campus instructor-led activities (lectures, classroom practice, examples, case studies)	65	2.6	CA15, CA16, CA17, CA18, KA11, KA12, SA17, SA18, CA15
Type: Supervised			
Specialized or on-campus tutorials: attention to groups or individuals	15	0.6	CA15, CA16, CA17, CA18, KA11, KA12, SA17, SA18, CA15
Type: Autonomous			
Distance and autonomous learning activities	170	6.8	CA15, CA16, CA17, CA18, KA11, KA12, SA17, SA18, CA15

The hours indicated for each training activity are approximate and may be slightly modified depending on the schedule or teaching needs.

In classroom activities, small-group work will be encouraged in order to maximise student participation.

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.

Assessment

Continous Assessment Activities

Title	Weighting	Hours	ECTS	Learning Outcomes
Critical thinking actvity design	40%	0	0	CA15, CA16, CA18, KA11, KA12, SA17, SA18
Learning materials evaluation	35%	0	0	CA16, CA17, CA18, KA11, KA12, SA17, SA18
Science education introduction activity	25%	0	0	CA16, CA18, KA12

Non continuos Assessment
Students opting for the single assessment of the module must submit all previously described tasks on 15/05/2026. The single assessment includes all aspects described in the continuous assessment.
In this case, all activities are individual.

Recovery
Whether choosing the single or continuous assessment option, recoverable activities must be submitted 15

days after receiving feedback. The new activity must be accompanied by a document justifying the changes made.

The maximum grade for recovered activities is 5.

Students who have submitted 2/3 of the tasks with an average grade of at least 3.5 may recover the failed activities.

The grade for each of these activities cannot exceed 5 out of 10.

Other Important Aspects

Language Accuracy
To pass this course, students must demonstrate good overall communicative competence, both oral and written, and a solid command of the Catalan language.

In all activities (individual and group), language accuracy, writing quality, and formal presentation will be considered. Students must be able to express themselves fluently and correctly and demonstrate a high level of understanding of academic texts. An activity may be returned (not graded) or failed if the instructor considers it does not meet these requirements.

Not Assessable
An activity will be considered *Not Assessable* if 2/3 of the assessment activities have not been submitted (proportional to the weight of the activity in the final grade).

Plagiarism
According to UAB regulations, plagiarism or copying of any assignment, or the use of AI without acknowledgment, will be penalized with a grade of 0, with no possibility of resubmission. This applies to both individual and group work (in the latter case, all group memberswill receive a 0).

Use of Artificial Intelligence (AI) Technologies
For this course, the use of AI technologies is allowed only for tasks explicitly authorized by the course instructor. Students must clearly identify which parts have been generated with AI, specify the tools used, and include a critical reflection on how they influenced both the process and the final outcome. Lack of transparency regarding AI use in an assessable activity will be considered academic dishonesty and will result in a total penalty (zero) for the activity.

Synthesis Exam

This course does not allow a synthesis exam in the case of a second enrollment.

Bibliography

Bibliografia general

COUSO, Digna; JIMÉNEZ-LISO, Rut; et al (Coord) (2020) Enseñando ciencia con ciencia. Madrid: Fundación Lilly; FECYT. Disponible online en: https://ddd.uab.cat/record/220343

DOMÈNECH, Jordi (2019). Aprenentatge basat en projectes, treballs pràctics i controvèrsies. 28 propostes i reflexions per ensenyar Ciències. Premi Marta Mata de Pedagogia 2018. Rosa Sensat.

DOMÈNECH, Jordi (2022) Mueve la lengua, que el cerebro te seguirá. 75 acciones lingüísticas para ensñar a pensar Ciencias. Graó: Barcelona

DOMÈNECH, Jordi (2023) *Aprenentatge Basat en Projectes per a STEM. Breu manual pràctic*. Rosa Sensat: Barcelona.

DRIVER, Rosalin et al. (1991). Ideas científicas en la infancia y la adolescencia. Madrid: Ed. Morata/MEC.

FERNÁNDEZ, Juan. (2021) Educar en la Complejidad. Barcelona: Plataforma Actual

FURMAN, Melina (2022) Enseñar Distinto. Clave Intelectual.

GRAU, Ramon. (2010.) Altres formes de fer ciència. Alternatives a l'aula de secundària. Associació de Mestres Rosa Sensat.

HARLEN, Winnie. (2010). Principios y grandes ideas de la educación en ciencias. Ed. Rosa Devés (www.innovec.org.mx)

IZQUIERDO, Mercè., ALIBERAS, Joan., (2004). Pensar, actuar i escriure a la classe de ciències. Per un ensenyament de les ciències racional i raonable. Cerdanyola. Publicacions de la UAB.

JIMENEZ- ALEIXANDRE, Maria Pilar (coord). (2003) Enseñar ciencias. Graó.

LÓPEZ-SIMÓ, V., COUSO., D. (2023). *Didàctica de la Física a l'Educació Secundària*. Serveide Publicacions UAB.

MORALES, Mariana FERNANDEZ, Juan (2022) La evaluación formativa. Biblioteca de Innovación Educativa SM.

RUIZ-MARTÍN, Hector (2021) Cómo aprendemos. Barcelona: Graó

SANMARTÍ, Neus (2010) Diez ideas sobre evaluación. Barcelona: Graó

SANMARTÍ, Neus. (2002) Didàctica de las ciencias en la educación secundaria obligatoria. Sintesis Educacion.

Didàctica de la Física

McDERMOTT, Lillian , SHAFFER, P.eter and the Physics Education Group at the University of Washington (2002). Tutorials in Introductory Physics, First edition. Upper Saddle River, NJ: Prentice Hall.

ROGERS, Ben (2018). The Big Ideas in Physics and How to Teach Them. A David Fulton Book.

VIENNOT, Laurence. (2001) Reasoning in Physics. The part of common sense. Dordrect: Kluwer Academic Publishers.

VIENNOT, Laurence. (2003) Teaching in Physics. Dordrect: Kluwer Academic Publishers.

Didàctica de la Química

CAAMAÑO, Aureli, (2002). La enseñanza de la Química. A : Jiménez, M.P. ed. Enseñar ciencias. Barcelona : Ed. Graó

IZQUIERDO, Mercè., (2006). La enseñanza de la química frente a los retos del tercer milenio. Educación Química,17 (X), 286-299

MARTÍN, Maria Jesús., GÓMEZ, Miguel Angel., GUTIÉRREZ,Maria Sagrario., (2000). La Física y la Química en secundaria. Madrid: Narcea

Documents oficials

Curriculum secundària www.xtec.cat

https://documents.espai.educacio.gencat.cat/IPCNormativa/DOIGC/CUR_ESO.pdf

Informe PISA http://www.gencat.net/educacio/csda/publis/quaderns.htm

Revistes d'Ensenyament 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/revista/index.htm

Projectes curriculars (disponibles al CDEC, www.xtec.es/cdec o la biblioteca d'Humanitats, UAB)

IZQUIERDO, M. (Coord.). Competències 12-15. Disponible a: https://formacio.cesire.cat/ciencies1215/

Projecte Advancing Phisics. IOP. http://advancingphysics.iop.org/

Projecte 21st Century Science. The University of York & Nuffield Foundation. http://www.21stcenturyscience.org/

Projecte Física i Química Salters i Salters Horners. The University of York, Nuffield Foundation, Salters Institute and Horners Co.

Salters Advanced Chemistry www.salters.co.uk/institute/curriculum_advanced.html

Salters Horners Advanced Physics www.salters.co.uk/institute/curriculum_horners.html

Disponible en català a: http://www.xtec.es/cdec/formacio/pagines/salters_f.htm

Projecte IDEAS, Nuffield Foundation & School of Education, Kings' CollegeLondon.

Original:www.kcl.ac.uk/schools/sspp/education/research/projects/ideas.html

Disponible en català a: http://phobos.xtec.cat/cdec/

Software

None

Groups and Languages

Please note that this information is provisional until 30 November 2025. You can check it through this link. To consult the language you will need to enter the CODE of the subject.