

**COURSE DATA****Data Subject**

Code	33652
Name	Science teaching: matter, energy and machines
Cycle	Grade
ECTS Credits	4.5
Academic year	2022 - 2023

Study (s)

Degree	Center	Acad. year	Period
1305 - Degree in Primary School Education	Faculty of Teacher Training	3	First term

Subject-matter

Degree	Subject-matter	Character
1305 - Degree in Primary School Education	12 - Teaching natural sciences in primary education	Obligatory

Coordination

Name	Department
ECHEGOYEN SANZ, YOLANDA	90 - Methodology of experimental and social sciences
SANJOSE LOPEZ, VICENTE	90 - Methodology of experimental and social sciences
SOLBES MATARREDONA, JORDI ANTONI	90 - Methodology of experimental and social sciences

SUMMARY

It is a subject that addresses the problem of how to ensure that boys and girls properly learn the physical-chemical and technological contents included in the Primary Education curriculum.

The objective of the subject is to ensure that teachers learn to teach science in a thoughtful and innovative way, so that they can make decisions, attending to the input of Science Didactics, around what and why to teach science and technology, and how to achieve childrens' learning in Primary Education.



It seeks to renew the usual expository method of teaching science so Primary teachers can increase the interest in the study of science and begin the scientific and technological literacy of new citizens that will allow them to address the risks and challenges of the world and prepare them to act for a sustainable future.

This subject is related to

- Natural Sciences for Teachers (2nd course)
- Science Teaching II: Environment, Biodiversity and Health (4th course)
- Practicum II (3rd course) and Practicum III (4th course)

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

It is recommended to have passed the subject Natural Sciences for Teachers from the second course.

OUTCOMES

1305 - Degree in Primary School Education

- Express oneself orally and in writing correctly and appropriately in the official languages of the autonomous region.
- Use information and communication technologies effectively as usual working tools.
- Analyse critically the most relevant issues in today's society that affect family and school education: social and educational impact of audiovisual languages and of screens; changes in gender and inter-gender relations; multicultural and intercultural issues; discrimination and social inclusion, and sustainable development; Also, carry out educational actions aimed at preparing active and democratic citizens, committed to equality, especially between men and women.
- Promote cooperative work and individual work and effort.
- Assume that teaching must be perfected and adapted to scientific, pedagogical and social changes throughout life.
- Know the processes of interaction and communication in the classroom.



- Recognise the identity of each educational stage and their cognitive, psychomotor, communicative, social and affective characteristics.
- Design, plan and evaluate teaching and learning classroom activities in multicultural and co-educational contexts.
- Know how to work as a team with other professionals within and outside the school to attend to each student, to plan the learning sequences and to organise work in the classroom and in the play space.
- Know and apply basic educational research methodologies and techniques and be able to design innovation projects identifying evaluation indicators.
- Understand that systematic observation is a basic tool that can be used to reflect on practice and reality, and to contribute to innovation and improvement in education.
- Identify and plan the resolution of educational situations that affect students with different abilities and different learning rates, and acquire resources to favour their integration.
- Understand the basic principles and fundamental theories of sciences: physics, chemistry, biology and geology.
- Know the natural science school curriculum.
- Develop and evaluate curriculum content through appropriate teaching resources and promote the corresponding basic competences in students.
- Raise and resolve issues of everyday life related to science by applying scientific reasoning.
- Promote the competences proposed in the curriculum among students.
- Create teaching proposals in relation to the interaction between science, technology, society and sustainable development.
- Promote interest in and respect for the natural environment through appropriate educational projects.
- Develop the ability to use scientific language, symbols, concepts and texts to maintain a dialogue with the natural world.
- Know the scientific methodology and promote scientific thinking and experimentation.
- Encourage respectful attitudes towards the preservation of the environment and health.

LEARNING OUTCOMES

At the end of the semester the student should be able to:

1. Support with professional arguments the basic scientific skills that citizens need to function today.
2. Sequence the school curriculum of Primary Education Sciences, in the aspects related to Matter, Energy and Machines, Universe and Earth as a cosmic body, in the three cycles.
3. Analyze the curricular contents (Matter, Energy, Machines, Universe and Earth as a cosmic body) to determine its structure, hierarchy, extract important and subordinate ideas, possible obstacles or learning difficulties, and the possibilities offered by each content to the development of basic competences in science and technology.



4. Know how to make a concept map of a specific topic or thematic section.
5. Relate the main ideas of a thematic content with the competences to be developed in each school stage and judge its suitability.
6. Analyze the usual alternative conceptions in schoolchildren on topics related to Matter, Energy, Machines, the Universe and Earth as a cosmic body.
7. Design instruments or procedures for diagnosing children's alternative conceptions about Matter, Energy, Machines, the Universe and Earth as a cosmic body.
8. Develop suitable materials for the physical exploration of the natural and technological environment by schoolchildren, such as simple experimental setups for specific purposes.
9. Propose and / or improve educational instructional activities / materials, of limited extension and in very specific contexts, with well-defined objectives: diagnose previous ideas, modify alternative conceptions, develop certain experimental competence, etc.
10. Design educational proposals responding to the characteristics and needs of schooling in Primary Education. Apply knowledge about child learning at each age to design appropriate educational proposals.
11. Consider respect for the Environment and the problems related to Sustainability in the developed educational proposals.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theoretical and practical classes	45,00	100
Study and independent work	67,00	0
TOTAL	112,00	

TEACHING METHODOLOGY

The activities (face to face and outside the classroom) will be varied, some examples can be found below:

FACE TO FACE ACTIVITIES (40%):

- Theoretical-practical sessions (COMPETENCES 1-9): In these sessions the contents of the subjects will be worked on, debated, and different activities will be carried out, using different teaching resources: master classes, seminars, workshops, working groups, etc.
- GROUP WORK (COMPETENCES 1-9): The aim of working in groups is to highlight the importance of cooperative learning and to reinforce individual learning. The defense of these assignments may be individual or collective, and it may be done in front of the rest of the classmates or in tutorials and seminars with small audiences.



· Tutorials (COMPETENCES 1-9): Individual and collective tutorials can be used to coordinate and help students in individual and group assignments, as well as to evaluate both individual progress and teaching activities and methodology.

ACTIVITIES OUTSIDE THE CLASSROOM (60%):

Autonomous study and work (COMPETENCES 1-9): The model of the teacher as researcher in the classroom focuses the student's activity on formulating relevant questions, searching for information, analysis, preparation and subsequent communication. Individual and group assignments will be proposed, all of them guided, supervised and evaluated by teachers.

EVALUATION

Objectives and competences will be evaluated, both those common to all subjects of the degree and those specific to the subject.

The evaluation will be continuous and comprehensive, will be guiding and formative, and must analyze the individual and collective learning processes.

The qualification, the ultimate representation of the evaluation process, should be a reflection of the individual learning, understood not only as the acquisition of knowledge, but as a process related fundamentally with intellectual and personal changes of students when encountering new situations that require developing new understanding and reasoning skills.

The information to demonstrate learning will be collected, mainly, through tools like:

- Periodic monitoring of students' progress, both in the classroom and in individual and group tutorials.
- Assessment of the tasks, including the analysis and evaluation of observations on works produced by third parties.
- Assessment of individual and group participation, both in the classroom and in out of the classroom activities.
- Oral and written tests.

The process of evaluating students may include a report of the degree of individual acquisition of learning.

REFERENCES

Basic



- ACEVEDO, J.A. (2008). El estado actual de la naturaleza de la ciencia en la didáctica de las ciencias, Eureka Enseñan. Divul. Cien. 5, 134-169.
- ALONSO, M., GIL-PÉREZ, D. y MARTÍNEZ TORREGROSA, J. (1996). Evaluar no es calificar. La evaluación y la calificación en una enseñanza constructivista de las ciencias, Investigación en la Escuela, 30, 15-26.
- CAAMAÑO, A. (2004). Experiencias, experimentos ilustrativos, ejercicios prácticos e investigaciones: ¿una clasificación útil de los trabajos prácticos? Alambique.
- CAJAS, F. (2001). Alfabetización científica y tecnológica: la transposición didáctica del conocimiento tecnológico. Enseñanza de las Ciencias, 19(2), 243-254.
- CAMPANARIO, J. y MOYA, A. (1999). ¿Cómo enseñar ciencias? Las principales tendencias y propuestas. Enseñanza de las Ciencias, 17(2), pp. 179-192.
- CARRASCOSA, A., CACHAPUZ, A., PRAIA, J., GIL, D. (2002). Visiones deformadas de la ciencia transmitidas por la enseñanza. Enseñanza de las Ciencias, 20(3), pp. 477-488.
- FRIED, A. (2005). Enseñar ciencias a los niños. Barcelona: Gedisa.
- HARLEN, W. (2007). Enseñanza y aprendizaje de las ciencias. Madrid, Ediciones Morata Ministerio de Educación y Ciencia.
- POZO, J.I., SANZ, A., GÓMEZ, M.A. y LIMÓN, M. (1991). Las ideas de los alumnos sobre la ciencia: Una interpretación desde la psicología cognitiva. Enseñanza de las Ciencias, 9, pp. 83-94.
- SOLBES, J., DOMÍNGUEZ, C., TRAVER, M. (2014). Didàctica de les ciències: Matèria, energia i màquines. Vlc, Tirant lo Blanc.

Additional

- ADÚRIZ BRAVO, Agustín, Et al. (2003). El olvido de la tecnología como refuerzo de las visiones deformadas de la ciencia. Revista Electrónica de Enseñanza de las Ciencias. 2(3).
- BARBERÁ, O.; VALDÉS, P. (1996) El trabajo práctico en la enseñanza de las ciencias: una revisión. Enseñanza de las Ciencias, 14, 365-379
- CAÑAL, P., GARCÍA-CARMONA, A. y CRUZ-GUZMÁN, M. (2016). Didáctica de las ciencias experimentales en educación primaria. Madrid: Paraninfo.
- GARRIDO, J.M., PERALES, J. y GALDÓN, M. (2010) Ciencia para educadores. Madrid: Pearson.
- PORLÁN, R. (1998). Pasado, presente y futuro de la didáctica de las ciencias. Enseñanza de las Ciencias, 16(1), pp. 175-185.
- PORLÁN, R. (2000). ¿Qué saben y qué deberían saber los alumnos de primaria sobre el medio? Investigación en la Escuela, 42, pp. 5-17.
- VILCHEZ, J.M. (2014) Didáctica de las ciencias para educación primaria. Vol I y II. Madrid: Pirámide.