



COURSE GUIDE

Master of Secondary Education Training, Professional
Training and Teaching of Languages

Didactics of Natural Sciences

Universidad Católica de Valencia

Curs 2023-24



COURSE GUIDE

		ECTS
MODULE: Biology and Geology		24
FIELD: Learning and education on B and G		12
SUBJECT: Didactics of Natural Sciences		6
Type of learning: Compulsory	YEAR: 1 Semester: 1	
Lecturer: Dra. Esther Moreno Latorre Dr. Eugenio Salvador Ivorra Catalá	Department: Specific Didactics	
	e-mail esther.moreno@ucv.es eugenio.ivorra@ucv.es	

SUBJECT ORGANIZATION

BIOLOGY AND GEOLOGY				Nº ECTS: 24
Subjects and Courses				
Subject	ECTS	Courses	ECTS	Course/ semester
Complements for the formation to discipline	6	Curriculum of Natural Sciences in ESO and Bachillerato	6	1
Learning and teaching of corresponding subjects	12	Didactics of Natural Sciences	6	1
		Didactic resources for the education of Natural Sciences	6	2
Teaching Innovation and Introduction to Educational Research	6	Teaching Innovation and Introduction to Educational Research in Biology and Geology	6	2



COURSE GUIDE TO THE SUBJECT

Prerequisites: none

GENERAL GOALS

- Identify the specific characteristics of the didactic of Natural Sciences in secondary education.
- Identify and analyze the factors that influence the teaching and learning of Natural Sciences.
- Value and use educational applications of scientific procedures.
- Use the environment as an educational resource
- Design a teaching program on a course or subject area for the Natural Sciences in Secondary Education
- Establish common core subjects and working with other areas of knowledge.
- Foster in the student autonomous learning skills and cooperative work

CROSS-SECTIONAL COMPETENCES

Competence measuring scale

	1	2	3	4
G 1 Competence in the application of acquired knowledge and problem solving abilities, encountered in new or unfamiliar environments; and, initiated within broader contexts or multidisciplinary scopes relative to one's field of study.		X		
G 2 Capability to integrate knowledge and determine complex judgment calls based on information which incorporates, but is not limited to, reflections on social and ethical responsibilities associated with pertinent knowledge and judgments		X		
G 3 Knowing how to effectively communicate conclusions (sustaining relative rationale or arguments) to specialized and unspecialized audiences, in a clear and unambiguous manner.		X		
G4 Having learning skills that enable them to continue studying in a self-directed or autonomous manner within the majority of circumstances		X		
G5 To Know the curriculum related to the specialization and the didactics of teaching and learning, as well as a didactic knowledge of the teaching and learning processes, respectively. A knowledge of the different professions will be included for vocational training.				X
G 6 To plan, develop and evaluate the teaching and learning process enhancing educational activities to facilitate the acquisition of the different competences, taking into account the level and previous training of				X



students to guide them, both individually and in collaboration with other teachers and school professionals.				
G7 To research, obtain, process and communicate information (oral, printed, audiovisual, digital, or multimedia), transforming it into knowledge that will be applied in the teaching and learning process.				X
G8 To set the curriculum that will be established in a school. To develop and implement teaching methodologies, for both groups and individuals, taking into account the diversity of students		X		
G9. To design and develop learning processes with special attention to equity, education and emotional values, equal rights and opportunities between men and women, civic education and respect for human rights that facilitate life in our society, making decisions and building a sustainable future.			X	
G10 To acquire strategies to encourage student effort and enhance their capacity to learn by themselves and with others, and develop thinking skills and decision-making abilities to facilitate autonomy, confidence and personal initiative.		X		
G 11 To know the processes of interaction and communication in the classroom, mastering social skills necessary to promote learning and coexistence together in the classroom, dealing with problems of discipline and conflict resolution		X		
G12 To design and carry out formal and informal activities that make the centre a place of participation and culture in the environment where it is located. To perform the functions of mentoring and guiding students in a collaborative and coordinated way. To participate in the evaluation, research and innovation of teaching and learning	X			

SPECIFIC COMPETENCES				
	1	2	3	4
1 To know the cultural and educational value of the specific subjects and the content that is taught.		X		
2 To know the history and recent developments of the classroom subjects and their perspectives in order to transmit a dynamic vision.		X		
3 To know different environments to practice curricular contents.				X
4 To know the theoretical and practical processes in teaching and learning different classroom subjects				X



5 To transform curricula in activity and work programs				X
6 To acquire criteria to select and develop educational resources				X
7 To foster a climate that facilitates learning and values the contributions of the students.			X	
8 To integrate training for the use of media studies in the teaching-learning process.		X		
9 To learn evaluation strategies and techniques and to understand evaluation as a tool to regulate and encourage the effort.				X
10 To know and apply innovative teaching proposals in the field of specialization			X	
12 To identify the problems of teaching and learning certain materials and to propose alternatives and solutions.				X

LEARNING OUTCOMES	COMPETENCES
R1 Identify the characteristics of the specific didactic of Biology and Geology.	G5 1, 2, 4
R2 Understand the fundamentals of the main didactic models in the teaching of Biology and Geology in Secondary Education.	G5, G6, G7 2, 4, 9, 10, 12
R3 Recognizes the importance of contextualization in the analysis and design of educational proposals, with specific reference to everyday life.	G1, G2, G5, G6, G7, G9 3, 4, 5, 6, 7, 8, 10
R4 Appropriately uses different methodological strategies and assessment tools in the design of activities for teaching biology and geology.	G5, G6, G7, G8, G10, G12 4, 5, 6, 7, 8, 9, 10, 12
R5 Develops educational proposals consistent with a significant learning of science and allowing for pupils with special education needs.	G5, G6, G7, G9, G10, G11, G12 1, 3, 4, 5, 6, 7, 8, 9, 10, 12
R6 Uses appropriate information from relevant sources in science education.	G4, G5, G7, G10 2, 6, 8



ON-CAMPUS EDUCATIONAL ACTIVITIES			
ACTIVITY	Teaching-Learning Methodology	Relationship With Learning Outcomes for the subject	ECTS
CLASS	Teacher presentation of contents, analysis of competences, explanation and in-class display of skills, abilities and knowledge.	R1, R2, R3, R4	1,20
PRACTICAL CLASSES	Group work sessions supervised by the professor. Case studies, diagnostic tests, problems, field work, computer room, visits, data search, libraries, on-line, Internet, etc. Meaningful construction of knowledge through interaction and student activity.	R4, R5, R6	1
GROUP PRESENTATION OF PAPERS	Presentation of acquired knowledge. Teacher-small group and small-large group interaction.	R1, R2, R3, R4, R5, R6	0,06
OFFICE ASSISTANCE	Personalized and small group attention. Period of instruction and/or orientation carried out by a tutor to review and discuss materials and topics presented in classes, seminars, readings, papers, etc.	R1, R2, R3, R4, R5, R6	0,04
ASSESSMENT	Set of oral and/or written tests used in initial, formative or additive assessment of the student.	R1, R2, R3, R4, R5, R6	0,10
Total			2,4



INDEPENDENT WORK ACTIVITIES			
ACTIVITY	Teaching-Learning Methodology	Relationship of Course with Learning Outcomes	ECTS
GROUP WORK	Group preparation of readings, essays, problem solving, seminars, papers, reports, etc. to be presented or submitted in theoretical lectures, practical and/or small - group tutoring sessions. Work done on the university e-learning platform (www.plataforma.ucv.es)	R3, R4, R5, R6	1,44
INDEPENDENT WORK	Student study: Group Individual preparation of readings, essays, problem solving, seminars, papers, reports, etc. to be presented or submitted in theoretical lectures, practical and/or small - group tutoring sessions. Work done on the university e-learning platform (www.plataforma.ucv.es)	R1, R2, R3, R4, R5, R6	2,16
Total			3,6

SYSTEM FOR ASSESSING THE ACQUISITION OF THE COMPETENCES AND ASSESSMENT SYSTEM		
Assessment Tool	LEARNING OUTCOMES ASSESSED	Allocated Percentage
Student work (individual and collaborative)	R1, R2, R3, R4, R5, R6	80%
Attendance and on-going assessment activities	R1, R2, R3, R4, R5, R6	20%

**MENTION OF DISTINCTION:**

The mention of Distinction will be awarded to students who have achieved a score equal to or greater than 9.0. The number of Distinctions granted will not exceed 5% of students enrolled in a subject in the corresponding academic year unless enrollment is under 20, in which case only one Distinction may be granted. (RD 1125/2003).

DESCRIPTION OF CONTENTS	COMPETENCES
1. Introduction to Science Didactics. Historical overview. Constructivist approach.	G5, G6, G7, 1, 2,
2. Learning of Biology and Geology. Alternative Conceptions. Factors influencing science learning. Self-regulation in science learning.	G1, G2, G3, G4, G7, G10, G11 3, 4, 8, 12
3. Teaching of Biology and Geology. Scientific competence. Teaching Strategies.	G1, G4, G6, G7, G8, G9, G10, G11, G12 2, 3, 4, 5, 6, 7, 8, 10, 12
4. Assessment. Regulatory function.	G4, G6, G7, G8, G9, G10, G11, G12 9, 10

DESCRIPTION OF CONTENTS
1. Introduction to Science Didactics. Historical overview. Constructivist approach.
2. Learning of Biology and Geology. Alternative Conceptions. Factors influencing science learning. Self-regulation in science learning.
3. Teaching of Biology and Geology. Scientific competence. Teaching Strategies.
4. Assessment. Regulatory function.



REFERENCES

Basic bibliography

- CAÑAL P. (coord.) (2011) *Didáctica de la Biología y la Geología* Barcelona: Graó
- CAÑAL P. (coord.) (2011) *Biología y Geología. Complementos de formación disciplinar* Barcelona: Graó
- CAÑAL P. (coord.) (2011) *Biología y Geología Investigación, innovación y buenas prácticas* Barcelona: Graó
- CAÑAS, A., MARTÍN-DÍAZ, M.J. y NIEDA, J. (2007) *Competencia en el conocimiento y la interacción con el medio físico*. Madrid: Alianza Editorial
- CATALÁ, M. y otros (2002) *Las ciencias en la escuela: teoría y prácticas*. Barcelona: Graó
- DELVAL, J. (2000) *Aprender en la vida y en la escuela*. Madrid: Morata.
- DRIVER, R., GUESNE, E. y TIBERGHIE, A. (1992) *Ideas científicas en la infancia y la adolescencia*. Madrid: Morata
- HARLEN, W. (2007) *Enseñanza y aprendizaje de las ciencias*. Madrid: Morata
- JIMÉNEZ, M. P. (Coord.) (2003) *Enseñar ciencias*. Barcelona: Graó
- LEYMONIÉ, J. (2009) *Aportes para la enseñanza de las Ciencias Naturales*. Santiago de Chile: UNESCO
- PEDRINACI (Coord.) (2012) *El desarrollo de la competencia científica. 11 ideas clave*. Barcelona: Graó
- PERALES, F.J. (Coord.) (2000) *Didáctica de las ciencias experimentales*. Alcoy: Marfil



- POZO, J.I. y FLORES, F. (2007) *Cambio conceptual y representacional en el aprendizaje y la enseñanza de la ciencia*. Madrid: Antonio Machado Libros.
- PUJOL, R. M. (2007) *Didáctica de las ciencias en la educación primaria*. Madrid: Síntesis.
- SANMARTÍ, N. (2002) *Didáctica de las ciencias en la educación secundaria*. Madrid: Síntesis
- SANMARTÍ, N. (2007) *Evaluar para aprender. 10 ideas clave*. Barcelona: Graó
- VVAA (2008) *Hacemos ciencia en la escuela: experiencias y descubrimientos*. Barcelona: Graó
- VVAA (2002) *Las ciencias en la escuela. Teoría y prácticas*. Barcelona: Graó

National Journals

- Enseñanza de las ciencias (www.ensciencias.uab.es/)
- Alambique (www.alambique.grao.com)
- Eureka (www.apac-eureka.org.revista/Consejo_revista.htm)
- Enseñanza de las Ciencias de la Tierra (www.aepect.org/nuestra_revista)
- REEC (saum.uvigo.es/reec/)
- Investigación en la Escuela (www.diadaeditora.com)

Complementary bibliography

GARRIDO, J.M., PERALES, F.J. y GALDÓN, M. (2009) *Ciencia para educadores* Madrid: Pearson

GIL, D., VILCHES, A. (2006) "Educación ciudadana y alfabetización científica: Mitos y realidades" *Revista Iberoamericana de educación* 42, 31-53.

GONZÁLEZ, M.P. (Coord.) (2003) *Prácticas de laboratorio y de aula. Biología, Ecología, Genética y Geología*. Madrid: Narcea-MEC

LÓPEZ, J., LOPEZ, R., CARDENETE, S. y CARMONA, J. (1999) *Técnicas experimentales de laboratorio*. Madrid: McGraw Hill

RAGA, F. (1999) *Matraz. El trabajo en el laboratorio*. Valencia: Tándem



ROJO, A. (2010) *La física en la vida cotidiana*. Barcelona: RBA

TOMÁS, A. y col. (2008) *Física y Química enlatadas*. Alicante: Aguaclara

VV. AA., (2000) *El gran libro de los experimentos*. Madrid: San Pablo

Website addresses

<http://recursostic.educacion.es/ciencias/biosfera/web/>

Proyecto Biosfera. Page prepared by the spanish Ministry of Education about Natural Sciences (Biology and Geology) area.

<http://ntic.educacion.es/v5/web/profesores/asignaturas/>

Instituto de Tecnologías Educativas. Spanish Ministry of Education. Classified set of educational resources

<http://www.cma.qva.es/web/>

Official Website of the Conselleria de Medio Ambiente, Agua, Urbanismo y Vivienda de la Generalitat Valenciana. Environment information, protected areas, environmental quality and environmental education.



Addendum to the Course Guide of the Subject Didactics of Natural Sciences

Master of Secondary Education Training, Professional Training and Teaching of Languages

Due to the exceptional situation caused by the health crisis of the COVID-19 and taking into account the security measures related to the development of the educational activity in the Higher Education Institution teaching area, the following changes have been made in the guide of the subject to ensure that Students achieve their learning outcomes of the Subject:

Situation 1: Teaching without limited capacity (when the number of enrolled students is lower than the allowed capacity in classroom, according to the security measures taken).

In this case, no changes are made in the guide of the subject.

Situation 2: Teaching with limited capacity (when the number of enrolled students is higher than the allowed capacity in classroom, according to the security measures taken).

In this case, the following changes are made:

1. Educational Activities of Onsite Work:

All the foreseen activities to be developed in the classroom as indicated in this field of the guide of the subject will be made through a simultaneous teaching



method combining onsite teaching in the classroom and synchronous online teaching.

Students will be able to attend classes onsite or to attend them online through the telematic tools provided by the university (videoconferences). In any case, students who attend classes onsite and who attend them by videoconference will rotate periodically.

In the particular case of this subject, these videoconferences will be made through:



Microsoft Teams



Kaltura

Situation 3: Confinement due to a new State of Alarm.

In this case, the following changes are made:

1. Educational Activities of Onsite Work:

All the foreseen onsite activities described in this section of the Course Guide, as well as the group and personalized tutoring, will be done with the telematic tools provided by the University, through:



Microsoft Teams



Kaltura



Explanation about the practical sessions:

2. System for Assessing the Acquisition of the competences and Assessment System

ONSITE WORK

Regarding the Assessment Tools:

☒ The Assessment Tools will not be modified. If onsite assessment is not possible, it will be done online through the UCVnet Campus.

☐ The following changes will be made to adapt the subject's assessment to the online teaching.

Course guide		Adaptation	
Assessment tool	Allocated Percentage	Description of the suggested changes	Platform to be used

The other Assessment Tools will not be modified with regards to what is indicated in the Course Guide.

Comments to the Assessment System: