COURSE DATA

DATA SUBJECT

Code: 43488
Name: Research in didactics of advanced experimental sciences
Cycle: Master's Degree / Doctorate
ECTS Credits: 7
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
2157 - Master's degree in Research in Subject Didactics	Facultat de Formació del Professorat	1	First quarter
3112 - PhD in Specific Didactics	Escola de Doctorat		
3112 - PhD in Specific Didactics	Escola de Doctorat		

SUBJECT-MATTER

Degree	Subject-matter	Character
2157 - Master's degree in Research in Subject Didactics	Research in didactics of experimental sciences	ELECTIVES
3112 - PhD in Specific Didactics		
3112 - PhD in Specific Didactics		

COORDINATION

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SUMMARY

The elective subject of Research in the Didactics of the Higher Experimental Sciences, within Module 7: Research in the Didactics of Experimental Sciences, tries to study in depth, in a more specialised way, different lines of research linked to the field of Sciences education, once the subject fundamental research in the didactics of experimental sciences has been studied.

It is intended to encourage students to reflect individually and collectively on the lines of research, specific to their training as future researchers, which are being developed in the didactics of experimental sciences.

The training objectives of the module and this subject in particular should encourage students to contribute to the construction of a coherent body of knowledge about the problems set out by the teaching of experimental sciences, putting them in a research situation and comparing their production with those obtained by the scientific community.

The aim of this subject is, therefore, to contribute to this general objective, promoting the immersion of students in research in science didactics, around different key aspects of the teaching/learning process, while training new researchers. All this will allow them to develop very diverse research on different conceptual, procedural and axiological dimensions of scientific education.

Research that must be associated to innovation, that is, the transformation of what is carried out in classrooms. This is because the main motivation for research in this field derives from the concern of what does not work in the science lessons and the corresponding interest in achieving better results. Research that must therefore seek to verify results within the framework of knowledge developed by the scientific community of researchers in the didactics of science of which we are part.

In this way, the aim is to strengthen and study in greater depth the subject of Fundamental Research in the Didactics of Experimental Sciences, previously addressed in the master's degree and with which this subject is therefore linked.

Achieving the objectives that this subject proposes will contribute to students being able to start a research project in any of the lines studied.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

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

OTHER REQUIREMENTS

No enrolment restrictions with other subjects in the curriculum have been specified.

In order to be correctly involved in the development of the subject, students must have studied the previous subjects of didactics and, in particular, some basic contents of the different scientific disciplines. In this way, they will be able to raise and address problematic situations related to scientific knowledge that can be researched due to their interest in improving the teaching and learning process of experiment

COMPETENCES / LEARNING OUTCOMES

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Adequately analyse and evaluate the partial and final results of one's own research and contrast, refute or modify the first hypotheses.

Analyse and synthesise the main current research agendas in Specific Didactics.

Choose an appropriate methodological framework to generate answers to research questions and master the use of the necessary methodological techniques.

Conduct quality research in the scientific field of Specific Didactics using the methodologies, techniques and procedures of this discipline.

Create spaces for research and learning with special attention to equity, emotional and values education, equal rights and opportunities between men and women, citizenship training and respect for human rights that facilitate life in society, decision-making and the construction of a sustainable future.

Critically analyse, from the point of view of research in Specific Didactics, the performance of teaching, good practice and guidance using quality indicators.

Decide, with objective criteria, which methodological paradigm quantitative, qualitative or mixed best fits the objectives of your own research.

Evaluate current research problems on teaching or learning in the fields of knowledge characteristic of Specific Didactics.

Evaluate the relevance of a research project, its quality and future projection, with scientific criteria appropriate to the international standards of the studied speciality.

Identify, analyse and evaluate national or international research publications in the field of Specific Didactics.

Integrate ethical values and responsibility associated with research tasks into one's own research.

Plantear preguntas de investigación pertinentes sobre un tema de investigación actual.

Search and synthesise information on research results in bibliographic, material, virtual, etc. repertoires useful to support a new research project.

Students should apply acquired knowledge to solve problems in unfamiliar contexts within their field of study, including multidisciplinary scenarios.

Students should be able to integrate knowledge and address the complexity of making informed judgments based on incomplete or limited information, including reflections on the social and ethical responsibilities associated with the application of their knowledge and judgments.

Students should communicate conclusions and underlying knowledge clearly and unambiguously to both specialized and non-specialized audiences.

Students should demonstrate self-directed learning skills for continued academic growth.

Students should possess and understand foundational knowledge that enables original thinking and research in the field.

Synthesise historical, epistemological and ontological aspects associated with the emergence and evolution of research in Specific Didactics.

Synthesise relevant research problems on learning or teaching in the disciplines belonging to Specific Didactics.

Understand and apply specialised research procedures in Specific Didactics.

Use appropriate bibliographical references that are relevant scientific background to the proposed research.

DESCRIPTION OF CONTENTS

1. 1. Problem-solving and science issues

1. Problem statement: Types of problem, applicability and advantages/disadvantages. Cognitive demand as an indicator of difficulty.
2. The individual solving the problem: Prior knowledge, cognitive and metacognitive strategies, working memory, analogue transfer, and motivation for the task.
3. Resolution environment: Collaborative and investigative work, teaching of metacognitive strategies, use of ICT and external representations
Based on all this theoretical background, various studies are presented in which variables of the aforementioned factors are brought into play and which have obvious didactic implications. Likewise, a computer application is used to examine the processes that students follow during the search for errors in a solved problem.
A critical analysis of various instructional methodologies in problem solving is then carried out, from the traditional teacher-centred methodology to problem solving such as research, problem-based learning, and problem solving using heuristics. Finally, the didactic uses of the formulation of questions in science teaching/learning are discussed.

2. 2. Modelling in Research in the Didactics of Science

1. What do we mean by model? Characteristics and types of models.
2. Student models. Teacher models.
3. Facilitating modelling. Models in science teaching.
4. Research on models in biology and geology.
5. Research on models in physics and chemistry.
The aim is for the master's students to know the characteristics of the models: importance, uses, limitations, and the various existing types, mental, tangible, etc. Likewise, to differentiate the scientific models, from those used in teaching, from those possessed by the teaching staff, and from those shown by the students.
We continue to study the problems and the various procedures to obtain the modelling of students from specific and isolated ideas, with the aim of obtaining explanatory and globalised visions.

3. 3. Research results in the teaching of biology

State of play on some of the most representative issues in the area, including:
3.1. Epistemological nature of biology. Curriculum development and construction of biology as a school discipline.
3.2. Description of the different types of research methodology based on the critical analysis of publications in biology didactics. Classification of magazines by their editorial line.
3.3. Students' conceptions on biological issues, identification of learning obstacles and didactic transposition processes.

3.4. Analysis of situations and learning processes: experimentation and laboratory practices, trips to the country, to museums and gardens, problem solving, computer tools, assessment and qualification, etc.
Didactic research that has been carried out on different topics of biology will be shown, highlighting the most deeply-rooted conceptions and instruments for their approach. On the other hand, the suitability of learning processes in non-formal and informal situations and contexts, their characteristics and the most used research approaches and designs will be analysed.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	42,00
Total hours	**42,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	0,00
Independent study and work	133,00
Preparation of lessons	0,00
Preparation for assessment activities	0,00
Resolution of case studies	0,00
Total hours	**133,00**

TEACHING METHODOLOGY

The subject is conceived as a workshop-course of guided research in which students participate collectively in the reconstruction of knowledge developed by the scientific community around research focused on the problems of teaching and learning the sciences, putting them in a research situation, comparing their production with those obtained by the scientific community, addressing the problems that the teaching of the sciences involves and, for all of this, counting on the guidance and support of the staff member responsible for each unit.

The activities (face-to-face and out-of-class) to be carried out will be diverse, for example, some that can be carried, in order to contribute to the set of general and specific skills that are intended, are as follows:

FACE-TO-FACE ACTIVITIES:

- Theory-practical classes in which the content of the subject will be developed, debates will be held and activities will be carried out using different teaching resources guided by teachers: seminars, workshops, group work, etc.

- Group work aimed at highlighting the importance of cooperative learning and consolidating individual learning. The defence of these activities may be individual or collective and may be done in the classroom or in tutorials and seminars with small audiences.
- Individual or collective tutorials that will be used to coordinate students on individual and group assignments, as well as to assess both individual progress and teaching activities and methodology.

OUT-OF-CLASS ACTIVITIES:

Study and independent work. The teaching model as a researcher in the classroom focuses the student's activity on posing relevant questions, searching for information, analysis, development and subsequent communication.

EVALUATION

The assessment will be continuous and comprehensive, of a guiding and formative type, and must analyse the individual and collective learning processes, taking into account all the contributions and extending them to all aspects of learning. The grade, the ultimate expression of the assessment process, must reflect the achievements accomplished as a result of individual and collective work.

The information to show learning will mainly be collected through some of the following methods:

- Periodic monitoring of students' progress. 20-30%
- Assessment of the work assigned (assignments, reports, analysis of readings, debates, etc.). 20-30%
- Assessment of individual and group participation. 20-30%
- Oral and/or written tests. 40-50%

The student assessment process may include the preparation of an individual learning acquisition level report.

Plagiarism or the improper use of artificial intelligence tools may be sanctioned in accordance with article 15 of the Regulations of evaluation and qualification of the Universitat de València.

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