Universitat Autònoma de Barcelona

2018/2019

Context in Research into the Teaching and Learning of Science and Mathematics

Code: 43930
ECTS Credits: 6

Degree	Type	Year	Semester
4313815 Research in Education	OT	0	2

Contact

Name: Digna Maria Couso Lagaron

Email: Digna.Couso@uab.cat

Use of languages

Principal working language: catalan (cat)

Teachers

Neus Sanmartí Puig

Lluis Albarracin Gordo

Edelmira Rosa Badillo Jiménez

Maria Isabel Hernandez Rodriguez

Prerequisites

None

Objectives and Contextualisation

This module tackles some of the main transversal processes related to science and mathematics education, such as practical work, school projects, ICTs for learning and communication in schools, problem solving and assessment. Having into account learnings from previous modules, the focus of this one will be on the design of context-based educational instruction that facilitates the integration of STEM areas. Emphasis will be also put on how to evaluate teaching proposals taking into consideration a design-based research approach. The following contents will be discussed:

- Contexts for integrating science and maths teaching
- Learning to solve mathematical problems in context
- Inquiry and practical work to teach context-based science
- Affordances and constraints of the use of ICTs in contextualised projects
- Teachers' pedagogical content knowledge in relation with science and maths teaching
- Assessment as a tool to promote contextualised science and maths teaching

Skills

- Analyse data according to its nature and present results in accorance with the research proposals.
- Collect research data coherently in accordance with the chosen method.
- Communicate and justify conclusions clearly and unambiguously to both specialised and non-specialised audiences.

- Communicate the research results, knowledge acquired and the implications for practice, and adapt the register to the public and formal protocols.
- Continue the learning process, to a large extent autonomously.
- Develop professional values including ethics in educational research, in particular with respect to diversity of opinion and ways of being and doing.
- Integrate knowledge and use it to make judgements in complex situations, with incomplete information, while keeping in mind social and ethical responsibilities.
- Plan research according to practice-related problems, taking into account theoretical advances in the field of knowledge.
- Recognise and relate the theoretical, empirical and social aspecys of the specific field of research.
- Solve problems in new or little-known situations within broader (or multidisciplinary) contexts related to the field of study.
- Use ICT in the research process, information search and management, data analysis and the dissemination and communication of results.
- Use acquired knowledge as a basis for originality in the application of ideas, often in a research context.
- Work in teams and with teams in the same or interdisciplinary fields.

Learning outcomes

1. Collect data to allow an understanding of forms of communication and interaction in the classroom.
2. Communicate and justify conclusions clearly and unambiguously to both specialised and non-specialised audiences.
3. Continue the learning process, to a large extent autonomously.
4. Decide on the information and the subjects involved in the study.
5. Define appropriate tools for analysing the nature of the data in context.
6. Design research pertinent to problems related to science and mathematics education in context.
7. Design strategies for collecting information.
8. Develop professional values including ethics in educational research, in particular with respect to diversity of opinion and ways of being and doing.
9. Identify and analyse the different theoretical frameworks of reference that guide research in the context of science and mathematics education.
10. Identify in practice problems related to research into science and mathematics education in context.
11. Identify problems related to specific areas of science and mathematics education and evaluate which methodological approaches allow for their solution.
12. Identify theoretical references and evaluate their appropriateness for interpreting problems specific to science and mathematics education in context.
13. Integrate knowledge and use it to make judgements in complex situations, with incomplete information, while keeping in mind social and ethical responsibilities.
14. Judge the importance and theoretical and social pertinence of specific research into science and mathematics education in context.
15. Plan research taking into account the possibilities and limitations of the use of digital tools in science and mathematics teaching.
16. Produce conclusion taking into account the objectives and research questions and the theoretical references in context in science and mathematics education.
17. Recognise the importance of social and cultural contexts in formal and non-formal education in science and mathematics research.
18. Recognise the main processes related to research in scientific and mathematics education in context.
19. Relate results in accordance with their origin (sources and instruments).
20. Solve problems in new or little-known situations within broader (or multidisciplinary) contexts related to the field of study.
21. Understand the main aspects of research contexts in science and mathematics education and analyse them as objects of research.
22. Understand the possibilities and limitations of the use of digital tools in teaching science and mathematics.
23. Use ICT in the research process, information search and management, data analysis and the dissemination and communication of results.
24. Use acquired knowledge as a basis for originality in the application of ideas, often in a research context.
25. Work in teams and with teams in the same or interdisciplinary fields.

26. Write research articles about research in contexts adapted to the needs of professionals in education
27. Write scientific summaries to be presented to different audiences.

Content

- Contextualization and interdisciplinarity in the teaching of science and mathematics.
- Scientific model-based inquiry in relevant contexts.
- Mathematical modeling from relevant contexts.
- Digital tools for the teaching of science and mathematics.
- Models of professional knowledge of the teacher and Resolution of mathematical problems in relevant contexts.
- Formative assessment throughout the learning process of the sciences and mathematics.
- The assessment to qualify the learning of science and mathematics.
- The external evaluation of the teaching of science and mathematics.

Methodology

The training activity will be developed based on the following dynamics:

- Readings of articles and document collections
- Lectures by teachers
- Analysis and collective discussion of articles and document collections
- Classroom practices: problem solving / cases / exercises
- Presentation of works
- Tutorials

Activities

Title	Hours	ECTS	Learning outcomes
Type: Directed			
Classroom practices	18	0.72	
Lectures	18	0.72	20, 2, 21, 22, 8, 5, 4, 7, 16, 6, 10, 9, 11, 12, 23, 13, 14, 15, 1, 18, 17, 27, 19, 24, 3, 25
Type: Supervised			
Analysis and group discussion of papers	16	0.64	
Tutorials	10	0.4	
Type: Autonomous			
Production of papers / group work	60	2.4	
Reading papers	28	1.12	

Evaluation

To access the assessment, 80% of the sessions of the module will need attendance.
Students' participation and involvement will be valued in the activities prc
Two evaluation activities are proposed:

- Individual reflection paper on the proposals for improvement of the project evaluated (also based on some of the reflections in theoretical referents analyzed throughout the module)
- Evaluation of an interdisciplinary project (including the design of a question that allows assessing students' competencies) - Presentation of the work in groups

Evaluation activities

Title	Weighting	Hours	ECTS	Learning outcomes
Evaluation of an interdisciplinary project	45%	0	0	20, 2, 21, 22, 8, 5, 4, 7, 16, 6, 10, 9, 11, 12, 23, 13, 14, 15, 1, 18, 17, 27, 19, 24, 3, 25
Individual reflection document	45%	0	0	20, 2, 21, 22, 8, 5, 4, 7, 16, 6, 10, 9, 11, 12, 23, 13, 14, 15, 1, 18, 17, 26, 27, 19, 24, 3
Participation	10%	0	0	25

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