UAB
Universitat Autònoma de Barcelona

Research Into Specific Ambits of Science and Mathematics Teaching

2026/2027

Code: 43929
Credits: 6

Degree programme	Type	Course
Research in Education	OP	1

Contact lecturer

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Teaching staff

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Group languages

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

Prerequisites

None

Objectives

The goal of this module is to show and discuss different research perspective in science and math learning and teaching from early childhood to secondary education, as well as in the field of teacher training.

Learning outcomes

- CA62 (Formulate research problems on the development of competence and scientific thinking in innovative contexts while also formulating relevant questions and goals.) Formulate research problems on the development of competence and scientific thinking in innovative contexts while also formulating relevant questions and goals.
- CA63 (Contrast the data from research and innovations on the development of scientific competence and thinking with the goals of the study and the corpus of available knowledge in order to draw

conclusions.) Contrast the data from research and innovations on the development of scientific competence and thinking with the goals of the study and the corpus of available knowledge in order to draw conclusions.
- KA61 (Identify lines of research in the field of the didactics of science and mathematics that address the development of scientific and mathematical competence and thinking in teachers and students.) Identify lines of research in the field of the didactics of science and mathematics that address the development of scientific and mathematical competence and thinking in teachers and students.
- KA62 (Identify the learning difficulties associated with scientific and mathematical competence and thinking in order to provide innovative solutions for the training of teachers and students.) Identify the learning difficulties associated with scientific and mathematical competence and thinking in order to provide innovative solutions for the training of teachers and students.
- SA47 (Produce a comprehensive review of the scientific literature in relation to a specific topic regarding learning in science and mathematics education.) Produce a comprehensive review of the scientific literature in relation to a specific topic regarding learning in science and mathematics education.
- SA48 (Analyse different kinds of data obtained from research on the development of scientific and mathematical competence and thinking.) Analyse different kinds of data obtained from research on the development of scientific and mathematical competence and thinking.
- SA49 (Present research on the didactics of mathematics or didactics of experimental sciences, adapting the tone to the typical type of communication in the disciplines of the didactics of sciences and mathematics.) Present research on the didactics of mathematics or didactics of experimental sciences, adapting the tone to the typical type of communication in the disciplines of the didactics of sciences and mathematics.

Contents

The course content will focus on the following disciplinary areas:

Development of mathematical and scientific competence and thinking.

Development of mathematics and science teachers' professional knowledge and competences.

Within this framework, the following thematic blocks will be addressed:

Evolution of research in mathematics education.

Research on modelling in mathematics education: mathematical and scientific models in school contexts.

Research on teachers' own practice and Design-Based Research (DBR) in mathematics education.

Competency-based tasks in mathematics teaching.

Research on teachers' professional noticing competence in mathematics teaching and learning situations.

Research on modelling in science education.

Development of students' critical thinking through modelling activities.

Modelling, systems thinking, big ideas, and learning trajectories from the perspective of biology education.

Research on the development of scientific models based on controversial contexts.

Learning activities and methodology

Title	Hours	ECTS	Learning outcomes
Directed	36	1.44	CA62, CA63, KA61, KA62, SA47, SA48, SA49
Autonomous	88	3.52	CA62, CA63, KA61, KA62, SA47, SA48

Supervised	26	1.04	CA62, CA63, KA61, KA62, SA47, SA48

In each session, the main lines of research and the findings of selected research articles will be presented and discussed. Data related to the topic of the session will also be analysed.

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

Continuous assessment activities

Title	Weight	Hours	ECTS	Learning outcomes
Individual actitvity based on the content analysis	40	0	0	KA62, SA47, SA48, SA49
Individual activity based on a research article	40	0	0	CA63, KA61, KA62, SA47
Coevaluation activity	20	0	0	CA62, CA63, KA61

1. Continuous Assessment

The continuous assessment consists of three activities:

Activity 1: Critical Reflection on a Research Article

Students will select a research article in the field of mathematics education or science education and prepare a written reflection based on their responses to a set of guiding questions.

Submission deadline: 14 January 2027 via the Virtual Campus.

Activity 2: Analysis of the Progression of a Mathematical or Scientific Topic

The specific topic to be analysed will be agreed upon with the course instructor.

The written assignment must be submitted through the Virtual Campus before 4 March 2027 and will be presented orally to the class on 4 March 2027 (the final session of the module).

Activity 3: Feedback on the Presentation

Based on the presentations delivered on 4 March 2027, each student will prepare a feedback report on one of the presentations, identifying one strength and one aspect for improvement. The report will be sent to the student who delivered the presentation.

2. Single Assessment

Students opting for the single assessment must deliver the oral presentation on the last day of class, submit Activity 1, and prepare and submit feedback on a classmate's presentation.

3. Resit

Both the continuous and the single assessment include the possibility of resitting failed assessment tasks. The maximum grade that can be obtained through the resit is 5 (Pass).

To be eligible for the resit, students must submit a report explaining the revisions made to their work in response to the feedback provided by the instructor. The revised work must be submitted through the Virtual Campus within one week of the publication of the assessment results.

4. Not Assessable

Students who fail to submit any one of the three assessment activities will receive a Not Assessable (NA) grade.

In accordance with UAB regulations, plagiarism, copying, or the use of artificial intelligence without appropriate acknowledgement in any assignment will result in a grade of 0 for that assignment, and the student will forfeit the right to resit it.

Feedback on submitted work will be provided within 20 days of the submission deadline.

Bibliography

Ärlebäck, J. B., & Albarracín, L. (2024). Fermi problems as a hub for task design in mathematics and stem education. Teaching Mathematics and its Applications, 43(1), 25-37. https://doi.org/10.1093/teamat/hrad002

Caviedes, S., De Gamboa, G., & Badillo, E. (2024). Mathematical connections involved in area measurement processes. *Research in Mathematics Education*, *26*(2), 237-257.

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Drijvers, P.; Doorman, M.; Boon, P.; Reed, H.; Gravemeijer, K. (2010). The teacher and the tool: instrumental orchestrations in the technology-rich mathematics classroom. Educational Studies in Mathematics, 75, 213-234.

Fernández, C.; Llinares, S. (2012). Características del desarrollo del razonamiento proporcional en la Educación Primaria y Secundaria. Enseñanza de las Ciencias, 30(1), 129-142.

Garrido, A., & Couso, D. (2025). The IPM cycle: An instructional tool for promoting students' engagement in modeling practices and construction of models. *Journal of Research in Science Teaching*, *62*(2), 391-425.

Gobert, J. (2000). A typology of causal models for plate tectonics: Inferential power and barriers to understanding. International Journal of Science Education, 22, 9, 937-977.

Grimalt-Álvaro, C., López-Simó, V., & Tena, È. (2025). How Do Secondary-School Teachers Design STEM Teaching-Learning Sequences? A Mixed Methods Study for Identifying Design Profiles. *International Journal of Science and Mathematics Education*, *23*(1), 235-260.

Izquierdo, M. (2005). Hacia una teoría de los contenidos escolares, Enseñanza de las Ciencias, 23 (1), 11-122.

Ogborn, J. (2012). Curriculum Development in Physics: Not Quite so Fast. Scientia in educatione 3(2), p. 3-15. (article basat en la conferència plenària del catedràtic Jon Ogborn el 03 de juliol de 2012, al The World Conference on Physics Education 2012, Istanbul,Turkey.

Radford, L. (2010). Algebraic thinking from a cultural semiotic perspective. Research in Mathematics Education, 12(1), 1-19.

Sauvé, L. (2010). Educación científica y educación ambiental: un cruce fecundo. Enseñanza de las Ciencias, 28 (1), 5-18

Links:

- Centre de Recursos per Ensenyar i Aprendre Matemàtiques (CREAMAT). Generalitat de Catalunya. http://phobos.xtec.cat/creamat/joomla/

- Freudental Institute. Utrecht (Nederlands). http://www.fisme.science.uu.nl/fisme/en/

- The Nrich Maths Project. Cambridge (UK). http://nrich.maths.org/frontpage

Godino, J. D., Batanero, C. & Font, V. (2003). Fundamentos de la enseñanza y el aprendizaje de las matemáticas. Departamento de Didáctica de las Matemáticas. Universidad de Granada. (Recuperable en, http://www.ugr.es/local/jgodino/)

Iranzo, N. (2009). Influence of dynamic geometry software on plane geometry problem solving strategies. Unpublished Doctoral Dissertation. Bellaterra, Spain: Universitat Autònoma de Barcelona. (Recuperable en, http://www.geogebra.org/publications/2009-06-30-Nuria-Iranzo-Dissertation.pdf)

Software

No specific software will be used

Course groups and languages

The information provided is provisional until November 30. After this date, you will be able to consult the language of each group through this link. To access the information, you will need to enter the course CODE

Type of teaching	Group	Language	Semester	Shift
(TEm) Theory (master)	1	Catalan	first semester	afternoon