UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Mathematics Teaching (with Workshop)

2425-4-G8501R023

Course title

G8501R023 - Didactics of mathematics with laboratory

Topics and course structure

The lecture course aims to provide skills and tools practical for the development of teaching activities for the teaching of mathematics and related disciplines through:

- The analysis of teaching units structured according to the principle of discovery followed by consolidation;
- The learning and consolidation of programming principles applicable to creating teaching experiences to support the teaching of the discipline;
- The study of examples of the application of educational robots to teach mathematics in an interactive and laboratory context.

The lecture course aims to provide examples and opportunities for practical trials in various forms in which teaching can be articulated, starting from the early experiences in preschool to didactic pathways for primary school.

Objectives

With this lecture course, with constant and active attendance in the lessons and the laboratory connected to the course, the following learning outcomes will be achieved:

- curriculum design and didactic activities for teaching mathematics in preschool and primary school
- introduction and consolidation of programming principles helpful in supporting the learning of the discipline

- use and coding of educational robots as an aid for teaching mathematics.

At the end of the course, students:
- Understand models of educational design and the role of technologies in teaching practices
- Are familiar with foundational scientific concepts, formalized language, and mathematical structures
- Are able to design and implement educational pathways using a variety of methods and creating connections with other disciplines
- Can use mathematical language to tackle problems
- Develop autonomy in analyzing, implementing, and evaluating educational needs
- Gain perspective on research in mathematics education

Methodologies

Lectures (40 percent, frontal teaching), interactive workshops (60 percent, interactive teaching), pedagogical-didactic laboratory (30 percent, interactive teaching).

Teaching is conducted in Italian. Students wishing to use English in writing the portfolio and during the oral exam are welcome to do so.

Online and offline teaching materials

All information related to the lecture course (lectures, laboratory, and exams) and educational and supplementary materials will be available exclusively in the dedicated space on the website http://elearning.unimib.it/. Therefore, all students who intend to attend the laboratory associated with the course and/or take the exam are required to register on this platform.

The instructor provides recordings of the lessons on the e-learning page to support students in studying and preparing for the exam.

Programme and references

The teaching program includes:

- The analysis of educational activities for teaching mathematics in preschool and primary school, developed according to the principle of discovery of concepts, techniques of formalization, and consolidation of the newly learned concepts in various areas of mathematics (algebra, geometry, probability).

- Learning the most common programming languages (Scratch, Python) that are functional for developing coding activities to support the learning of the discipline.

- Studying examples of using educational robots for creating laboratory activities that reinforce concepts related to logic, mathematics, and related disciplines.

Reference Texts

Materials provided by the instructor will be available on the course's e-learning page.

Educational materials useful for portfolio development and in-depth study

Peter Liljedahl, "Building Thinking Classrooms in Mathematics.", Corwin, 2020 (lettura consigliata)
Peter Liljedahl & Maegan Giroux, "Mathematics Tasks for the Thinking Classroom, Grades K-5", Corwin, 2024
Daniele Gouthier, "Matematica fuori dalle regole - Guida di sopravvivenza per genitori e insegnanti", Feltrinelli, 2024
Silvia Tabarelli, "Astuccio delle regole di matematica", Erickson, 2016
AAVV, "EnigMath: Quaderni delle sfide matematiche", Innovamat Education, 2024
Elena Rinaldi, "Facciamo Che Eravamo Matematici", Scienza Express, 2019
Laura Montagnoli, "Matematica con SCRATCH", Editrice Morcelliana, 2023
Fondazione Mondo Digitale, "Tinkering Coding Making", Erikson, 2019
Linda Liukas, "HELLO RUBY - Avventure nel mondo del coding", Erikson, 2017
Kiki Prottsman, "My First Coding Book", DK, 2017
Carol Vorderman, "Computer Coding Games in Scratch for Kids", DK, 2024
Carol Vorderman, "Computer Coding Python Games for Kids", DK, 2018

Students who intend to spread the exam over two years must agree with the instructor on the bibliography to prepare for the exam.

Assessment methods

The exam consists of a portfolio of written assignments and an oral test. There are no intermediate tests.

The portfolio of written assignments consists of the presentations of two teaching plans with commentary, developed on themes chosen by the student within the scope of the ministerial programming for kindergarten and primary school. The first of these relates to teaching activities for discovery and consolidation, and the second relates to workshop activities based on coding and robotics.

The oral exam includes a discussion of the portfolio and an analysis of the laboratory experience. The ability to rework the topics of study and the laboratory experience will be evaluated, as well as the ability to independently choose a mathematical theme for teaching, analyze it from a content perspective, and identify its most significant aspects that can form the basis for effective teaching activities. Additionally, the knowledge of the mathematical topics on which the activity under analysis is based and the ability to identify connections between the significant aspects, from a mathematical point of view, of such topics and the possible teaching methods usable for designing activities on such content will also be evaluated.

The assignment of the final grade expresses an overall evaluation of everything that contributes to the achievement of the educational objectives described above. In particular, the following criteria will be used to formulate the evaluation:

- Completeness and accuracy of conceptual development
    - Consistency and accuracy of the logical structure of the portfolio and its presentation
    - Ability to analyze and synthesize
    - Precise and rigorous use of mathematical language

Office hours

By appointment (via email).

Programme validity

According to the rules of the degree programme.

Course tutors and assistants

Prof. Matteo Fossati
Dr. Lorenzo Pizzuti

Sustainable Development Goals

QUALITY EDUCATION