# Syllabus

## *Course Description*

| | |
|---|---|
| **Course Title** | Didactics of Mathematics and Natural Sciences 1 - Basics |
| **Course Code** | 11410 |
| **Course Title Additional** | |
| **Scientific-Disciplinary Sector** | NN |
| **Language** | Italian |
| **Degree Course** | 5 year master degree in Primary Education - Italian section |
| **Other Degree Courses (Loaned)** | LM-85 bis Education Ladin section |
| **Lecturers** | Prof. Dr.Dr. Robert Philipp Wagensommer, RobertPhilipp.Wagensommer@unibz.it https://www.unibz.it/en/faculties/education/academic-staff/person/40174<br>Dott. Mag. Michele Marcaccio, Michele.Marcaccio@unibz.it https://www.unibz.it/en/faculties/education/academic-staff/person/40854 |
| **Teaching Assistant** | |
| **Semester** | Second semester |
| **Course Year/s** | 2 |
| **CP** | 11 |
| **Teaching Hours** | 70 |
| **Lab Hours** | 50 |
| **Individual Study Hours** | 155 |
| **Planned Office Hours** | 33 |
| **Contents Summary** | Knowledge:<br>Acquisition of general scientific and didactic content of the biological science and chemistry teaching in pre-school and primary school, as provided for in the Provincial Directions of the Autonomous Province of Bozen/Bolzano, the National Directions for the Curriculum and PAT Guidelines:<br>living organisms; similarities and differences between living |

| | |
|---|---|
| | organisms; transformations and changes that occur in the course of the life of organisms; relationships between living organisms, and between living organisms and the environment; morpho-functional adaptations of living organisms; chemistry as a bridging science between the scientific disciplines for an interdisciplinary view of the sciences; the chemistry of life.<br>Critical knowledge of the fundamental contents of the teaching of mathematics and the life sciences in the primary school as set out in the Provincial Directions of the Autonomous Province of Bolzano, the National Directions for the Curriculum and the PAT Guidelines.<br><br>Capability:<br>Ability to understand and scientifically interpret simple natural processes/events, particularly those related to everyday life.<br>Ability to find, analyse, use, modify and develop materials for work in situations involving biological and chemical sciences.<br>Ability to design interdisciplinary teaching/learning paths of chemical and biological sciences adapted to the context situation and able to stimulate the development of specific competences of the scientific disciplines.<br>Ability to qualitatively evaluate learning processes.<br>Ability to read and interpret classroom situations in mathematics and life sciences. Ability to interact with pre-school children in situations involving the environment, life sciences, mathematics.<br>Ability to find, critique, use, modify and develop materials for classroom action in situations involving the environment, life sciences and mathematics. |
| **Course Topics** | See the individual course modules |
| **Keywords** | Mathematics, biology, chemistry, didactics of mathematics, didactics of biology, didactics of chemistry, early mathematical education, early science education. |
| **Recommended Prerequisites** | Basic knowledge of arithmetic and biology. |
| **Propaedeutic Courses** | |
| **Teaching Format** | Lectures and laboratories. |
| **Mandatory Attendance** | In accordance with the regulation |
| **Specific Educational Objectives and Learning Outcomes** | Disciplinary skills<br><br>Knowledge and understanding: |

| | |
|---|---|
| | Critical knowledge of the fundamental content of mathematics in primary school<br>Mastery of the language of mathematics and science.<br>First elements of knowledge of the theoretical constructs of mathematics education<br>Knowledge of the main documentation and reference sites<br>Critical knowledge and understanding of the general and theoretical foundations of biology and chemistry, linked to everyday life experiences consistent with the age of the children; knowledge of the disciplines' own research methods, including those applied to school contexts.<br><br>Ability to apply knowledge and understanding:<br>Ability to read concrete classroom situations related to mathematics in primary school.<br>Ability to interpret children's mathematical productions in both IS and SP<br>Ability to interpret assessment results in mathematics<br>Ability to design teaching interventions concerning basic chemistry and biology topics that actively involve the class group, with its specificities<br>Ability to promote intrinsic motivation in pupils to chemistry and biology problems related to everyday life situations<br>Ability to work in groups for the planning, organisation and verification of educational-didactic interventions in the field of chemistry and biology.<br><br>Transversal/soft skills<br><br>Autonomy of judgement:<br>Ability to recognise the validity of teaching paths in mathematics and chemical and biological sciences, observed during the internship or read in books, manuals, teaching guides<br>Ability to recognise the coherence and validity of materials for the teaching of mathematics and chemical and biological sciences on the web<br>Ability to recognise correct arguments, procedures and demonstrations<br>Ability to analyse and evaluate protocols (films, papers, oral and written productions) of students |

| | |
|---|---|
| | Ability to reflect autonomously and critically on acquired chemical-biological skills and the contents of disciplinary teaching;<br><br>Communication skills:<br>Reporting of teaching activities<br>Communication both orally and on online platforms with colleagues<br>Ability to discuss student papers<br>Ability to lead students to a conscious use of language<br>Ability to argue about basic aspects of the disciplines of chemistry and biology and their teaching in a clear, effective and cross-science manner.<br><br>Ability to learn:<br>Acquire the ability to learn from the environment in which one will be placed, analysing materials, documentation of experiences, protocols, assessment results<br>Acquire the ability to learn by interacting with peers<br>Possess skills that can be used in study strategies for lifelong learning and have the ability to find sources to update and deepen them. |
| **Specific Educational Objectives and Learning Outcomes (additional info.)** | |
| **Assessment** | Written test (3 hours total working time) and project works.<br>The content of the lectures in mathematics education and biology and chemistry education is assessed in a written examination, aimed at the verification of the basic disciplinary knowledge required for teaching in kindergarten and primary school and the ability to analyse and interpret situations by critically using materials. Performance in the laboratories is assessed on the basis of assignments/reports/works, which must be completed outside of laboratory sessions by the specified deadlines. Active participation in the laboratories is required.<br>As a consequence of the number of ECTS foreseen for each module and the necessary rounding, the written test in Mathematics counts for 11/30 in the final grade, the activities carried out in the Mathematics laboratory for 5/30, the written test in Biology and Chemistry for 9/30 and the activities carried out in the Biology and Chemistry laboratory for 5/30. |

| | |
|---|---|
| | In the event of a failing grade for the entire course exam, any partial examinations taken with a positive result will be considered as already passed at the next attempt to take the entire course examination. It should be borne in mind that, even in this case, a negative mark for the entire course exam will be counted towards the number of attempts available to take an examination.<br>According to the Examinations Regulations, if a student fails an examination in three consecutive attempts, he/she may not register for the same examination in the three sessions following the last attempt (Art. 6, para. 4 of the current Regulations for Proficiency Examinations). |
| **Evaluation Criteria** | In the written test, students will be required to be familiar with the Provincial and National Indications for the first cycle of education; to critically master the contents, also in teaching and learning situations; to adequately use some theoretical constructs to analyse classroom situations, teaching materials, student protocols, survey and assessment results.<br>In reports and laboratory applications, students must show that they can apply the acquired notions and that they can present and defend their work.<br>Assessment criteria: knowledge of the required content, logical structure, clarity and coherence of argumentation, formal and linguistic correctness. |
| **Required Readings** | See the required reading listed for each module. |
| **Supplementary Readings** | See the further reading listed for each module. |
| **Further Information** | |
| **Sustainable Development Goals (SDGs)** | Quality education, Reduced inequalities, Life on land, Climate action, Responsible consumption and production |

# *Course Module*

| | |
|---|---|
| **Course Constituent Title** | Basics of Mathematics and its Didactics |
| **Course Code** | 11410A |
| **Scientific-Disciplinary Sector** | MATH-01/B |
| **Language** | Italian |
| **Lecturers** | Prof. George Richard Paul Santi, |

| | |
|---|---|
| | GeorgeRichardPaul.Santi@unibz.it<br>https://www.unibz.it/en/faculties/education/academic-staff/person/39717 |
| **Teaching Assistant** | |
| **Semester** | Second semester |
| **CP** | 4 |
| **Responsible Lecturer** | |
| **Teaching Hours** | 40: Prof. George Richard Paul Santi |
| **Lab Hours** | 0 |
| **Individual Study Hours** | 60 |
| **Planned Office Hours** | 12 |
| **Contents Summary** | Teaching Basic Elements of Mathematics for its Didactics involves a critical analysis of the fundamental contents of the teaching of mathematics and life sciences in primary school as set out in the Provincial Directions of the Autonomous Province of Bolzano, the National Directions for the Curriculum and the PAT Guidelines. This analysis will be supplemented by work on materials such as national and international assessments, analysis of textbooks, and exploration of the main repositories of teaching materials. |
| **Course Topics** | The Provincial Indications for primary schools:<br>- numbers<br>- space and figures<br>- data and predictions<br>- relations and functions<br>- transversal nuclei |
| **Teaching Format** | Lectures, case discussions, exercises with discussion, analysis of standardized tests |
| **Required Readings** | Sabena, C., Ferri, F., Martignone, F. & Robotti, E. (2019). *Insegnare e apprendere matematica nella scuola dell'infanzia e primaria.* Milano: Mondadori.<br><br>Fandiño PinillaM.I, & Sbaragli, S. (2011). matematica di base per insegnare nella scuola primaria. |
| **Supplementary Readings** | D'Amore, B. (2000) Elementi di Didattica della Matematica. |

| | |
|---|---|
| | Bologna: Pitagora. |

# *Course Module*

| | |
|---|---|
| **Course Constituent Title** | Basics of Mathematics and its Didactics with an Emphasis on the Age Range (0)-2-7 (Lab.) |
| **Course Code** | 11410B |
| **Scientific-Disciplinary Sector** | MATH-01/B |
| **Language** | Italian |
| **Lecturers** | Prof. George Richard Paul Santi,<br>GeorgeRichardPaul.Santi@unibz.it<br>https://www.unibz.it/en/faculties/education/academic-staff/person/39717 |
| **Teaching Assistant** | |
| **Semester** | Second semester |
| **CP** | 2 |
| **Responsible Lecturer** | |
| **Teaching Hours** | 0 |
| **Lab Hours** | 30<br>Gruppi 1, 2 e 3: Prof. George Richard Paul Santi |
| **Individual Study Hours** | 20 |
| **Planned Office Hours** | 6 |
| **Contents Summary** | The teaching Basic elements of mathematics for its teaching with a focus on the age group (0)-2-7 includes exercises on teaching activities related to the subject content and the writing of reports. |
| **Course Topics** | Since this is a workshop, situations, materials, mediation tools and teaching experiences will be analysed in groups on the following nuclei:<br>- Approaching the concept of number<br>- the conquest of symbols<br>- orienting oneself in space<br>- measuring and measuring oneself<br>- recognising shapes |
| **Teaching Format** | Workshop |

| | |
|---|---|
| **Required Readings** | None |
| **Supplementary Readings** | |

# *Course Module*

| | |
|---|---|
| **Course Constituent Title** | Basics of Biology and Chemistry and their Didactics |
| **Course Code** | 11410C |
| **Scientific-Disciplinary Sector** | BIOS-01/A |
| **Language** | Italian |
| **Lecturers** | Prof. Dr.Dr. Robert Philipp Wagensommer, RobertPhilipp.Wagensommer@unibz.it https://www.unibz.it/en/faculties/education/academic-staff/person/40174 |
| **Teaching Assistant** | |
| **Semester** | Second semester |
| **CP** | 3 |
| **Responsible Lecturer** | |
| **Teaching Hours** | 30 |
| **Lab Hours** | 0 |
| **Individual Study Hours** | 45 |
| **Planned Office Hours** | 9 |
| **Contents Summary** | The teaching of "Basic elements of biology and chemistry for their didactics" has as its educational objectives the acquisition of a scientific approach to reality, the acquisition and application of the scientific method as well as the acquisition of general scientific and didactic contents and competences, proper to the disciplines of biological and chemical sciences in pre-school and primary school, as foreseen in the Provincial Indications of the Autonomous Province of Bolzano, in the National Indications for the curriculum and the PAT Guidelines.<br>The teaching intends to provide the basic tools and knowledge for an interdisciplinary view of the sciences, enabling the ability to read and interpret elementary natural, chemical-biological processes linked to everyday life. |
| **Course Topics** | In accordance with the national and provincial guidelines, the following topics are addressed, in relation to teaching in pre-school |

| | |
|---|---|
| | and primary school:<br>- Early science education in kindergarten and basic science education in primary school.<br>- Didactic principles of sustainable science education in kindergarten and primary school: natural sciences as an activity of observing, comparing, describing, classifying, asking questions, formulating hypotheses, drawing conclusions.<br>- Development of science-related interests, abilities and skills in early childhood.<br>- Current didactic concepts, principles and objectives of science education, particularly in the fields of biology and chemistry.<br>- To be able to answer children's questions scientifically correctly.<br>- Cells, living beings.<br>- Atoms, molecules.<br>- Photosynthesis.<br>- Biodiversity, classification of living beings.<br>- Structure of a plant: root, stem, leaf.<br>- Flowers, fruits.<br>- The most important animal groups.<br>- Plant and animal species native to Trentino-South Tyrol. |
| **Teaching Format** | Lectures with media support, invitation to oral reflection, critical case discussion, videos. |
| **Required Readings** | The slides that will be uploaded during the course via the digital learning platform set up for the course. |
| **Supplementary Readings** | Antonietti, M., & Bertolino, F. (a cura di) (2017) A tutta natura! Nuovi contesti formativi all'aria aperta per l'infanzia di oggi. Parma: Edizioni Junior, 206 pp.<br><br>Crudeli, F. (a cura di) (2021) L'outdoor education: per la costruzione di una comunità educante. Parma: Edizioni Junior, 127 pp.<br><br>Longo, C. (2014) Didattica della Biologia. Milano: Ledizioni, 262 pp.<br><br>Padoa-Schioppa, E. (2018) Metodi e strumenti per l'insegnamento |

| | |
|---|---|
| | e l'apprendimento della biologia. Ed. Edises. |

# *Course Module*

| | |
|---|---|
| **Course Constituent Title** | Basics of Biology and Chemistry and their Didactics with an Emphasis on the Age Range (0)-2-7 (Lab.) |
| **Course Code** | 11410D |
| **Scientific-Disciplinary Sector** | BIOS-01/A |
| **Language** | Italian |
| **Lecturers** | Prof. Dr.Dr. Robert Philipp Wagensommer, RobertPhilipp.Wagensommer@unibz.it https://www.unibz.it/en/faculties/education/academic-staff/person/40174<br>Dott. Mag. Michele Marcaccio, Michele.Marcaccio@unibz.it https://www.unibz.it/en/faculties/education/academic-staff/person/40854 |
| **Teaching Assistant** | |
| **Semester** | Second semester |
| **CP** | 2 |
| **Responsible Lecturer** | |
| **Teaching Hours** | 0 |
| **Lab Hours** | 20<br>Gruppi 1, 2: Dr. Michele Marcaccio, Gruppo 3: Prof. Dr. Dr. Robert Philipp Wagensommer |
| **Individual Study Hours** | 30 |
| **Planned Office Hours** | 6 |
| **Contents Summary** | The teaching "LAB Basic elements of biology and chemistry for their teaching with special attention to the age group (0)-2-7" intends to propose simple experiences and activities of observation and analysis to stimulate the development of the ability<br>- to find, analyse, use, modify and develop materials for work in situations involving the biological and chemical sciences<br>- to design interdisciplinary teaching/learning paths in biological and chemical sciences appropriate to the context situation (0)2-7 years and capable of stimulating the development of specific |

| | |
|---|---|
| | competences in the scientific disciplines. |
| **Course Topics** | -Experiences of observation, exploration and manipulation of objects and living organisms, useful for stimulating the understanding of the concept of living things from pre-school age.<br>-Didactic review of the activities carried out for their application in the age group (0-)2-7 years.<br>-Use of the microscope (specifically the stereomicroscope) for the observation of living organisms.<br>-Preparation of herbarium specimens.<br>-Games and experiments related to the plant and animal kingdoms. |
| **Teaching Format** | Guided practical exercises, using tools (formal and informal) and materials (structured and unstructured), group work and discussions. |
| **Required Readings** | None |
| **Supplementary Readings** | Antonietti, M., & Bertolino, F. (a cura di) (2017) A tutta natura! Nuovi contesti formativi all'aria aperta per l'infanzia di oggi. Parma: Edizioni Junior, 206 pp.<br><br>Crudeli, F. (a cura di) (2021) L'outdoor education: per la costruzione di una comunità educante. Parma: Edizioni Junior, 127 pp.<br><br>Longo, C. (2014) Didattica della Biologia. Milano: Ledizioni, 262 pp.<br><br>Padoa-Schioppa, E. (2018) Metodi e strumenti per l'insegnamento e l'apprendimento della biologia. Ed. Edises. |