Syllabus

Course Description

Course Title	Didactics of Natural Sciences
Course Code	11418
Course Title Additional	
Scientific-Disciplinary Sector	NN
Language	German; Italian
Degree Course	5 year master degree in Primary Education - Italian section
Other Degree Courses (Loaned)	LM-85 bis Education Ladin section
Lecturers	Prof. Federico Corni, Federico.Corni@unibz.it https://www.unibz.it/en/faculties/education/academic-staff/person/800 Prof. Dr.Dr. Robert Philipp Wagensommer, RobertPhilipp.Wagensommer@unibz.it https://www.unibz.it/en/faculties/education/academic-staff/person/40174 Dr. Mita Drius, Mita.Drius@unibz.it https://www.unibz.it/en/faculties/education/academic-staff/person/44449
Teaching Assistant	
Semester	First semester
Course Year/s	3
CP	11
Teaching Hours	60
Lab Hours	40
Individual Study Hours	175
Planned Office Hours	33
Contents Summary	See the individual course modules.
Course Topics	See the individual course modules.

Keywords	Systems thinking Game-based didactics Imaginative forms of expression Embodied mind Forces of Nature and Energy Biodiversity Evolution Human biology Ecosystems
Recommended Prerequisites	FIS: none. BIO: Attendance and successful completion of the Basic Elements of Biology and Chemistry module.
Propaedeutic Courses	
Teaching Format	Lectures, classroom experiences, case discussions, laboratory activities in small groups.
Mandatory Attendance	In accordance with the regulation
Specific Educational Objectives and Learning Outcomes	Knowledge Acquisition of the fundamental scientific and didactic concepts of the teaching of biological sciences and chemistry in pre-school and primary school, as set out in the Provincial Indications of the Autonomous Province of Bozen/Bolzano, the National Indications for the Curriculum and the PAT Guidelines: Methods of teaching biological sciences in primary education; human biology; living organisms and their main biological functions; similarities and differences between living organisms; transformations and changes occurring during the life of living organisms; relationships between living organisms, and between living organisms and their environment; morpho-functional adaptations of living organisms; evolution; chemistry as a bridging science between the scientific disciplines for an interdisciplinary view of science; elements of nature conservation. Critical knowledge of the fundamental contents of the teaching of physical sciences in pre-school and 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. Knowledge of the fundamental elements of planning teaching activities and teaching experiences in the physical, chemical and

	biological sciences from an interdisciplinary perspective. Competences Ability to scientifically read and interpret natural processes/events, particularly those related to everyday life. Ability to find, critically analyse, use, modify and develop materials for work in situations involving the physical, biological and chemical sciences. Ability to design interdisciplinary teaching/learning paths in natural, physical, chemical and biological sciences, appropriate to the context situation and able to stimulate the development of specific competences of the individual scientific disciplines. Ability to qualitatively evaluate learning processes. Ability to read and interpret everyday situations in scientific terms. Ability to find, criticise, use, modify and develop materials for work in situations involving the physical sciences. Ability to design interdisciplinary teaching/learning paths in physical, chemical and biological sciences adapting to the context situation. Ability to formatively assess learning. Disciplinary skills Knowledge and understanding: Critical knowledge and understanding of the basic and theoretical foundations of biology and chemistry, related to everyday life experiences consistent with the age of the children; knowledge of the disciplines' own research methods, including those applied to school contexts. Knowledge and mastery of the subject content of physics to be taught in pre-school and primary school; knowledge of the fundamental and transversal concepts of the discipline necessary for comprehension; knowledge and understanding of the specific and formal language of the discipline. Ability to apply knowledge and understanding: Ability to design didactic interventions concerning basic topics of physics, chemistry and biology, transversal to the sciences, which actively involve the class group, with its specificities; ability to promote intrinsic motivation in pupils to problems related to

	everyday life situations; ability to work in groups for the design, organisation and verification of educational-didactic interventions. Ability to use fundamental concepts in different everyday life contexts; ability to use natural language to correctly describe phenomena, ability to formalise, ability to differentiate fundamental concepts. Ability to design and carry out experiences in the field and in the contexts of everyday life. Ability to design and carry out laboratory experiences. Ability to collect, analyse and interpret experimental data Ability to construct graphs, tables, diagrams etc. for the analysis, representation and interpretation of processes. Soft skills Autonomy of judgement: Capacity for autonomous and critical reflection in relation to the acquired chi-mico-biological competences and the contents of the disciplinary teaching. Students must be able to interpret natural phenomena autonomously and originally, using the concepts discussed and dealt with in the course. Communication skills: Students should be able to communicate their own thinking clearly and critically, to be able to question it by identifying developments and improvements from the dialogue with other students, the teacher or hypothetically children; to be able to communicate the contents of the discipline in an appropriate way to children, to be able to interpret children's speeches from the perspective of science education. Learning skills: Possess skills that can be used in study strategies for continuing education and have the ability to find sources to update and deepen them. Students are expected to demonstrate autonomy in learning with the ability to formulate questions, plan activities, and synthesise.
Specific Educational Objectives and Learning Outcomes (additional info.)	

Assessment	Examination procedure: individual oral examination on the content of the lectures, with discussion of group work carried out in the labs. The exam score is composed of the scores of the individual parts (lecture and lab of physics, lecture and lab of biology) weighted against the relative number of CFUs. The four parts must be passed individually with a score of no less than 60%. In the event of a failing grade for the entire course, any parts successfully passed will be considered as already passed on the next attempt to take the entire examination. It should be taken into account that, even in this case, a negative mark for the entire course will be counted in the number of attempts available to take an examination. According to the Examinations Regulations, if a student fails an examination in three consecutive attempts, he/she may not attend the same examination in the three sessions following the last attempt (Art. 6(4) of the current Regulations for Proficiency Examinations).
Evaluation Criteria	In the examinations, students are required to demonstrate that they have learnt the content covered in the course and are able to apply it to concrete situations, also by producing teaching materials. Assessment criteria: knowledge of the required content, logical structure, clarity and coherence of argument, formal and linguistic correctness.
Required Readings	Physics: H.U. Fuchs and F. Corni, (2023). Primary Physical Science Education - An imaginative approach to encounters with nature. Springer, Open Access.
Supplementary Readings	Physics: • Egan, K. (1986). Teaching as Story Telling. An alternative approach to teaching and curriculum in the elementary school. The University of Chicago Press. • Egan, K. (2012). La comprensione multipla. Sviluppare una mente somatica, mitica, romantica, filosofica e ironica. Erickson.

	Biology: • Fthenakis, W. E. (2009). Natur-Wissen schaffen - Band 3: Frühe naturwissenschaftliche Bildung. Bildungsverlag Eins. • Lück, G. (2018). Handbuch naturwissenschaftliche Bildung in der Kita. Herder. • Padoa-Schioppa E., 2018. Metodi e strumenti per l'insegnamento e l'apprendimento della biologia. Ed. Edises. • Schmiemann, P. & Mayer, G. (Hrsg.) (2016). Experimentieren Sie! Biologieunterricht mit Aha-Effekt. • Stäudel L., Werber B., & Wodzinski R. (2006). Forschen wie ein Naturwissenschaftler: Das Arbeits- und Methodenbuch. Friedrich Any other materials will be made available to students on OLE, Reserve Collection or Teams.
Further Information	
Sustainable Development Goals (SDGs)	Good health and well-being, Quality education, Clean water and sanitation, Affordable and clean energy, Life on land, Responsible consumption and production, Climate action, Life below water, Reduced inequalities

Course Module

Course Constituent Title	Basics of Physics and its Didactics
Course Code	11418A
Scientific-Disciplinary Sector	PHYS-06/B
Language	Italian
Lecturers	Prof. Federico Corni, Federico.Corni@unibz.it https://www.unibz.it/en/faculties/education/academic-staff/person/800
Teaching Assistant	
Semester	First semester
CP	3
Responsible Lecturer	
Teaching Hours	30
Lab Hours	0
Individual Study Hours	45

Planned Office Hours	9
Contents Summary	Lessons in which physics topics are revisited from a didactic point of view, seeking to identify elementary conceptualisations, cognitive tools and language suitable for children in their first encounter with natural phenomena.
Course Topics	Reference to the Provincial Indications and the National Indications. Natural phenomena, with particular reference to children's direct experience (wind, rain, heat, light, electrical phenomena, motion, etc.). Intensive, extensive aspects of natural phenomena. Introduction to the notion of energy. Metaphorical, analogical and narrative thinking in the understanding of natural phenomena. Understanding and cognitive tools. Stories of forces of nature. Introduction to systems thinking.
Teaching Format	Lectures, classroom experiences, case discussions.
Required Readings	H.U. Fuchs and F. Corni, (2023). Primary Physical Science Education – An imaginative approach to encounters with nature. Springer, Open Access.
Supplementary Readings	

Course Module

Course Constituent Title	Didactics of Physics with an Emphasis on the Age Range (0)-2-7 (Lab.)
Course Code	11418B
Scientific-Disciplinary Sector	PHYS-06/B
Language	Italian
Lecturers	Prof. Federico Corni, Federico.Corni@unibz.it https://www.unibz.it/en/faculties/education/academic-staff/person/800
Teaching Assistant	
Semester	First semester
CP	2
Responsible Lecturer	
Teaching Hours	0

Lab Hours	20 Gruppi 1, 2 e 3: Prof. Federico Corni
Individual Study Hours	30
Planned Office Hours	6
Contents Summary	Proposal of experiences and activities of observation, exploration, manipulation and analysis to stimulate the development of the following skills - applying the methodologies and cognitive tools introduced in class; - designing interdisciplinary science teaching and learning paths with reference to children aged 2 to 7.
Course Topics	Analysis of materials proposed by the teacher and activities of production in small groups. Laboratory experiences in various scientific contexts. Development of teaching materials with a focus on the 2-7 age group.
Teaching Format	Workshop with small group activities and elaboration of materials.
Required Readings	H.U. Fuchs and F. Corni, (2023). Primary Physical Science Education – An imaginative approach to encounters with nature. Springer, Open Access.
Supplementary Readings	

Course Module

Course Constituent Title	Didactics of Biology and Chemistry: In-depth Analysis of Selected Topics
Course Code	11418C
Scientific-Disciplinary Sector	BIOS-01/A
Language	German
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	First semester
CP	4
Responsible Lecturer	

Teaching Hours	30
Lab Hours	0
Individual Study Hours	70
Planned Office Hours	12
Contents Summary	The course "Didactics of biology and chemistry: in-depth content" has the pedagogical goal of acquiring scientific and didactic concepts that are fundamental to the teaching of biology and chemistry in primary and secondary schools. These concepts are provided for in the framework guidelines of the Autonomous Province of Bolzano, in the national curriculum guidelines and in the PAT guidelines. The course aims to provide basic knowledge necessary for the planning of interdisciplinary activities and didactic experiences in the field of biological and chemical sciences in order to develop the ability to read, describe and interpret reality and natural processes in everyday life.
Course Topics	In accordance with the National Guidelines and Provincial Guidelines, the following topics are addressed, in relation to teaching in pre-school and primary school: - environmental, climate and energy crisis, sustainable development and environmental education; - plant blindness; - flora and vegetation; - the scientific method; - herbaria and botanical gardens; - main causes of biodiversity loss: habitat destruction, invasive alien species; - nature conservation: endangered species, red lists, protected areas; - ecosystems, biomes, interactions between organisms and their relations with the environment; - altitudinal vegetation belts in the Alps; - ecosystem services; - water cycle, biogeochemical cycles of elements; - food chain, food web; - evolution and adaptation, extinctions, evolutionary history of life on Earth; - relationship between form and function; - the human body;

	- poisonous and dangerous plants, mushrooms and animals in Trentino-South Tyrol; - indications, suggestions and reflections on the didactic aspects of the biological and chemical sciences with a focus on fundamental and transversal science concepts.
Teaching Format	Lecture with media support, invitation to oral reflections, 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	Fthenakis, W. E. (2009). Natur-Wissen schaffen - Band 3: Frühe naturwissenschaftliche Bildung. Bildungsverlag Eins. Lück, G. (2018). Handbuch naturwissenschaftliche Bildung in der Kita. Herder. Schmiemann, P. & Mayer, G. (Hrsg.) (2016). Experimentieren Sie! Biologieunterricht mit Aha-Effekt. Stäudel L., Werber B., & Wodzinski R. (2006). Forschen wie ein Naturwissenschaftler: Das Arbeits- und Methodenbuch. Friedrich. Further reading recommendations can be provided via the digital learning platform set up for the course.

Course Module

Course Constituent Title	Didactics of Biology and Chemistry with an Emphasis on the Age Range 5-12 (Lab.)
Course Code	11418D
Scientific-Disciplinary Sector	BIOS-01/A
Language	German
Lecturers	Dr. Mita Drius, Mita.Drius@unibz.it https://www.unibz.it/en/faculties/education/academic-

	staff/person/44449
Teaching Assistant	
Semester	First semester
CP	2
Responsible Lecturer	
Teaching Hours	0
Lab Hours	20 Gruppo 1, 2 e 3: Dr. Mita Drius
Individual Study Hours	30
Planned Office Hours	6
Contents Summary	The laboratory "Didactics of Biology and Chemistry with special attention to ages 5-12" aims to propose experiences and activities of observation, exploration, manipulation and analysis to stimulate the development of the following skills: - Find, analyse, use, modify and develop materials and concepts for work in biology and chemistry; - design interdisciplinary science teaching and learning pathways appropriate to the contextual situation of 5-12 year olds and capable of stimulating the development of specific competences of the scientific disciplines.
Course Topics	Implementation of didactic concepts and models for science education in the fields of biology and chemistry with a focus on primary school practice: - Acquisition of basic experimentation skills to enable scientific processes in chemistry and biology education and learning and to awaken and encourage pupils' interest in natural processes. - Practical examples for promoting and initiating scientific thinking and working methods as well as problem-solving strategies such as observing, comparing, organising, describing, asking questions, carrying out and planning experiments, evaluating, drawing conclusions, reflecting, linking and applying. - Practical examples of learning experiences and learning environments with a focus on the "experiment" to promote and further develop scientific skills in accordance with the content areas of the lecture. - Planning, implementation, reflection and evaluation of learning tasks from biology and chemistry and selection of suitable learning

	environments for primary schools. - Reflection on the importance of practical work in the natural sciences with a focus on biology and chemistry as well as further development of one's own attitude towards learning through research and discovery. - Application of common methods and languages in physics and biology.
Teaching Format	Laboratories with group work; reflection tasks and documentation tasks at home; preparation of a learning task or learning experience; independent realisation of a long-term experiment and documentation.
Required Readings	N/A
Supplementary Readings	• Schmiemann, P. & Mayer, G. (Hrsg.) (2016). Experimentieren Sie! Biologieunterricht mit Aha-Effekt. • Padoa-Schioppa E., (2018). Metodi e strumenti per l'insegnamento e l'apprendimento della biologia. Ed. Edises