Syllabus

Descrizione corso

Titolo insegnamento	Didattica della matematica e sviluppo dei concetti scientifici nella prima infanzia
Codice insegnamento	400004
Titolo aggiuntivo	
Settore Scientifico-Disciplinare	NN
Lingua	Tedesco
Corso di Studio	Corso di laurea magistrale a ciclo unico in Scienze della Formazione primaria - sezione tedesca
Altri Corsi di Studio (mutuati)	
Docenti	mag. Christian Laner, Christian.Laner@unibz.it prof. dr. Reinhard Tschiesner, reinhard.tschiesner@unibz.it https://www.unibz.it/en/faculties/education/academic-staff/person/29821 prof. dr. Angelika Pahl, AnPahl@unibz.it https://www.unibz.it/en/faculties/education/academic-staff/person/31985 Dott. mag. Vera Knapp, Vera.Knapp@unibz.it https://www.unibz.it/en/faculties/education/academic-staff/person/36686 Prof. Dr.Dr. Robert Philipp Wagensommer, RobertPhilipp.Wagensommer@unibz.it https://www.unibz.it/en/faculties/education/academic-staff/person/40174 Dott. mag. Irene Köfele, Irene.Koefele@unibz.it https://www.unibz.it/en/faculties/education/academic-

	staff/person/47254 Dott. mag. Sonia Pichler, Sonia.Pichler@unibz.it https://www.unibz.it/en/faculties/education/academic-staff/person/48873 dr. Marion Zöggeler, Marion.Zoeggeler@unibz.it https://www.unibz.it/en/faculties/education/academic-staff/person/55087 Dott. mag. Judith Kerschbaumer, Judith.Kerschbaumer@unibz.it https://www.unibz.it/en/faculties/education/academic-staff/person/45891
Assistente	
Semestre	Secondo semestre
Anno/i di corso	1
CFU	12
Ore didattica frontale	92
Ore di laboratorio	32
Ore di studio individuale	176
Ore di ricevimento previste	36
Sintesi contenuti	The course modules provide fundamental disciplinary, pedagogical, and developmental competencies for designing educational and learning processes in early childhood and primary education. The courses focus on fostering mathematical and scientific ways of thinking, as well as supporting the development of knowledge, concepts, and categories during early childhood. Students engage with theoretical foundations of learning and cognitive development while exploring how children can be guided in constructing mathematical and scientific understandings. Through the integration of theory and practice, participants examine, test, and reflect upon appropriate learning environments, materials, and didactic approaches, evaluating their educational effectiveness. Particular emphasis is placed on child-centered learning, the role of language in knowledge construction, and the balance between guided instruction and independent learning processes.
Argomenti	See the individual course modules.

dell'insegnamento	
Parole chiave	Early mathematics education, mathematics didactics, numbers and operations, cognitive development, knowledge structuring, category and concept formation, learning environments, language development, early science education, physical concepts, inquiry-based learning, child-centered education, practice and reflection.
Prerequisiti	
Insegnamenti propedeutici	
Modalità di insegnamento	See the individual course modules.
Obbligo di frequenza	In accordance with the regulation
Obiettivi formativi specifici e risultati di apprendimento attesi	1. Knowledge and understanding By the end of the course, students will be able to: - Demonstrate knowledge of key theories regarding cognitive and conceptual development in early childhood, with particular focus on Core Knowledge systems, executive functions, and Embodied Cognition. - Understand how young children build spontaneous explanations and construct physical and mathematical concepts through action, movement, gestures, and sensory experiences. - Master fundamental content within the "Numbers and Operations" conceptual domain (number systems, computation, early algebra, properties, and algorithms). 2. Applying knowledge and understanding By the end of the course, students will be able to: - Design learning units and educational activities for preschool and primary school, integrating mathematics, physics, science education, and developmental psychology. - Utilize physical artifacts, digital tools, and mediating instruments to foster exploration, modeling, and problem-solving in young learners. - Analyze and interpret educational situations and children's outputs (verbal, gestural, and graphical) related to mathematical and physical phenomena. - Implement laboratory-based teaching strategies and cooperative learning to promote hypothesis generation, reasoning, and active concept formation. - Comprehend theoretical and pedagogical frameworks in

	mathematics education (laboratory-based learning, Activity Theory, didactic transposition, didactic contract, semiotic registers of representation, and multimodality). 3. Making judgements By the end of the course, students will be able to: - Critically evaluate instructional materials, laboratory experiences, and pedagogical proposals concerning early childhood mathematics and science education. - Reflect critically on teaching practices, recognizing the teacher's role, the influence of the didactic contract, and the value of children's intuitive ideas. - Select and adapt mathematical and scientific tasks appropriately based on children's cognitive development levels and classroom needs. 4. Communication skills By the end of the course, students will be able to: - Use appropriate, precise disciplinary terminology across mathematics, science education, and developmental psychology. - Facilitate and orchestrate mathematical and scientific discussions in the classroom, encouraging peer reasoning, debate, and collaborative meaning-making. - Present, justify, and discuss instructional designs clearly with peers and instructors using digital tools and multimodal representations. 5. Learning skills By the end of the course, students will be able to: - Independently access and analyze research literature, bibliographic sources, and educational materials in early childhood mathematics and science education. - Cultivate a reflective attitude toward self-assessment and continuous professional development. - Apply acquired theoretical frameworks to analyze real educational settings and address future teaching challenges.
Obiettivi formativi specifici e risultati di apprendimento attesi (ulteriori info.)	

Modalità di esame	Written exam
Criteri di valutazione	Academic accuracy, depth of argumentation, use of appropriate academic language, knowledge of methodology, ability to reflect, formal correctness
Bibliografia obbligatoria	See the individual course modules.
Bibliografia facoltativa	See the individual course modules.
Altre informazioni	
Obiettivi di Sviluppo Sostenibile (SDGs)	Ridurre le disuguaglianze, Istruzione di qualità

Modulo del corso

Titolo della parte costituente del corso	Didattica della matematica per la scuola dell'infanzia e primaria 1: numeri e operazioni
Codice insegnamento	400004A
Settore Scientifico-Disciplinare	MATH-01/B
Lingua	Tedesco
Docenti	
Assistente	
Semestre	Secondo semestre
CFU	7
Docente responsabile	
Ore didattica frontale	56
Ore di laboratorio	0
Ore di studio individuale	119
Ore di ricevimento previste	21
Sintesi contenuti	The course covers the disciplinary and subject-specific pedagogical foundations that early childhood educators and primary school teachers must possess in order to initiate, support, and foster learning processes in the content domain of numbers and operations (arithmetic), from kindergarten through the end of primary education, in a manner that is both mathematically sound and responsive to the individual potential of each child.

Argomenti dell'insegnamento	Mathematics as an activity of discovering, describing, constructing, and justifying patterns and structures; the development of mathematics-related interests, abilities, and skills in early childhood; concepts of early mathematics education in alignment with the curricular guidelines for kindergarten in South Tyrol and with current research in mathematics education; disciplinary and subject-specific pedagogical foundational knowledge for the learning-supportive treatment of the content domain of number (arithmetic), preceded by classifying and sorting according to attributes and engaging with sets, from kindergarten through the transition to lower secondary education (development of the concept of number; elements of number theory; foundations of fractions and rational numbers in decimal representation; place-value systems; laws of arithmetic; methods and strategies for the four basic operations), with continuous attention to the overarching mathematical competencies of problem solving, communication, representation, reasoning, and modelling/mathematisation.
Modalità di insegnamento	Lecture supported by multimedia presentations, interspersed with individual and small-group activities, complemented by regular opportunities for (also written) reflection and for providing detailed feedback on the course.
Bibliografia obbligatoria	Benz, Ch., Peter-Koop, A., & Grüßing, M. (2015). Frühe mathematische Bildung. Mathematiklernen der Drei- bis Achtjährigen. Springer Spektrum. - Daraus: Kapitel 1, 2 und 4 Gaidoschik, M. (2025). Lernschwierigkeiten in Mathematik. Warum wir nicht von Rechenschwäche und Dyskalkulie sprechen und was wir ab dem Kindergarten tun sollten. Persen. Padberg, F. & Benz, Ch. (2021). Didaktik der Arithmetik (4. Auflage). Spektrum.
Bibliografia facoltativa	Benz, Ch., Maier, A., Reuter, F., Sprenger, P., Zöllner, J. (2024). Mathematik entdecken in Kita und Grundschule. Spiel- und Lernsituationen aus der Mach-mit-Werkstatt MiniMa. Klett-Kallmeyer.

	Gaidoschik, M. (2025). Das dezimale Stellenwertsystem verstehen, verinnerlichen, flexibel anwenden: Ein Leitfaden für den Unterricht in der Grundschule. Klett-Kallmeyer. Gaidoschik, M. (2026). Einmaleins verstehen, vernetzen, merken. Strategien gegen Lernschwierigkeiten (7. Auflage). Kallmeyer-Klett.

Modulo del corso

Titolo della parte costituente del corso	Didattica della matematica per la scuola dell'infanzia e primaria 1: numeri e operazioni (lab.)
Codice insegnamento	400004B
Settore Scientifico-Disciplinare	MATH-01/B
Lingua	Tedesco
Docenti	mag. Christian Laner, Christian.Laner@unibz.it Dott. mag. Vera Knapp, Vera.Knapp@unibz.it https://www.unibz.it/en/faculties/education/academic-staff/person/36686 Dott. mag. Irene Köfele, Irene.Koefele@unibz.it https://www.unibz.it/en/faculties/education/academic-staff/person/47254 dr. Marion Zöggeler, Marion.Zoeggeler@unibz.it https://www.unibz.it/en/faculties/education/academic-staff/person/55087 Dott. mag. Judith Kerschbaumer, Judith.Kerschbaumer@unibz.it https://www.unibz.it/en/faculties/education/academic-staff/person/45891
Assistente	

Semestre	Secondo semestre
CFU	2
Docente responsabile	
Ore didattica frontale	0
Ore di laboratorio	32 Gruppe 1: Dr. Marion Zöggeler Gruppe 2: Mag. Christian Laner Gruppe 3: Dott. Mag. Vera Knapp Gruppe 4: Dott. Mag. Irene Köfele Gruppe 5: Dott. Mag. Judith Kerschbaumer
Ore di studio individuale	18
Ore di ricevimento previste	6
Sintesi contenuti	The laboratory serves, on the one hand, to support students in acquiring the content of the lecture "Didactics of Mathematics for Kindergarten and Primary School 1: Numbers and Operations" through practical exercises in small groups. On the other hand, it provides opportunities for the practical exploration and testing of substantial tasks, materials, and media for early mathematics education. A central element of the laboratory is the critical reflection on the experiences gained in these exercises and their systematic connection to the theoretical frameworks addressed in the lecture.
Argomenti dell'insegnamento	Reflection on and further development of one's own beliefs and attitudes toward mathematics and the learning of mathematics; discovering, exploring, describing, extending, and justifying patterns and structures as a guiding principle of mathematical activity from kindergarten onward; games, everyday situations, substantial tasks, and learning environments that stimulate and foster the (further) development of competencies in the specified content domains; practical exercises aimed at deepening students' own disciplinary understanding, as well as the analysis and implementation of current subject-specific pedagogical concepts, methods, and instructional materials related to the content areas of "numbers" (including foundational aspects of fractions and rational numbers in decimal representation relevant already at the primary level), "place-value systems," and "laws of arithmetic, computational methods, and strategies for the four basic operations," with continuous attention to the overarching

	mathematical competencies of problem solving, communication, representation, reasoning, and modelling/mathematisation.
Modalità di insegnamento	The workshops combine theoretical input with individual, pair, and group work, as well as discussions. Short written assignments are primarily intended to prepare students for the laboratory sessions, and the discussion of these assignments constitutes an integral part of the sessions. Assessment for the laboratory is based on assignments to be completed outside the scheduled sessions and submitted by the specified deadlines.
Bibliografia obbligatoria	Benz, Ch., Peter-Koop, A., & Grüßing, M. (2015). Frühe mathematische Bildung. Mathematiklernen der Drei- bis Achtjährigen. Springer Spektrum. - Daraus: Kapitel 1, 2 und 4 Gaidoschik, M. (2025). Lernschwierigkeiten in Mathematik. Warum wir nicht von Rechenschwäche und Dyskalkulie sprechen und was wir ab dem Kindergarten tun sollten. Persen. Padberg, F. & Benz, Ch. (2021). Didaktik der Arithmetik (4. Auflage). Spektrum.
Bibliografia facoltativa	Benz, Ch., Maier, A., Reuter, F., Sprenger, P., Zöllner, J. (2024). Mathematik entdecken in Kita und Grundschule. Spiel- und Lernsituationen aus der Mach-mit-Werkstatt MiniMa. Klett-Kallmeyer. Gaidoschik, M. (2025). Das dezimale Stellenwertsystem verstehen, verinnerlichen, flexibel anwenden: Ein Leitfaden für den Unterricht in der Grundschule. Klett-Kallmeyer. Gaidoschik, M. (2026). Einmaleins verstehen, vernetzen, merken. Strategien gegen Lernschwierigkeiten (7. Auflage). Kallmeyer-Klett.

Modulo del corso

Titolo della parte costituente del corso	Sviluppo di categorie e concetti nella prima infanzia (sem.)
Codice insegnamento	400004C
Settore Scientifico-Disciplinare	PSIC-02/A
Lingua	Tedesco
Docenti	prof. dr. Reinhard Tschiesner, reinhard.tschiesner@unibz.it https://www.unibz.it/en/faculties/education/academic-staff/person/29821
Assistente	
Semestre	Secondo semestre
CFU	1
Docente responsabile	
Ore didattica frontale	12 Gruppe 1 und 2: Prof. Dr. Reinhard Tschiesner
Ore di laboratorio	0
Ore di studio individuale	13
Ore di ricevimento previste	3
Sintesi contenuti	This seminar focuses on the structuring of knowledge in early childhood. Central to this are the terms category and concept. The course explores how categories and concepts change throughout the process of cognitive development.
Argomenti dell'insegnamento	Knowledge representations, categories, concepts
Modalità di insegnamento	Synchronus and asychronous Course (Lectures, individual work, group work) The seminar takes place remotely.
Bibliografia obbligatoria	Pauen, S. & Träuble, B. (2006). Kategorisierung und Konzeptbildung. In W. Schneider & B. Sodian (Eds.), *Enzyklopädie der Psychologie. Entwicklungspsychologie, Band 2* (p. 377-407). Hogrefe.

	Siegler, R., Eisenberg, N., DeLoache, J & Saffran, J. (Eds.) (2021). *Entwicklungspsychologie des Kindes- und Jugendalters (5th Edition)*. Springer.
Bibliografia facoltativa	

Modulo del corso

Titolo della parte costituente del corso	Sviluppo di categorie e concetti nella prima infanzia (sem.)
Codice insegnamento	400004D
Settore Scientifico-Disciplinare	MATH-01/B
Lingua	Tedesco
Docenti	Dott. mag. Sonia Pichler, Sonia.Pichler@unibz.it https://www.unibz.it/en/faculties/education/academic-staff/person/48873
Assistente	
Semestre	Secondo semestre
CFU	1
Docente responsabile	
Ore didattica frontale	12 Gruppe 1 und 2: Dott. Mag. Sonia Pichler
Ore di laboratorio	0
Ore di studio individuale	13
Ore di ricevimento previste	3
Sintesi contenuti	Complementing and extending the lecture "Didactics of Mathematics for Kindergarten and Primary School 1: Numbers and Operations," the seminar elaborates the subject-specific pedagogical perspective on early mathematics education, both theoretically and, in particular, with regard to its practical and pedagogical implications. It addresses a dual orientation toward the child and the discipline, the continuous effort to balance instruction and construction, the significance of language for learning mathematics, and the possibilities as well as the limitations of the three principal organizational forms of early

	mathematics education: everyday situations, play, and structured learning activities.
Argomenti dell'insegnamento	Variations in the development of the concept of number in early childhood as a function of instructional stimuli; the role of subitizing and quasi-subitizing, and the implications thereof for early mathematics education; variations in the development of understanding of the fundamental quantitative concepts of "equal quantity," "more," and "less."
Modalità di insegnamento	The seminar takes place remotely. Synchronous and asynchronous online teaching, including lectures supported by media, guided questions and learning activities, individual and collaborative group work, and structured discussions.
Bibliografia obbligatoria	Gaidoschik, M. (2025). *Lernschwierigkeiten in Mathematik. Warum wir nicht von Rechenschwäche und Dyskalkulie sprechen und was wir ab dem Kindergarten tun sollten.* Persen. - Out of this: Chapter 4: Frühes Mathematiklernen und mögliche frühe Schwierigkeiten
Bibliografia facoltativa	Benz, Ch., Peter-Koop, A., Grüßing, M. (2015). *Frühe mathematische Bildung. Mathematiklernen der Drei- bis Achtjährigen.* Springer Spektrum. - Out of this: Chapters 1 to 4.

Modulo del corso

Titolo della parte costituente del corso	Sviluppo di categorie e concetti nella prima infanzia (sem.)
Codice insegnamento	400004E
Settore Scientifico-Disciplinare	PHYS-06/B
Lingua	Tedesco
Docenti	prof. dr. Angelika Pahl, AnPahl@unibz.it https://www.unibz.it/en/faculties/education/academic-staff/person/31985
Assistente	
Semestre	Secondo semestre
CFU	1

Docente responsabile	
Ore didattica frontale	12 Gruppe 1 und 2: Prof. Dr. Angelika Pahl
Ore di laboratorio	0
Ore di studio individuale	13
Ore di ricevimento previste	3
Sintesi contenuti	The seminar illustrates how children develop intuitive conceptions of the physical world in early childhood. Based on this insights, the course examines how the development of physical concepts and the categorization of phenomena can be specifically fostered through suitable learning environments and didactic stimuli.
Argomenti dell'insegnamento	- From everyday experiences to initial physical concepts and categories - Exploratory, play-based, and active-discovery learning - Learning facilitation for interest-led science learning - Gaining insight into children's conceptions of physical phenomena
Modalità di insegnamento	The seminar takes place remotely. Online seminar (synchronous / asynchronous) with group and individual work
Bibliografia obbligatoria	Möller, C. Lernen von Naturwissenschaften heisst: Konzepte verändern. In Labudde, P. (Hrsg.) Fachdidaktik Naturwissenschaften (S. 57-72). Haupt.
Bibliografia facoltativa	Wagenschein, M. (2003). Kinder auf dem Wege zur Physik. Beltz.