# Austria (High School) Curriculum Standards (A-C)

**The presentations offered by The Educated Choices Program provide support for teaching and learning of the following standards:**

| Biology & Environmental Studies, grades 9-12 | | Environment and Modern Agriculture | Healthful Eating |
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| Grade 9-12 | Contribution to the educational areas<br>● The contribution to the educational areas of the school below is related to the learning content and the basic concepts, the competence model and the teaching principles.<br>Language and communication<br>● Promotion of reading and writing skills as well as oral expression in various teaching situations;<br>● Introduction to the technical language;<br>● Inclusion of German and foreign-language specialist literature.<br>People & Society<br>● Man as a biological and social being;<br>● Humans as influencing factors of ecosystems;<br>● Economics and Sustainability (Consumer Education);<br>● Interaction between ecology, economy, regional and national politics and social development;<br>● Application of biological knowledge to social issues.<br>Nature and technology<br>● Phenomenon life; | ✔ | ✔ |

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| | • Networking of living systems, impact of human activities on ecosystems;<br>• Species knowledge and species protection;<br>• Environmental education for sustainable development;<br>• Bioethics;<br>• Energy as a conserved quantity;<br>• Scientific ways of thinking and working.<br>Health and movement<br>• Relationship between health and ability to perform;<br>• Biological prerequisites for movement;<br>• Health and disease as a biological and social phenomenon;<br>• Sex education;<br>• Health education.<br>Creativity and design<br>• Development of research designs;<br>• Modeling;<br>• Knowledge communication through the use of different media;<br>• Media education.<br>Didactic principles (3rd and 4th semester)<br><br>The competence model for natural sciences as a guideline for teaching biology and environmental studies<br><br>The competency model for natural sciences specifies the characteristics of scientific research work as a dimension of action. There are three areas of competency:<br>• Acquisition of expertise<br>• Gaining knowledge independently by means of observation and experiment | | |

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| | • Application of knowledge and insights, justifying positions in social discourse and acting in a reflective manner in everyday life<br>In the context of the subject biology and environmental studies, these areas of competence are described as follows:<br>• Acquiring and communicating knowledge<br>• W1: Describe and name biological processes and phenomena.<br>• W2: Take subject-specific information from different media and sources.<br>• W3: Present and explain processes and phenomena in various forms (graphs, tables, images, diagrams, ...) and communicate them in a way that is appropriate for the recipient.<br>• W4: Explain processes and phenomena using specialist knowledge using laws (models, rules, laws, functional relationships).<br>• W5: Explain biological processes and phenomena in the context of their evolutionary context.<br>Gain insights<br>• E1: Observe, measure and describe biological processes and phenomena.<br>• E2: Analyzing biological processes and phenomena with regard to evolutionary biological criteria and working out relationships<br>• E3: Ask questions and formulate hypotheses about biological processes and phenomena.<br>• E4: Plan, carry out and record investigations or experiments on scientific issues.<br>• E5: Analyze data and results of investigations (e.g. arrange, compare, determine dependencies) and interpret.<br>Justify positions and act in a reflective manner<br>• S1: Argue correctly and logically and differentiate between scientific and non-scientific arguments. | | |

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| | • S2: Discuss and evaluate facts and problems in a considered manner, taking into account controversial points of view.<br>• S3: Recognize the importance, opportunities and risks of applying scientific knowledge for the individual and for society in order to act responsibly.<br>• S4: Reflecting on human patterns of experience and behavior from an evolutionary point of view.<br>• S5: Create and design recommendations for action (e.g. nature conservation strategies, health concepts, nutrition plans, ...).<br>In order to enable students to form biological education as part of the basic scientific education (Scientific literacy), the lessons in the subject of biology and environmental studies must be designed in such a way that competencies from all three areas mentioned above are acquired and promoted on the basis of the learning content of each semester .<br><br>Basic concepts to support competence-oriented learning<br>• Basic concepts help to recognize fundamental patterns in biology.<br>• They are derived from the elementary concepts of biology and support students and teachers in ordering and linking the difficult to understand and constantly growing subject areas of the biological disciplines.<br>• Seven overarching areas are formulated below, from which a large number of different phenomena can be related to one another.<br>• They help learners to network content, to organize the wealth of topics in a meaningful way and to appropriate them.<br>• The curriculum content is therefore developed on the basis of these concepts and linked to them on an ongoing basis.<br>The achieved basic understanding of biology enables the assessment of biological findings, | | |

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| | ● for example in the environmental area, taking into account nature conservation and sustainable development, in the biotechnological area or in medicine, taking into account economic, social and ethical aspects.<br>● Dealing with the interactions within or between biosystems promotes systemic thinking and counteracts purely linear thinking.<br>● This allows participation in social discourses.<br>In principle, any content can be viewed from the perspective of any basic concept.<br>● The application of the basic concepts to the curriculum content is the responsibility of the teacher, depending on which concepts are used to develop a specific content.<br>Structure and function<br>● Capturing, ordering and recognizing structures is the basis for understanding and explaining biological functions at all system levels and in the course of their development.<br>● It helps, for example, to understand the following phenomena:<br>○ Principle of surface enlargement<br>○ Key-lock principle<br>○ Counterflow principle<br>○ Opponent principle<br>Reproduction<br>Living things are capable of reproduction.<br>● This is based on the transmission of genetic information and leads to diversity within organisms and thus to an evolutionary adaptation to a dynamic environment.<br>● It helps, for example, to understand the following processes:<br>○ Identical replication of genetic information<br>○ Mutation and recombination<br>○ Growth based on cell division processes (mitosis) | | |

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| | ○ Formation of gametes (meiosis)<br>○ Sexual reproduction and asexual reproduction<br>○ Succession of generations and evolution in populations<br>Compartmentalization<br>This basic concept illustrates the building block principle of organisms and ecosystems.<br>● It helps, for example, to understand the following phenomena:<br>○ Cell organelles, cells, tissues and organs as delimited reaction spaces within an organism (principle of division of labour)<br>○ Compartmentalization at the level of populations (division of labor in socially organized species) and ecosystems<br>Control and regulation<br>Living systems maintain certain states through regulation and react to changes.<br>● Regulation means that the internal states of a living being remain within a functional framework (set value) despite changing environmental and living conditions.<br>● Control describes the ability of an organism to actively change certain parameters independently of target values.<br>● As a rule, controls are used to adapt to changed conditions.<br>● It helps, for example, to understand the following phenomena:<br>○ Hormonal regulation<br>○ Feedback mechanisms<br>○ Function of the nervous system<br>○ Controlling developmental processes by altering gene activation<br>○ Relationships between organisms and communities<br>Material and energy conversion<br>Living beings are open systems and bound to material and energy conversion. | | |

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| | ● The ongoing release of energy is balanced by a constant supply of energy in the sense of a dynamic equilibrium.<br>● It helps, for example, to understand the following phenomena:<br>○ Assimilation<br>○ Dissimulation<br>○ Nutrition, Digestion and Elimination<br>○ Conservation and transformation of matter and flow of energy<br>○ Material cycles in an ecosystem<br>Information and communication<br>Living beings - and also their cells and tissues - have the ability to take in information, forward it, store it, process it and pass it on to other organisms.<br>● Communication is the mutual exchange of information.<br>● This requires a common language or specific stimuli that can be picked up and decoded by the receiver.<br>● It helps, for example, to understand the following processes:<br>○ excitation line<br>○ recording information from the environment via sensory cells and sensory organs<br>○ communication at cellular and molecular level (e.g. immune system and hormone system)<br>○ genetic and epigenetic information<br><br>Variability, relatedness, history and evolution<br>The variability in living beings is caused by the mutation of hereditary factors and their recombination in connection with sexual reproduction.<br>● The basic concept addresses the fact that adaptation is only possible through variability and is brought about by selection.<br>● Similarity of living beings on the one hand and diversity on the other hand are the result of phylogenetic development processes. | | |

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| | • Evolutionary change does not only take place at the level of organisms, but also at the level of molecules, cells, tissues and organs.<br>• Evolution is a process that takes place at the population level.<br>• Knowledge of evolutionary mechanisms enables understanding of the relationship between variability and evolutionary adaptation processes.<br>• It helps, for example, to understand the following phenomena:<br>  ○ diversity of organisms<br>  ○ changeability through evolution<br>  ○ evolutionary processes that have led to today's observable diversity of living beings and the development of humans<br>  ○ relationship of man to other living beings<br>3rd semester – competence module 1<br>Learning content<br>• The cell as the basic building block of organisms; Connections between life processes and cell structures<br>• Mitosis and its importance for growth, cell differentiation and the formation of multicellular organisms<br>• Differences between pro- and eukaryotes; Importance of microorganisms for ecological cycles<br>• Biotechnical processes in food production<br>• Structure, reproduction and life of plant organisms<br>• Metabolic processes: assimilation (photosynthesis and heterotrophic assimilation) and dissimilation (fermentation and cellular respiration)<br>• Ecology and sustainability: (world) food, different forms of agriculture<br>• Structure and function of the organ systems of metabolism (digestion, respiration, circulation, excretion) and their development in different organizational levels and habitats<br>• Healthy and balanced diet | | |

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| | • Information and communication in the nervous system (stimulus reception, excitation conduction, processing, influence of drugs)<br>• Information and communication in the endocrine system<br>• Importance of meiosis for sexual reproduction<br>• Sexuality as a biological, social and ethical phenomenon<br>• Human embryonic development and possible reproductive manipulations<br>• Networked systems: ecology, economy and sustainability<br>4th semester – competence module 2<br>Learning content<br>• Ecosystems (material and energy cycles, environmental factors, succession, convergence phenomena)<br>• Environmental problems (e.g. climate change), their causes and sustainable solutions<br>• Functioning of the immune system and effects of disorders (e.g. allergies, AIDS)<br>• Behavioral biology<br>• Composition and structure of the earth, geodynamic forces of formation<br>• Cytological and molecular basis of heredity<br>• Biochemical processes in protein synthesis (transcription, translation, regulation of gene activity, epigenetics)<br>• Rules of inheritance and human genetics<br>• Evolutionary mechanisms; chemical and biological evolution<br>• Biotechnological processes, their application and possible effects; Science and Bioethics<br>• History of human development; evolution theories<br>• Evolution as the basis for the diversity of organisms and for the change in ecosystems, organs and cellular structures | | |

| Chemistry, grades 9-12 | | Environment and Modern Agriculture | Healthful Eating |
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| Grades 9-12 | People & Society:<br>● Responsibility for the sustainable use of material and energy resources across borders;<br>● Consideration of ethical standards in the socially relevant implementation of chemical knowledge<br>Nature and technology:<br>● Basic knowledge of the function and networking of natural and anthropogenic material cycles;<br>● In-depth understanding of the relationship between the structure and properties of substances and their targeted changes;<br>● Insight into technical and scientific fields of study<br>Language and communication:<br>● Extension and safe use of chemical terminology as an additional form of communication within and outside of the scientific field.<br>Creativity and design: (almost the same as in the modular curriculum)<br>● Creative problem solving strategies and model development;<br>● Enrichment of emotional experiences<br>Health and movement:<br>● Basics for the health-promoting and health-conscious handling of substances in everyday life;<br>● deepened critical awareness of the ambivalence of drugs and pharmaceuticals<br><br>The content and methods must be selected in such a way that the development and application of the following concepts can be implemented: | | ✔ |

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| | Matter-particle concept:<br>● Becoming aware of the difference between phenomena that can be experienced in the physical world and their interpretation at the particle level;<br>● Creation of the connection with the periodic table.<br>Structure Feature Concept:<br>The nature, arrangement and interaction of the particles determine the properties of a substance.<br>Donor-acceptor concept:<br>● Acid-base and redox reactions can be described in terms of proton and electron transfer.<br>Energy concept:<br>● All chemical reactions involve energy turnover.<br>Size concept:<br>● Material and energy turnover can be described quantitatively.<br>Equilibrium concept:<br>● Reversible chemical reactions can lead to a dynamic state of equilibrium.<br>The following guidelines should be taken into account in terms of the desired variety of methods:<br>● Work empirically and learn based on experience<br>○ The special status of the experiment as a characteristic method of scientific knowledge acquisition is to be taken into account in the classroom as far as possible.<br>● Learn situation-related and based on authentic problems<br>○ Learning must start from realistic and relevant problems that motivate to acquire new knowledge and skills.<br>○ This builds on previous knowledge and basic knowledge and professional experience of the students. | | |

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| | ○ This claim is realized to the maximum when students are placed in an authentic situation that requires concrete interdisciplinary and interdisciplinary work.<br>○ A minimal realization A possible realization can be guaranteed by linking to current problems, authentic cases or personal experiences.<br>● Learning in diverse contexts and from multiple perspectives<br>○ In order to prevent original and newly acquired knowledge from remaining fixed on a specific situation, the same content should be learned and worked on in several different contexts.<br>○ The realization can range from referring to different application situations to actually applying what has been learned in a concrete situation.<br>● Learning in a social environment<br>● problems has to be part of as many learning phases as possible.<br>● Group work is suggested as a possibility for realization.<br>● Learning with instructional and media support<br>○ Learning without any instruction is usually ineffective and easily leads to overwhelm.<br>○ Lessons are to be designed in such a way that the knowledge required to deal with problems (e.g. assignments) is made available and acquired.<br>○ Modern media must also be used to obtain, evaluate and process information.<br>If necessary, the subject matter of the lower grades must be repeated appropriately to the knowledge of the students, so that the basic knowledge required to master the subject matter is secured. | | |

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| | Competence model<br>● The competency model for chemistry is constructed as a three-dimensional model that provides for content dimension, action dimension and requirement dimension.<br>● The content dimension can be found in the individual semesters.<br>● The action dimension includes the areas of organizing knowledge, gaining knowledge and drawing conclusions.<br>○ Descriptors in the individual areas describe how students should be able to deal with the content.<br>Organizing knowledge: researching, presenting, communicating<br>● Present and explain data as well as processes and phenomena in nature and technology in various forms (text, graphics, tables, images, diagrams, models, ...) using chemical terminology in a manner appropriate to the addressee<br>● Argue correctly and logically in technical and technical terms<br>● Draw on knowledge, skills and abilities from other disciplines to organize chemical knowledge<br>● Present, explain and discuss the importance of scientific findings and models for the development of civilization and culture<br>● Present, explain and discuss the importance of chemical processes and phenomena<br>Gaining knowledge:<br>● Asking,<br>● Investigating,<br>● Interpreting<br>● Carry out a suitable investigation (observation, measurement, experiment, ...) on chemical questions, assumptions and problems | | |

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| | • Ask questions about simple processes and phenomena in nature and technology, make assumptions and define problems that can be processed or checked with the help of scientific knowledge and investigations<br>• Critically look at research results with regard to a specific question, assumption or problem<br>Draw conclusions:<br>• Evaluate,<br>• Decide,<br>• Act<br>• Represent technically justified evaluation criteria<br>• Recognize chemical questions and arguments<br>• Weigh competing interpretation options against each other and make decisions on this basis<br>• Reflect critically on a problem-solving process or model<br>• Assess the importance, opportunities and risks of applying scientific knowledge for oneself and for society<br>• Justify and evaluate decisions on socially relevant issues from a scientific point of view<br>The requirement dimension includes level 1, on which students are guided through a task, and level 2, on which they work largely independently.<br><br>Cross-semester competencies<br><br>Chemical knowledge and the competent handling of it are essentially constructive, ie basic knowledge and basic skills acquired in one semester must be applied and expanded in the following semesters. | | |

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| | ● The basic concepts acquired in previous semesters as well as the chemical technical and formula language must be able to be applied to tasks from all chemically relevant areas.<br>● Competence is not acquired selectively, but extends over a longer period of time.<br>4th semester – competence module 1<br>Modeling<br>● Consistently differentiate between the phenomena that can be experienced in the physical world and their interpretation at the particle level (substance-particle concept)<br>● Using the models of the structure of atoms, gain insight into the nature and development of chemistry-specific models and present them<br>● Explain the structural principles of the periodic table of the elements with the help of the wave-mechanical atomic model<br>● Describe and compare the models of chemical bonding and interactions between particles<br>Structures<br>● Explain the properties of substances through the type, arrangement and interaction of the particles (structure-property concept)<br>● Using substances to create connections between structures and properties of substances<br>Substance and energy<br>● Quantitatively describe material and energy conversions in chemical reactions (energy concept, size concept)<br>● Explain the relationships between material and energetic changes using the energy balance of chemical reactions (including catalytic processes). | | |

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| | • Use simple examples from stoichiometry, demonstrate the possibilities of quantitative considerations of material and energy turnover<br>• Assess the use of fossil raw materials as energy sources<br>Balance<br>• Depict the equilibrium dynamics of chemical reactions, explain how they are influenced and thus explain how reactions are controlled (equilibrium concept)<br>Transmission<br>• Describe acid-base reactions as transfer or displacement processes (donor-acceptor concept)<br>• Explain donor-acceptor interactions as a fundamental principle of chemical reactions using the example of protolysis equilibria<br>Dealing with matter<br>• Describe the conversion of natural products and the synthesis of important inorganic chemical basic products as well as their use<br>• Name potential risks using the example of selected substances<br>• Describe the formation and effects of pollutants<br><br>5th semester – competence module 2<br>Structure and reaction<br>Describe relationships between structures and properties using the example of carbon compounds including functional groups and types of isomerism.<br>• Apply donor-acceptor interactions as a fundamental principle to explain reactions of organic molecules.<br>• Describe mechanisms of reactions in organic chemistry.<br>Substance and energy<br>• Manufacture and use of important organic chemical basic products.<br>• Assess the use of material and energy resources, taking into account regional and European characteristics. | | |

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| | Chemical foundations of life<br>● Explain how all life processes are based on material and energetic changes and how people are dependent on their material environment. | | |

| **Computer Science, grades 9-12** | | **Environment and Modern Agriculture** | **Healthful Eating** |
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| Grades 9-12 | Education and teaching work:<br>The students should<br>● be able to use the services of the Internet and other electronic media to obtain information;<br>● acquire basic skills to use electronically offered learning and information material to acquire knowledge and to correctly assess its reliability and quality;<br>● know the difference between synchronous and asynchronous communication tools and be able to use different forms of communication in a goal-oriented manner;<br>● understand the social, economic and legal problems associated with information and communication technology.<br><br>Didactic principles:<br>● The teaching subject e-learning refresher course is to be designed in such a way that the knowledge acquired can be used to support learning processes with the help of software or the services of the Internet. It is important to ensure that the students are able to | ✔ | ✔ |

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| | contribute and expand on their different previous knowledge and experience. The design of the lessons should serve as an example for the students' own work organization outside of the classroom.<br>● The goals and content in the teaching material section are dimensioned for two semester hours per week. If only one semester hour is available, the specifications in italics are not binding.<br><br>Teaching material:<br><br>The students should<br>● Get to know and learn how to use methods for goal-oriented and efficient searches on the Internet<br>● Be able to work in a virtual class: pick up, open, operate, edit learning units<br>● Use the latest means of communication technology and be able to use different communication tools.<br>● Be able to use presentation software for papers and visualizations or master the techniques of scientific work for handouts and departmental work in a word processor | | |