Austria (Middle School) Curriculum Standards

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

Biology & Environment, grades 6-8		Environment and Modern Agriculture	Healthful Eating
Grades 6-8	Biology education is important for our society in many areas. ● Gaining scientific knowledge brings about progress in different areas, for example in medicine, in biotechnology and gene technology, in the neurosciences, in ecology and in questions of sustainability. ● On the other hand, scientific development also harbors risks and dangers that must be recognized, considered and evaluated. ● This requires biological knowledge, which is therefore an essential part of general education. The aim of the subject Biology and Environmental Studies is to make scientific phenomena tangible and to be able to gain, understand and communicate findings from biological research and to be able to deal with their limits. The lessons lead to scientific understanding based on evolution and to health-conscious, ethical and environmentally friendly action. It promotes the ability to actively participate in social developments and discourses.	✔	

	Contribution to the educational areas ● 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. Language and communication ● Promotion of reading and writing skills as well as oral expression in various teaching situations; Introduction to the technical language; Inclusion of German and foreign-language specialist literature. People & Society ● Man as a biological and social being; humans as influencing factors of ecosystems; Economics and Sustainability (Consumer Education); Interaction between ecology, economy, regional and national politics and social development; Application of biological knowledge to social issues. Nature and technology ● Phenomenon life; Networking of living systems, impact of human activities on ecosystems; Species knowledge and species protection; environmental education for sustainable development; bioethics; energy as a conserved quantity; scientific ways of thinking and working. Health and exercise ● Relationship between health and ability to perform; biological prerequisites for movement; health and disease as a biological and social phenomenon; sex education; health education.		

	Creativity and design ● Development of research designs; modeling; Knowledge communication through the use of different media; media education. The competence model for natural sciences as a guideline for teaching biology and environmental studies ● The competency model for natural sciences specifies the characteristics of scientific research work as a dimension of action. There are three areas of competency: Acquisition of expertise ● Gaining knowledge independently by means of observation and experiment Application of knowledge and insights, justifying positions in social discourse and acting in a reflective manner in everyday life In the context of the subject biology and environmental studies, these areas of competence are described as follows: Acquiring and communicating knowledge ● W1: Describe and name biological processes and phenomena. ● W2: Take subject-specific information from different media and sources. ● 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. ● W4: Explain processes and phenomena using specialist knowledge using laws (models, rules, laws, functional relationships). ● W5: Explain biological processes and phenomena in the context of		

	their evolutionary context. Gain insights ● E1: Observe, measure and describe biological processes and phenomena. ● E2: Analyzing biological processes and phenomena with regard to evolutionary biological criteria and working out relationships. ● E3: Ask questions and formulate hypotheses about biological processes and phenomena. ● E4: Plan, carry out and record investigations or experiments on scientific issues. ● E5: Analyze data and results of investigations (e.g. arrange, compare, determine dependencies) and interpret. Justify positions and act in a reflective manner ● S1: Argue correctly and logically and differentiate between scientific and non-scientific arguments. ● S2: Discuss and evaluate facts and problems in a considered manner, taking into account controversial points of view. ● S3: Recognize the importance, opportunities and risks of applying scientific knowledge for the individual and for society in order to act responsibly. ● S4: Reflecting on human patterns of experience and behavior from an evolutionary point of view. ● S5: Create and design recommendations for action (e.g. nature conservation strategies, health concepts, nutrition plans, ...). In order to enable the pupils to have biological education as part of their basic scientific education (scientific literacy), the lessons in biology and		

	environmental studies must be designed in such a way that competencies from all three areas mentioned above are acquired and based on the learning content of each semester be promoted. Basic concepts to support competence-oriented learning ● Basic concepts help to recognize fundamental patterns in biology. 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. Seven overarching areas are formulated below, from which a large number of different phenomena can be related to one another. They help learners to network content, to organize the wealth of topics in a meaningful way and to appropriate them. The curriculum content is therefore developed on the basis of these concepts and linked to them on an ongoing basis. ● The achieved basic understanding of biology enables the assessment of biological findings, 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. Dealing with the interactions within or between biosystems promotes systemic thinking and counteracts purely linear thinking. This allows participation in social discourses. ● In principle, any content can be viewed from the perspective of any basic concept. 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.		

	Basic concepts of biology Structure and function ● 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. It helps, for example, to understand the following phenomena: ● Principle of surface enlargement ● Key-lock principle ● Counterflow principle ● Opponent principle ● Reproduction ○ Living things are capable of reproduction. 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. ○ It helps, for example, to understand the following processes: ■ Identical replication of genetic information ■ Mutation and recombination ■ Growth based on cell division processes (mitosis) ■ Formation of gametes (meiosis) ■ Sexual reproduction and asexual reproduction ○ Succession of generations and evolution in populations ■ Identical replication of genetic information ■ Mutation and recombination ■ Growth based on cell division processes (mitosis) ■ Formation of gametes (meiosis) ■ Sexual reproduction and asexual reproduction ■ Compartmentalization		

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

	supply of energy in the sense of a dynamic equilibrium. It helps, for example, to understand the following phenomena: ● Assimilation ● Dissimilation ● Nutrition, Digestion and Elimination ● Conservation and transformation of matter and flow of energy ● Material cycles in an ecosystem ● Information and communication 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. ● Communication is the mutual exchange of information. ● This requires a common language or specific stimuli that can be picked up and decoded by the receiver. It helps, for example, to understand the following processes: ● Excitation line ● Recording information from the environment via sensory cells and sensory organs ● Communication at cellular and molecular level (e.g. immune system and hormone system) Genetic and epigenetic information Variability, relatedness, history and evolution ● The variability in living beings is caused by the mutation of hereditary factors and their recombination in connection with sexual		

	reproduction. ○ The basic concept addresses the fact that adaptation is only possible through variability and is brought about by selection. ○ Similarity of living beings on the one hand and diversity on the other hand are the result of phylogenetic development processes. ○ Evolutionary change does not only take place at the level of organisms, but also at the level of molecules, cells, tissues and organs. ○ Evolution is a process that takes place at the population level. ○ Knowledge of evolutionary mechanisms enables understanding of the relationship between variability and evolutionary adaptation processes. It helps, for example, to understand the following phenomena: ● Diversity of organisms ● Changeability through evolution ● Evolutionary processes that have led to today's observable diversity of living beings and the development of humans ● Relationship of man to other living beings Schoolwork ● The time frame for school work in the 7th and 8th grades of the Realgymnasium and Oberstufenrealgymnasium with supplementary lessons in biology and environmental studies, physics and chemistry can be found in the section "Performance assessment" of the third part.		

Grade 6	3rd semester – competence module 3 Learning content ● Information and communication in the nervous system (stimulus reception, excitation conduction, processing, influence of drugs) ● Information and communication in the endocrine system ● Importance of meiosis for sexual reproduction ● Sexuality as a biological, social and ethical phenomenon ● Human embryonic development and possible reproductive manipulations ● Networked systems: ecology, economy and sustainability 4th semester – competence module 4 Learning content ● Ecosystems (material and energy cycles, environmental factors, succession, convergence phenomena) ● Environmental problems (e.g. climate change) and possible solutions within the framework of sustainable development ● Functioning of the immune system and effects of disorders (e.g. allergies, AIDS) ● Behavioral biology ● Composition and structure of the earth, geodynamic forces of formation	✔	

Grade 7	5th semester – competence module 5 (if Biology and Environment is taught in 7th grade) Learning content ● Parasitism and symbiosis ● Pathogens (bacteria, viruses, fungi, protozoa, multicellular organisms) ● Selected examples of infectious diseases, hygiene measures and prophylaxis ● Civilization diseases (e.g. cardiovascular diseases, stress diseases, cancer) ● Health promotion measures, role of microorganisms in human health 6th semester – competence module 6 (if Biology and Environment is taught in 7th grade) Learning content ● Movement systems in plants and animals ● Structure and function of the skeleton and muscles ● Origin and organization of biological diversity ● Systematics and taxonomy ● Characteristics of sustainable development (based on a selected regional and/or global example)	✔	
Grade 8	7th semester Learning content ● Cytological and molecular basis of heredity ● Biochemical processes in protein synthesis (transcription, translation,	✔	

	regulation of gene activity, epigenetics) ● Rules of inheritance and human genetics ● Evolutionary mechanisms; chemical and biological evolution, theories of evolution 8th semester Learning content ● Biotechnological processes, their application and possible effects; Science and Bioethics ● History of human development ● Evolution as the basis for the diversity of organisms and for the change in ecosystems, organs and cellular structures		

Chemistry, grades 7-8		**Environment and Modern Agriculture**	**Healthful Eating**
Grades 7-8	Basic chemical education should familiarize with the "doublethink" characteristic of chemistry, which seeks and finds explanations for processes in the macroscopic area in the submicroscopic area. ● Material properties and material type conversions can be traced back to relatively few philosophical systems of interpretation and basic ideas. ● As a basis for interventions in material processes, getting to know this way of thinking should contribute to understanding today's world view and the development of our culture.	✔	

	Chemistry lessons in the upper grades expand and deepen the knowledge and skills acquired in the lower grades. ● It prepares you for scientific thinking and working by opening up different approaches to the different dimensions of what is worth researching. In connection with biology, mathematics and physics, chemistry lessons should show in an exemplary way the way of finding knowledge about the development and application of interpretation systems, i.e. about model thinking, system thinking, planning and evaluating experiments on substance type conversions. ● The alternating and needs-based application of inductively oriented hypothesis building and deductively oriented hypothesis testing helps. ● In this way, chemistry lessons create the basis for life-shaping learning strategies and promote independence and personal responsibility in the acquisition of knowledge and skills such as teamwork, problem-solving skills and the ability to communicate with experts beyond school. The aim is to gain insight into the diversity and omnipresence of chemical processes: ● This should not only facilitate professional orientation, but also make material changes recognizable as the material and energetic basis of life and civilization and also create an understanding of the European and global importance of the chemical industry. ● The development of a sense of responsibility and the ability to criticize the use and abuse of scientific knowledge should enable participation in important social decisions.		

	Contribution to the school's responsibilities ● The contributions already defined in the lower school curriculum are to be further developed and deepened in an age-appropriate manner. Contributions to the areas of education ● Language and communication ● Extension and safe use of chemical terminology as an additional form of communication within and outside of the scientific field; ● Description, logging and presentation of chemical facts People & Society ● Responsibility for the sustainable use of material and energy resources across borders; ● Consideration of ethical standards in the socially relevant implementation of chemical knowledge Nature and technology ● Basic knowledge of the function and networking of natural and anthropogenic material cycles; ● in-depth understanding of the relationship between the structure and properties of substances and their targeted changes; ● Insight into technical and scientific study and professional fields Health and exercise ● Basics for the health-promoting and health-conscious handling of substances in everyday life; ● deepened critical awareness of the ambivalence of drugs and pharmaceuticals		

	Creativity and design ● Aesthetics in selected chemical reactions; ● creative problem solving strategies and model development; ● Enrichment of emotional experiences		
Grade 7	5th semester – competence module 5 Modeling ● Consistently differentiate between the phenomena that can be experienced in the physical world and their interpretation at the particle level (substance-particle concept). ● Using the models of the structure of atoms, gain insight into the nature and development of chemistry-specific models and present them. ● Explain the structural principles of the periodic table of the elements with the help of the wave-mechanical atomic model. ● Describe and compare the models of chemical bonding (including delocalized electron systems) and interactions between particles. Structures ● Explain the properties of substances through the type, arrangement and interaction of the particles (structure-property concept). ● Creating connections between the structures and properties of the substances by combining the formation of hypotheses and experimental verification using substances with covalent bonds. ● Apply knowledge of the model ideas about molecular geometries and hybridization . Substance and energy ● Quantitatively describe material and energy conversions in chemical	✔	

	reactions (energy concept, size concept). ● Explain the relationships between material and energetic changes using the energy balance of chemical reactions (including catalytic processes). ● Using simple examples from stoichiometry, demonstrate the possibilities of quantitative considerations of material and energy turnover. ● Assess the use of fossil raw materials as energy sources. 6th semester – competence module 6 Balance ● Depicting the equilibrium dynamics of chemical reactions, explaining how they are influenced and thus explaining how reactions are controlled (equilibrium concept). ● Apply the law of mass action to solution equilibria and complex formation equilibria. Transmission ● Describe acid-base, redox and complex formation reactions as transfer or displacement processes (donor-acceptor concept) ● Explain donor-acceptor interactions as a fundamental principle of chemical reactions using the example of protolysis equilibria and redox reactions ● Applying knowledge of redox reactions to problems relating to electrochemical processes		

	• Additionally in the Realgymnasium with in-depth lessons in biology, chemistry and physics: ○ describe quantitative equilibrium reactions and electrochemical processes Dealing with matter • Describe the conversion of natural products and the synthesis of important inorganic chemical basic products as well as their use. • Name potential risks using the example of selected substances. • Explain the function and networking of natural and anthropogenic material cycles. • Assess the use of material and energy resources, taking into account regional and European characteristics. • Describe the formation and effects of pollutants. • Explain chemical processes in the household depending on the substances involved. • Extraction and use of metals and ceramic materials and recycling of metals. • Perform selected chemical analysis methods and interpret the results.		
Grade 8	7th semester Structure and reaction • Describe relationships between structures and properties using the example of carbon compounds including functional groups and types of isomerism. • Apply donor-acceptor interactions as a fundamental principle to explain reactions of organic molecules.	✔	

	● Additionally in the Realgymnasium with in-depth lessons in biology, chemistry and physics: ○ describe mechanisms of reactions in organic chemistry. Substance and energy ● Manufacture and use of important organic chemical basic products. ● Outline selected metabolic processes. ● Represent extraction, use and recycling of macromolecular substances. ● In addition, in the Realgymnasium with in-depth lessons in biology, chemistry and physics: specify renewable raw materials and compare them with fossil raw materials. 8th semester Chemical foundations of life ● Explain how all life processes are based on material and energetic changes and how people are dependent on their material environment. ● Discuss the importance of a health-conscious lifestyle using examples from food chemistry. ● Take a stand on nutritional recommendations through the critically reflective use of differentiated material knowledge. ● Discuss health-promoting and conscious handling of substances from everyday life using the example of stimulants and drugs.		

	Additionally in the Realgymnasium with in-depth lessons in biology, chemistry and physics: ● Describe the structure and function of biological membranes ● Present aspects of pharmacology and toxicology using selected examples		

Ethics, grades 6-8		**Environment and Modern Agriculture**	**Healthful Eating**
Grade 6-8	Competency model, competency areas, competency descriptions The competency model is divided into five competency areas that apply to all school levels. The skills described are to be developed at all school levels. Their level of expression should become more complex and differentiated as the school level progresses. Perceive and take perspectives The students can ● Perceive, describe and interpret situations and problems in the individual, social and ecological environment ● Deal with the way of thinking, values and living environments of others and assess their own position. Analyze and reflect The students can ● Develop and write ethically relevant texts with the help of	✔	✔

	subject-specific terminology and methods and ● Relate knowledge and experiences from different fields and areas of life and reflect them in the light of ethical positions. Arguing and judging The students can ● Present basic moral and ethical concepts, understand their historical, socio-economic and cultural contexts and ● Critically examine arguments and make independent and well-founded ethical judgements. Interact and communicate The students can ● Present their own thoughts and those of others appropriately and linguistically sensitively and ● Conduct disputes on an argumentative basis with consensus and dissent and deal with differences of opinion and conflicts non-violently. Develop options for action The students can ● Take a responsible and ethically reflective position on moral problems through action plans and; ● Relate the skills acquired to their own life plans.		