Biology

Aims

Biology is about life in its variety of expressions and forms. The aim of teaching biology is for students to gain insight into important phenomena and contexts through experiences with nature and to develop thoughts, language and concepts that have value in everyday life. The pupils' joy in dealing with nature must be maintained and promoted, and the teaching must contribute to the pupils developing a sense of the interaction between humanity and nature.
In the further course, the aim of the teaching in biology is for the students to acquire competences in the subject and knowledge about the living organisms and the surrounding nature, about the environment and health and about the application of biology. Particular emphasis must be placed on the understanding of contexts. In certain subjects, the teaching must be based on the students' own experiences, ideas and investigations, e.g. in laboratory and field work, and seek to promote their enjoyment of nature and desire to deal with biological subjects and problems. The pupils' curiosity and responsibility towards nature and the environment must be further developed, and the teaching must contribute to creating a basis for taking a stand and acting in relation to man's interaction with and dependence on nature. Teaching horticulture is an important practical subject in relation to biology, which is why reference is made to this teaching plan.

Objectives and Final Goals

Investigation (I) The teaching gives students the opportunity to

- design, implement and evaluate studies in biology

Modeling (M) The teaching gives students the opportunity to

- use and evaluate models in biology

Perspective (P) The teaching gives students the opportunity to

- see the perspective that biology has to the outside world
- relate the content of the subject to the development of scientific knowledge

Communication (C) The teaching gives students the opportunity to

- communicate about scientific matters in biology, i.e. communication, argumentation, using subject terms and being able to understand subject texts.

Content and outcomes of the class teaching can be read below. This also reflects the procedural goals for the students. Reference is also made to the teaching plan in horticulture, which through a practical approach via work in the school garden supplements biology teaching at all grade levels.

The Development of the Subject		
Content and Focus	**Objectives**	**Final Goals**
Class 1 to Class 3 Biology lessons begin from the first day at school, even if it is not on the timetable as a separate subject. Already in the nature legends and stories of the small classes, a dawning love for, wonder at and understanding of nature is established. The children experience nature as a part of life that concerns them. In Class 1, the children still have an immediate sense of unity with nature, and it is a task for the school, in continuation of what has happened in the kindergarten, to nurture the nature experience through, for example, trips in the local environment at different times of the year. A next step is to foster the relationship with agriculture and cultivated nature. Many small classes have created small gardens where they sow, plant and harvest, just as visits to a farm are often included in the lessons.	Investigation (I), Perspective (P) and Communication (C)	The teaching gives the student the opportunity to ● wonder about everyday biological phenomena ● know and acquire knowledge about livestock, useful plants, fish etc. in connection with old professions (the farmer, the fisherman, the shepherd and various crafts). ● have respect for life and the environment ● feel kinship with nature and its various creatures: people, animals, plants, stones ● know and feel the conditions of man on earth from old occupations (the farmer, the fisherman, the shepherd and various crafts). ● communicate about scientific matters in biology, i.e. communication, argumentation, using subject terms and being able to understand subject texts.

During the first school years, the child is not yet separated from nature as an objective observer. Its world is a whole that stands in the middle of biology. And through fairy tales and nature legends, we encounter nature in such a perspective.		
Class 4 The first real biology period comes with zoology in Class 4. We start, however, with the human figure reviewed in its basic features: We walk upright. The round, calm head at the top of the body senses and thinks. The arms hang down, freely movable with the hands as tools. Students still have to learn new things: writing, knitting, sewing, braiding, hammering, etc. The stomach digests the food, nourishes and strengthens the whole body. Finally, the legs carry us where we want to go without us thinking about it. Thus we become familiar with humans from a "naive" plastic morphology. After that, we thoroughly review a number of animal species, where the peculiarity in relation to the human anatomy stands out particularly strongly. A number of invertebrate animals, such as the squid and mussel, show in their appearance a kinship with the human head; if the whole body is	Investigation (I), Perspective (P) and Communication (C)	The teaching gives the student the opportunity to: ● wonder about everyday biological phenomena ● know and acquire knowledge about livestock, useful plants, fish etc. in connection with old professions (the farmer, the fisherman, the shepherd and various crafts). ● know the appearance, growth conditions and characteristics of different plants ● know the way of life and characteristics of different animals ● know the needs of plants and animals for light and air and nutrition, their dependence on their specific habitats. ● have respect for life and the environment and know about nature's various cycles ● feel kinship with nature and its various creatures: people, animals, plants, stones ● know and feel the conditions of man on earth from old occupations (the farmer, the fisherman, the

"sucked up" by the head, the octopus or mussel is created. – In many vertebrates, such as the mouse, it is the stomach that takes over both head and limbs. Three main motifs can be the cow, the lion and the eagle. Thus, the child's artistic-plastic sense is sought to be used to bring out the differences of the animals and their specialization seen in relation to humans. The student learns to know and admire the interaction between the animal's form and the animal's way of life in its environment. Humans thus become the key to understanding the diversity of the animal kingdom. **Class 5** The main theme is botany. Here, the budding thought activity can be practiced in a particularly realistic and fruitful way. The thoughts can follow the varying forms of the plants in their legal context with environments: we encounter mountain plants, light plants, shade plants, drought plants, etc. Through depictions of the plant kingdom, students must encounter the causal way of understanding the world. The plants' close connection with the environment is observed such as growing plants of the buttercup family in very different environments. The meadowsweet unfolds on a wet meadow, the buttercup on a rich loam, while the ice		shepherd and various crafts). assess the habitats of plants and animals • communicate about scientific matters in biology, i.e. communication, argumentation, using subject terms and being able to understand subject texts.

buttercup can cope with the cold and rocky mountainside. Mushrooms, algae and ferns are described through images of the young child's development. The pupils slowly approach puberty, where the soul life of the individual intensifies and becomes individualized. Then the plants can be a practice field for a kind of mirroring psychology: in every flower we see a unique mood, a soulful gesture. The nodding bellflower in the grass speaks a different emotional language than a large round sunflower, and the thistle speaks differently than the tight lines of the sword lily. Thus, botany becomes more than botany, it becomes a field where we can become acquainted with something of our own inner self in a poetic way. Such considerations can stimulate the awakening sense of the coherence of the environment. **Class 6** In Class 6 there is a period of studying insects with the main emphasis on bees and ants. There are also many threads about botany here. The previous years' material can be continued and expanded, so that students get a broader picture of the diversity of the animal kingdom and botany. The reviewing of fruit formation, seed dispersal or trees in a more systematic way are suitable topics. Chapters on bird		

life or on the interaction between insects and plants may also be suitable. Furthermore, botany and zoology at this grade level are linked to the globe through geographical zones. Students will investigate plants that grow in the subtropics and the habitat of and animals living in temperate climates which is where man mainly settled and cultivated land and mined for minerals and crystals. Plant belts up a mountain are compared to climate zones.		
Class 7 A special theme for Class 7 is human biology, often called human studies. Based on health and disease, all human organs, the blood circulation, respiration and digestion are treated from a holistic and phenomenological approach, by emphasizing in the teaching what the students themselves can observe and experience. At this age, it is fruitful to bring up topics that the students are familiar with: sleep and daily rhythms, food and pleasure, clothing and heat regulation, illness and medicine. In this way, health and nutritional issues can receive a multifaceted treatment based on a natural context. Topics such as tobacco,	Investigation (I), Modelling (M), Perspective (P) and Communication (C)	Investigation Skills and Knowledge Objectives: The teaching gives the student the opportunity to: ● formulate and investigate a limited problem with science content, including collecting and evaluating data from own and others' studies in science, as well as concluding and generalizing on the basis of own and others' practical and investigative work. ● have knowledge of the application possibilities and limitations of research methods, including the collection and validation of data as well as criteria for evaluating research in natural sciences. Evolution, ecosystems, body and health, cells, microbiology and biotechnology skill objectives:

alcohol, drugs and use and abuse are addressed, and their consequences in today's society are highlighted. Health and nutrition are important subjects at this grade level, and the subjects described here in biology are also taken up in connection with chemistry, geography and history. In nutrition theory, there are three main groups: starch, sugar and fat. These substances are examined in connection with metabolism. In a particularly fine harmony, you find these three substances in breast milk. You can go into the history of the various foodstuffs such as the potato and the occurrence and production of sugar. Animal and vegetable fats are processed, just as in connection with the processing of egg whites, milk and cheese production is carried out. The importance of salt is discussed, and the students experience that our nourishment is not only taken from the plant and animal world but also taken from the mineral kingdom. Bee life and honey are also investigated at this grade level. Education about digestion is based on the student's own experiences, and only at a later grade level is it treated in more detail. Inhalation and exhalation are described in detail and also treated in connection with health issues such as lung diseases and the effects of		The teaching gives the student the opportunity to: ● seek and incorporate relevant biological knowledge and understanding through own investigations and experiments in nature and the laboratory ● examine selected biotopes with their biological diversity ● design, conduct and evaluate studies ● plan, carry out and evaluate simple studies and experiments in nature and laboratories ● use simple equipment for investigations and experiments ● examine selected biotopes with a view to understanding ecological relationships ● distinguish between factual questions and attitude questions and formulate relevant questions ● provide suggestions for solutions and action options regarding environmental and health problems ● give examples of conflicts of interest and different attitudes in connection with health conditions and utilization of natural resources, including environmental problems ● know and describe selected organisms, their life expressions and adaptations to different living conditions ● know about the structure and turnover of organic matter, material cycles and energy flows

smoking. The need to keep the body warm is also addressed. In connection with the three areas of nutrition, respiration and heat energy, it would be natural to compare human anatomy to that of the animal world and look at, for example, the digestive system of ruminants, the gills of fish, the fat layer of seals, etc. **Class 8** Human biology continues to be studied at this grade level in the form of a description and study of the structure of the body, with the main emphasis placed on the physics and mechanics of the human body. In this context, the bones of the skeleton are reviewed, as well as the lever principle in the movements of the limbs, the different types of joints and the structure of the bones based on their bearing and support functions. The muscles and their use, wear and training can also be treated. The most important senses are reviewed, especially the internal structure of the eye and ear. Work is done with the refraction of the eye lens or the mechanics of the bones of the middle ear. Simple comparisons with the skeletal or sensory systems of the animals can be addressed. By looking at the human skeleton, students have experience in		• know how biological knowledge is created through scientific working methods • knowledge of the collection and dissemination of data • know about simple equipment for investigations and experiments Modelling Skills and Knowledge Objectives: The teaching gives the student the opportunity to: • use purpose-relevant models to explain phenomena and problems in science, with an understanding of the applicability and limitations of the individual methods. • have knowledge of modelling, the structure of selected models and their advantages and disadvantages. Evolution, ecosystems, body and health, cells, microbiology and biotechnology Skill objectives: The teaching gives the student the opportunity to: • give a physiological account of photosynthesis and respiration and their fundamental importance in an ecosystem • give a qualitative and quantitative account of selected examples of food chains • explain the concept of ecosystem in terms of primary and secondary producers and decomposers.

geology and chemistry, where lime has been processed. The pupils' awareness is turned towards the peculiarity that the bones of infants are very soft and become harder during life. Conversely, one can observe that the infant's fat stores are in excess, while in old people it is the skeleton that stands out clearly. Such examples help to arouse students' interest in the subject and the world around them. The names and numbers of the bones are learned, just as the different bones are drawn. In this way, students experience how the skull has its round and protective shape, while the limbs are hard on the inside and soft on the outside. The teeth and their development are exciting and thought-provoking, also seen in relation to the animal world. It shows how the muscles and tendons hold the skeleton together. **Class 9** The focus of Class 9 is ecology. By studying animals and plants in their ecological contexts, for example by depicting selected biotopes, the teaching seeks to consolidate the students' knowledge of and understanding of the synergistic nature of the world. Examples of symbiosis, mutual dependence and equilibrium can be given here, which can lead to an understanding of the ecological whole in a biotope: all		• recognize biological arguments and models in the social debate and consider their possibilities and limitations • explain biological processes linked to raw material production, including in agriculture and fishing • explain important biological processes linked to food processing, including fermentation, dairy production, preservation Objectives: The teaching gives the student the opportunity to: • know and describe selected organisms and their systematic relationships, as well as apply concepts of life expressions, including food intake, respiration, growth, R/K strategy, reproduction and movement in connection with different types of organisms • know and describe the general different types of organisms at different trophic levels in an ecosystem, their characteristics and their living conditions such as food, nutrients, water, oxygen, light, function • give examples of convergent adaptation of different species in structure, function and behavior to different types of habitats and living conditions

parts which are necessary and indispensable to each other. These science goals in biology can be achieved in different ways. Students go on a week's agricultural practice. Students investigate the development of agriculture and cultivated plants, the history of the cultural landscape, the discovery of artificial fertilizers, different views on agriculture and society, with everything based on humanity''s positive place in nature, as culture creator and breeder. Another important focus for Class 9 is the study of fetal development. Human reproduction is an area that can be treated in many ways. The caution of earlier times has been replaced by a greater openness with all its positive sides. Students explore the excitement and mysteries that underlie our own conception, fetal development and birth. It is therefore a pedagogical task to preserve something of the "sacred" which is rightly linked to this intimate area, while at the same time going into the scientific study of life and development of the fetus. In continuation of this, it is natural to deal with many of the questions and problems linked to sexual life and cohabitation in the broadest sense.		• describe the cycle of selected substances in nature, with a particular focus on nitrogen cycle and fixation • know about important principles of allopatric speciation and the development of life and the connection with biological diversity • describe the function of and the connection between the skeleton, muscles, senses and nervous system • explain basic features of the body's energy metabolism Perspective Skills and Knowledge Objectives: The teaching gives the student the opportunity to: • use general models to describe conditions in the immediate environment, shed light on societal issues and contextualize scientific arguments. • give an account of examples of natural and man-made changes in ecosystems and their importance for biological diversity • have knowledge of relevant current scientific issues, conflicts of interest, sustainable development and the development of scientific statements. Evolution, ecosystems, body and health, cells, microbiology and biotechnology as well as the use of the

		natural basis skill objectives: The teaching gives the student the opportunity to: ● make ethical assessments ● describe people's use of the natural basis and include perspectives for sustainable development ● deal with current environmental problems and their importance for human health and the surrounding nature ● examine and explain general biological processes, e.g. a. in food production ● relate to modern biotechnological use and significance for the individual, society and nature ● explain the connection between the adaptation of different species in structure, function and behavior in relation to different types of habitats and living conditions ● explain the causes and effects of natural and man-made changes in the ecosystem and their importance for biological diversity. ● use knowledge to be able to participate qualifiedly in the social debate on current topics, e.g. the consequences of global warming ● relate to values and conflicts of interest linked to issues with biological content, e.g. future drinking water solutions ● argue factually for own choices and opt-outs in the preparation and dissemination of action proposals

		• explain the biological background of health problems linked to lifestyle and living conditions • give an account of man's use of the natural basis in various occupations, including agriculture and fishing • give examples of current local and global environmental and health problems • give examples of the biological background for selected prevention and health methods • give examples of how lifestyle and living conditions affect human health • explain causes, significance and measures in relation to environmental and health challenges • explain the human view of and use of production animals and pets • assess the sustainability and consequences for animals, plants and nature of selected forms of production • describe and assess the individual's and society's discharge of substances Objectives: The teaching gives the student the opportunity to: • describe and explain essential body functions • know various factors that affect human health • be able to participate qualifiedly in the social debate on current topics, e.g. the consequences of global warming

		• explain the most important functions of the internal organs and their mutual interaction on the organ system and organismal level, including in the digestive system, lungs and blood circulation • know about regulation of the internal environment through the nervous and hormonal system, among other things regarding water, carbon dioxide, temperature and waste substances • know how the body defends itself against bacteria and viruses • know about human reproduction and development 1. Communication skills objectives: The teaching gives the student the opportunity to: • communicate about science subjects using suitable media, as well as assess the quality of one's own and others' communication about science subjects. Objectives: The teaching gives the student the opportunity to: • have knowledge of methods for conveying science subjects, as well as knowledge of source-aware dissemination of science subjects. 2.Argument skill objectives: The teaching gives the student the opportunity to:

		• formulate a claim and argue for it on a scientific basis, as well as assess the validity of one's own and others' scientific arguments. Objectives: The teaching gives the student the opportunity to: • have knowledge of claims and justifications, as well as knowledge of quality criteria for different types of arguments in a science context. 3. Vocabulary skill objectives: The teaching gives the student the opportunity to: • express oneself orally and in writing precisely and nuancedly using specialist words and concepts. This includes acquiring biological technical terms and using them appropriately. Objectives: The teaching gives the student the opportunity to: • have knowledge of words and concepts in science. 4. Academic reading and writing skill objectives: The teaching gives the student the opportunity to: • purposefully read and write texts in science subjects. Objectives: The teaching gives the student the opportunity to:

		• have knowledge of the purpose and structure of science texts and their objectivity requirements.