Curriculum for Natural science

This is a translation from Norwegian Bokmål of the official Norwegian subject curriculum text.

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About the subject

Relevance and central values

Natural science is an important subject for describing and understanding the structure of our physical world. The subject shall help to give the pupils experiences of nature and the know-how for protecting natural resources, preserving biological diversity and contributing to sustainability. Natural science shall also contribute to the pupils' development of competence to take care of their own and others' health. When the pupils use natural-science terminology and natural-science methods, practices and approaches for working on topics in the subject, they will acquire the foundation for understanding how natural-science knowledge is used and developed. Knowledge about the interaction between nature, individuals, technology and society can promote the pupils' ability to think critically and help them make conscious decisions in their daily lives. Natural science shall prepare the pupils for a working and societal life that will require an exploratory approach and technological competence.

All subjects shall help the pupils to understand and apply the value system for learning. Natural science shall contribute to the pupils' sense of wonder, curiosity, inventiveness, engagement and innovation by opening for them to work in the subject in a practical and exploratory manner. The pupils shall gain insight into how people's way of life and actions affect life on Earth. Nature has inherent value that is independent of human use and influence, and natural-science knowledge can contribute to well-reasoned nature management. Nature is also an important part of Sami culture and identity. Knowledge about the Sami's experience-based and traditional approach to nature can therefore contribute to sustainable use of resources and preservation of diversity in nature.

Core elements

Natural-science practices and approaches

The pupils shall experience natural science as a practical and exploratory subject. Through perceiving, having a sense of wonder, exploring and experiencing the pupils shall understand the world around them in a natural-science perspective. Through practical work and making their own models to solve challenges in this field, the pupils can develop their ability to be inventive and innovative, and develop their understanding of natural-science theory. The natural-science disciplines have specific terminologies and ways of explaining phenomena and events. This core element describes the forms of expression, methods and approaches in the subject. Working with the core

element of natural-science practices and approaches shall be combined with work linked to the other core elements.

Technology

The pupils shall understand, develop and use technology, including programming and modelling, in their natural-science work. By using and creating technology, the pupils can combine experience and know-how with creative and innovative thinking. The pupils shall understand technological principles and procedures. They shall assess how technology can contribute to solutions, but also create new challenges. Knowledge of and competence in technology are therefore important in a sustainability perspective. Work with the core element technology shall be combined with work linked to the other core elements.

Energy and matter

The pupils shall learn to understand how we use key theories, laws and models for, and concepts about, energy, matter and particles to explain our physical world. By using knowledge about energy and matter, the pupils shall understand natural phenomena and see the interconnections in the natural science subject.

Earth and life on Earth

Through the natural science subject the pupils shall increase their understanding of nature and the environment. The pupils shall acquire a basic understanding of the origins of the earth and how life on Earth has developed. Learning about Earth as a system and how people impact this system, shall give the pupils the foundation for making sustainable decisions.

Body and health

The pupils shall understand how the macro and micro systems of the body work together. They shall also understand how the body develops and how physical and mental health can be looked after. Knowledge about the body's systems and how they affect one another, shall help the pupils to take care of their own bodies and health in a lifelong perspective.

Interdisciplinary topics

Health and life skills

In natural science the interdisciplinary topic of health and life skills refers to providing the pupils with the competence to understand their own body and take care of their physical and mental health. The pupils shall be able to take a critical approach to health-related information and to use this to make good

and responsible choices related to health, safety and the environment, in their everyday lives and in working life.

Democracy and citizenship

In natural science the interdisciplinary topic of democracy and citizenship refers to providing the pupils with the basis for distinguishing between knowledge based on science and knowledge that is not based on science. Natural science shall also contribute to openness for experience-based and traditional knowledge the Sami have of nature. Competence in natural science shall be the underpinning for understanding and being critical about argumentation in public debates and is important so that pupils will be active citizens and contribute to technological development and sustainability.

Sustainability

In natural science the interdisciplinary topic of sustainability refers to the pupils acquiring the competence to make environmentally aware decisions and actions, and to see these in relation to local and global environmental and climate challenges. Knowledge about interconnections in nature is necessary to understand how we influence them. Competence in natural science can help us to find solutions to limit the climate challenges we face, preserve biological diversity and manage the earth's natural resources in a sustainable manner.

Basic skills

Oral skills

Oral skills in natural science refers to the ability to take part in subject-related conversations and to share and develop knowledge with natural-science content based on observations, experiences and information from the field. Oral skills also refers to using natural-science terminology and concepts to describe, demonstrate understanding, present knowledge, develop questions, argue, explain, reflect and give grounds for one's own attitudes and decisions. The development of oral skills in the natural-science subject progresses from listening and talking about experiences and observations to presenting and discussing increasingly complex interconnections in the subject and the ability to use increasingly precise natural-science terminology.

Writing

Writing in natural science refers to formulating questions and hypotheses and writing natural-science explanations based on evidence and sources. It also refers to describing observations and experiences, as well as formulating and arguing in favour of points of view. The development of writing skills in natural science progresses from using drawings and text to gradually using more

precise natural-science terminology, including figures and symbols. This refers to the ability to write increasingly complex texts and to use different types of text which build on a critical and varied use of sources adapted to the purpose and receiver.

Reading

Reading in natural science refers to the ability to understand natural-science concepts, symbols, figures and arguments by working with natural-science texts. Reading in natural science also refers to exploring, identifying, interpreting and using information from different types of texts and to critically assess how natural-science information is presented and used in argumentation. The development of reading skills in natural science progresses from finding and using information in texts to understanding texts with increasingly more subject-relevant terminology, symbols, figures, tables and implicit information.

Numeracy

Numeracy in natural science refers to the ability to collect, adapt and present relevant statistics. Numeracy in natural science also means using concepts and choosing suitable measuring instruments, measuring units and formulas to solve natural-science problems. Numeracy in natural science also refers to the ability to compare, assess and argue whether calculations, results and presentations are valid or not. The development of numeracy in natural science progresses from using simple methods for counting, sorting and classifying to the ability to assess the choice of methods, concepts, formulas and measuring instruments. The pupils also develop numeracy skills by creating increasingly advanced presentations and using calculations in subject-related argumentation.

Digital skills

Digital skills in natural science refers to using digital tools to explore, register, calculate, visualise, program, model, document and publish data from experiments, fieldwork and studies by others. Digital skills also refers to using search engines, mastering search strategies, critically assessing sources and selecting relevant information on natural-science topics. The development of digital skills in natural science progresses from the ability to use simple digital tools to demonstrating increasing independence and judgement in the choice and use of digital sources.

Competence aims and assessment

Competence aims and assessment after Year 2

Competence aims and assessment Year 2

The pupil is expected to be able to

- query, explore and make questions and to link these to one's own or others' experiences
- present one's findings and describe how one has arrived at them
- present one's own ideas for technological inventions
- explore and describe observable properties of different objects, materials and substances and sort them according to their properties
- talk about how we can make environmentally aware choices and carry out local environmental initiatives
- explore a local natural area and describe how some organisms are adapted to the area and to each other
- experience nature during the different seasons, reflect on how nature is undergoing changes and why the year is divided in different ways in the Norwegian and Sami traditions
- plan and carry out examinations of weather and sky phenomena and compare measurements, observations and weather signs throughout the year
- explore the senses through indoor and outdoor play and talk about how the senses are used to collect information
- give examples of some common diseases and talk about what can be done to protect the body from infectious diseases

Formative assessment

Formative assessment shall help to promote learning and develop competence in the subject. The pupils demonstrate and develop competence in natural science in Years 1 and 2 when they use relevant natural-science terminology in exploration, play, talking and presenting. They also demonstrate and develop natural-science competence when they work with the subject in practical and exploratory ways. They also demonstrate and develop competence when they have a sense of wonder, ask questions and describe observations and experiences.

The teacher shall facilitate for pupil participation and stimulate their desire to learn by allowing the pupils to play, have a sense of wonder and use their senses in their work to learn the subject. The teacher shall facilitate for varied ways of working in nature and other learning arenas. The teacher and pupils shall engage in dialogue about their development in natural science. The

pupils shall be given the opportunity to explore and experiment. With the competence the pupils have demonstrated as the starting point, they shall be given the opportunity to express what they believe they have achieved and what they believe they have improved on. The teacher shall provide guidance on further learning and adapt the teaching to enable the pupils to use the guidance provided to develop their knowledge on natural-science topics and their skills to ask questions and describe observations.

Competence aims and assessment Year 4

Competence aims after Year 4

The pupil is expected to be able to

- query, ask questions, formulate hypotheses and explore them to find answers
- use tables and figures to structure data, make explanations based on data and present findings
- compare models with observations and talk about how we use models in natural science
- explore technological systems that are composed of different parts and describe how the parts function and work together
- design and make a product based on specifications
- explore and describe how some substances can change when mixed with other substances
- explore observable quantities, such as speed and temperature, and connect them to energy
- talk about what energy is and explore different energy chains
- explore an area in nature and discuss sustainable use of the area
- explore and compare how different species of animals and plants adapt to environments and habitats and discuss why some species become extinct
- participate in harvesting and using natural resources and explain how natural resources can be used in a sustainable way
- give examples of good animal welfare and reflect on how to look after the needs of animals
- explore and describe the water cycle and explain why water is important for life on Earth
- talk about physical and mental health and explain how lifestyles and well-being affect health
- talk about the similarities and differences between the genders, about gender identity and about human reproduction
- describe how the muscles and skeleton function and relate this to movement
- describe functions in the body’s external defence mechanisms and talk about how these protect against disease

Formative assessment

Formative assessment shall help to promote learning and develop competence in the subject. The pupils demonstrate and develop competence in natural science in Years 3 and 4 when they use relevant natural-science terminology to describe and explain observations and natural-science phenomena. The pupils also develop natural science competence when they structure, compare and make their own natural-science questions and hypotheses, and when they explore these through play, practical work and other methods. They also demonstrate and develop competence when they reflect on findings and observations.

The teacher shall facilitate for pupil participation and stimulate their desire to learn by facilitating for varied, practical and exploratory ways of working in nature and in other learning arenas. The teacher and pupils shall engage in dialogue about their development in natural science. The pupils shall be given the opportunity to explore and experiment. With the competence the pupils have demonstrated as the starting point, they shall be given the opportunity to express what they believe they have achieved and what they believe they have improved on. The teacher shall provide guidance on further learning and adapt the teaching to enable the pupils to use the guidance to develop their competence in natural science.

Competence aims and assessment Year 7

Competence aims after year 7

The pupil is expected to be able to

- ask questions and formulate hypotheses about natural-science phenomena, identify variables and collect data to find answers
- distinguish between observations and conclusions, structure data, use cause and effect arguments, draw conclusions, assess sources of errors and present findings
- use and assess models that represent phenomena that cannot be observed directly and explain why models are used in natural science
- read and understand hazard labelling and reflect on the purpose os such labelling
- give examples of how natural-science knowledge has developed and continues to develop
- give examples of how traditional knowledge has contributed and continues to contribute to natural-science knowledge
- explore, make and program technological systems that consist of parts that work together
- design and make a product based on user needs
- reflect on how technology can solve challenges, create opportunities and lead to new dilemmas

- explore phase transitions and chemical reactions and describe their properties
- use the particle model to explain phase transitions and the properties of solids, liquids and gases
- explore electric and magnetic forces through experiments and talk about how we exploit electric energy in everyday life
- explain how organisms can be divided into main groups and give examples of the special features of different organisms
- explain the importance of biological diversity and implement measures to protect biological diversity in the local community
- propose measures to preserve biological diversity in northern areas and give examples of the importance of traditional knowledge in nature management
- explore and describe different food cycles and use this to discuss synergy in nature
- describe and visualise how day and night, moon phases and seasons arise and talk about the effect on life on Earth
- explain the conditions for life on Earth and compare these to other celestial bodies in the universe
- explain how the geological cycle, plate tectonics and external forces help shape and change different landscapes
- explain physical and mental changes during puberty and talk about how these can affect emotions, actions and sexuality
- describe some of the body's organ systems and describe how the systems work together

Formative assessment

Formative assessment shall help to promote learning and develop competence in the subject. The pupils demonstrate and develop competence in natural science in Years 5, 6 and 7 when they assess and use relevant subject-related terminology and models to explore, describe and explain natural-science phenomena. They also demonstrate and develop competence when they choose methods, explore and reflect on technology and other natural-science topics and assess their findings and results.

The teacher shall facilitate for pupil participation and stimulate their desire to learn by facilitating for varied, practical and exploratory ways of working. The teacher and pupils shall engage in dialogue about their development in natural science. The pupils shall be given the opportunity to explore and experiment. With the competence the pupils have demonstrated as the starting point, they shall have the opportunity to express what they believe they have achieved and reflect on what they believe they have improved on. The teacher shall provide guidance on further learning and adapt the teaching to enable the pupils to use the guidance to develop their competence in natural science.

Competence aims and assessment Year 10

Competence aims after Year 10

The pupil is expected to be able to

- ask questions and formulate hypotheses about natural-science phenomena, identify dependent and independent variables and collect data to find answers
- analyse and use collected data to make explanations, discuss the explanations in the light of relevant theory and assess the quality of one's own and others' explorations
- use and make models to predict or describe natural-science processes and systems and explain the strengths and limitations of the models
- participate in risk assessments in relation to experiments and comply with safety measures
- give examples of current research and explain how new knowledge is generated through collaboration and a critical approach to existing knowledge
- explore, understand and make technological systems that have a transmitter and receiver
- use programming to explore natural-science phenomena
- explore chemical reactions, explain mass conservation and explain the importance of some combustion reactions
- use atomic models and the periodic table to explain the properties of the elements and chemical compounds
- describe the greenhouse effect and explain factors that can cause global climate changes
- explain energy conservation and energy quality and explore different ways to convert, transport and store energy
- explain how energy production and energy use can affect the environment locally and globally
- describe how researchers have arrived at evolution theory and use it to explain the development of biological diversity
- compare cells in various organisms and describe the connections between structure and function
- explore connections between abiotic and biotic factors in an ecosystem and discuss how energy and matter are converted in cycles
- give examples of and discuss current dilemmas related to exploitation of natural resources and the loss of biological diversity
- give examples of traditional Sami knowledge about nature and discuss how this knowledge can contribute to sustainable nature management
- explain how photosynthesis and cellular respiration produce energy for all living organisms throughout the carbon cycle
- use plate tectonic theory to explain the development of Earth over time and give examples of observations that support this theory
- discuss questions relating to sexual and reproductive health

- compare the nervous system and hormone system and describe how drugs, medicines, environmental toxins and doping affect the cell signalling systems
- describe the body's immune system and how vaccines work and explain the importance of vaccines for public health

Formative assessment

Formative assessment shall help to promote learning and develop competence in the subject. The pupils demonstrate and develop competence in natural science in Years 8, 9 and 10 when they use relevant subject-related terminology, theories and models to describe, explain and discuss natural-science phenomena. They also demonstrate and develop competence when they explore, argue, analyse and reflect on natural-science topics and the interconnections between them, and assess their findings and results. They also demonstrate and develop competence when they apply the practices of the subject, and when they reflect on how natural-science knowledge is developed. The pupils also demonstrate competence when they use programming and explore technology.

The teacher shall facilitate for pupil participation and stimulate their desire to learn by facilitating for varied, practical and exploratory ways of working. The teacher and pupils shall engage in dialogue about their development in natural science. The pupils shall be given the opportunity to explore and experiment. With the competence the pupils have demonstrated as the starting point, they shall have the opportunity to express what they believe they have achieved, and reflect on their development in the subject. The teacher shall provide guidance on further learning and adapt the teaching to enable the pupils to use the guidance to develop their competence in natural science.

Assessment of coursework

The grade awarded for coursework shall reflect the overall competence of the pupil in natural science after completing Year 10. The teacher shall plan and facilitate for the pupils to demonstrate their competence in different ways, including through understanding, reflection and deliberation, and in various contexts. The teacher shall award a grade in natural science based on the competence demonstrated by the pupil when the pupil has communicated knowledge about and understanding of the content and interconnections in the subject. The grade shall also be based on the competence demonstrated by the pupil when working in a practical and exploratory manner.

Competence aims and assessment vg1 programmes for general studies

Competence aims after vg1 programmes for general studies

The pupil is expected to be able to

- explore a self-chosen natural-science research question, present findings and argue for the choice of methods
- carry out risk assessment of one's own experiments and manage the resulting waste in a suitable manner
- discuss how the development of natural-science hypotheses, models and theories helps us to understand and explain the world
- assess and make programs that model natural-science phenomena
- explore and describe some central wave phenomena
- explain the main principles of wireless communication and give examples of applications of this technology
- explore and describe electromagnetic and ionising radiation and assess information about radiation and the effect on health of various types of radiation
- describe the Big Bang theory, and the origin and development of the universe, and explain observations that support this theory
- explore and explain the connections between chemical bonds and the properties of different substances
- explore the properties and reactions of some organic and inorganic carbon compounds, give examples of applications and explain the importance of carbon for life on Earth
- explain how some environmental toxins can accumulate in food chains and assess measures to protect health and the environment
- explain the functions of some nutrients and discuss why a varied diet is important in a health and sustainability perspective
- discuss current health and lifestyle issues and assess the reliability of information from various sources
- describe DNA and how characteristics are inherited and explain how heredity is a precondition for evolution
- explain how climate changes affect evolution, the prevalence of species and biological diversity
- give examples of the use of biotechnology and discuss ethical questions related to biotechnology

Formative assessment

Formative assessment shall help to promote learning and develop competence in the subject. The pupils demonstrate and develop competence in natural science in the vg1 programme for general studies when they use subject-related terminology, theories and models to explore, describe, explain

and discuss relationships in and between natural-science phenomena. They also demonstrate and develop competence when they argue for the choice of methods, undertake ethical and safety assessments, reflect on findings and critically assess sources and information relating to their explorations and experiments. They also demonstrate and develop competence when they apply and reflect on natural-science practices and approaches and natural-science technology.

The teacher shall facilitate for pupil participation and stimulate their desire to learn by facilitating for varied, practical and exploratory ways of working. The teacher and pupils shall engage in dialogue about their development in natural science. The pupils shall be given the opportunity to explore and experiment. With the competence the pupils have demonstrated as the starting point, they shall be given the opportunity to express what they believe they have achieved, and reflect on their development in the subject. The teacher shall provide guidance on further learning and adapt the teaching to enable the pupils to use the guidance to develop their competence in natural science.

Assessment of coursework

The grade awarded for coursework shall reflect the overall competence of the pupil in natural science after completing vg1 in the programme for general studies. The teacher shall plan and facilitate for the pupils to demonstrate their competence in different ways, including through understanding, reflection and deliberation, and in various contexts. The teacher shall award a grade in natural science based on the competence demonstrated by the pupil when the pupil has communicated knowledge about and understanding of the content of the subject and has seen interconnections. The grade shall also be based on the competence demonstrated by the pupil when working in a practical and exploratory manner.

Competence aims and assessment vg1 building and construction

Competence aims after vg1 building and construction

The pupil is expected to be able to

- explore a self-chosen research question relating to one’s own education programme, present findings and argue for the choice of methods
- carry out risk assessment of one’s own experiments and manage the resulting waste in a suitable manner
- explore and present technology relating to one’s own education programme and assess it in a sustainability perspective
- discuss current health and lifestyle issues and assess the reliability of information from different sources

- explain the functions of some nutrients and discuss why a varied diet is important in a health and sustainability perspective
- explore the properties of different materials and surface treatments and assess their use in a sustainability perspective
- use the concepts of energy transition, energy conservation and efficiency to assess energy economy in buildings

Formative assessment

Formative assessment shall help to promote learning and develop competence in the subject. The pupils demonstrate and develop competence in natural science in the vg1 programme for building and construction when they use subject-related terminology, theories and models to explore, describe, explain and discuss relationships in and between natural-science phenomena. They also demonstrate and develop competence when they argue for the choice of methods, undertake ethical and safety assessments, reflect on findings and critically assess sources and information relating to their explorations and experiments. They also demonstrate and develop competence when they apply and reflect on natural-science practices and approaches and natural-science technology.

The teacher shall facilitate for pupil participation and stimulate their desire to learn by facilitating for varied, practical and exploratory ways of working. The teacher and pupils shall engage in dialogue about their development in natural science. The pupils shall be given the opportunity to explore and experiment. With the competence the pupils have demonstrated as the starting point, they shall have the opportunity to express what they believe they have achieved, and reflect on their development in the subject. The teacher shall provide guidance on further learning and adapt the teaching to enable the pupils to use the guidance to develop their competence in natural science.

Assessment of coursework

The grade awarded for coursework shall reflect the overall competence of the pupil in natural science after completing vg1 in the programme for building and construction. The teacher shall plan and facilitate for the pupils to demonstrate their competence in different ways, including through understanding, reflection and deliberation, and in various contexts. The teacher shall award a grade in natural science based on the competence demonstrated by the pupil when the pupil has communicated knowledge about and understanding of the content of the subject and has seen interconnections. The grade shall also be based on the competence demonstrated by the pupil when working in a practical and exploratory manner.

Competence aims and assessment vg1 electrical engineering and computer technology

Competence aims after vg1 electrical engineering and computer technology

The pupil is expected to be able to

- explore a self-chosen research question relating to one's own education programme, present findings and argue for the choice of methods
- carry out risk assessment of one's own experiments and manage the resulting waste in a suitable manner
- explore and present technology relating to one's own education programme and assess it in a sustainability perspective
- discuss current health and lifestyle issues and assess the reliability of information from different sources
- explain the functions of some nutrients and discuss why a varied diet is important in a health and sustainability perspective
- explain the connections between electrical energy and effect and present some energy-efficient solutions in buildings
- use the terms alternating current technology, direct current technology, energy storage and efficiency to describe and discuss methods for sustainable energy production

Formative assessment

Formative assessment shall help to promote learning and develop competence in the subject. The pupils demonstrate and develop competence in natural science in the vg1 programme for electrical engineering and computer technology when they use relevant subject-related terminology, theories and models to explore, describe, explain and discuss relationships in and between natural-science phenomena. They also demonstrate and develop competence when they argue for the choice of methods, undertake ethical and safety assessments, reflect on findings and critically assess sources and information relating to their explorations and experiments. They also demonstrate and develop competence when they apply and reflect on natural-science practices and approaches and natural-science technology.

The teacher shall facilitate for pupil participation and stimulate their desire to learn by facilitating for varied, practical and exploratory ways of working. The teacher and pupils shall engage in dialogue about their development in natural science. The pupils shall be given the opportunity to explore and experiment. With the competence the pupils have demonstrated as the starting point, they shall be given the opportunity to express what they believe they have achieved, and reflect on their development in the subject. The teacher shall

provide guidance on further learning and adapt the teaching to enable the pupils to use the guidance to develop their competence in natural science.

Assessment of coursework

The grade awarded for coursework shall reflect the overall competence of the pupil in natural science after completing vg1 in the programme for electrical engineering and computer technology. The teacher shall plan and facilitate for the pupils to demonstrate their competence in different ways, including through understanding, reflection and deliberation, and in various contexts. The teacher shall award a grade in natural science based on the competence demonstrated by the pupil when the pupils has communicated knowledge about and understanding of the content of the subject and has seen interconnections. The grade shall also be based on the competence demonstrated by the pupil when working in a practical and exploratory manner.

Competence aims and assessment vg1 hairdressing, floral, interior and retail design

Competence aims after vg1 hairdressing, floral, interior and retail design

The pupil is expected to be able to

- explore a self-chosen research question relating to one's own education programme, present findings and argue for the choice of methods
- carry out risk assessment of one's own experiments and manage the resulting waste in a suitable manner
- explore and present technology relating to one's own education programme and assess it in a sustainability perspective
- discuss current health and lifestyle issues and assess the reliability of information from different sources
- explain the functions of some nutrients and discuss why a varied diet is important in a health and sustainability perspective
- examine and assess the life cycle of various products from a sustainability perspective
- explore the properties and reactions of some substances and substance mixtures that are relevant to the education programme

Formative assessment

Formative assessment shall help to promote learning and develop competence in the subject. The pupils demonstrate and develop competence in natural science in the vg1 programme for hairdressing, floral, interior and retail design when they use relevant subject-related terminology, theories and

models to explore, describe, explain and discuss relationships in and between natural-science phenomena. They also demonstrate and develop competence when they argue for the choice of methods, undertake ethical and safety assessments, reflect on findings and critically assess sources and information relating to their explorations and experiments. They also demonstrate and develop competence when they apply and reflect on natural-science practices and approaches and natural-science technology.

The teacher shall facilitate for pupil participation and stimulate their desire to learn by facilitating for varied, practical and exploratory ways of working. The teacher and pupils shall engage in dialogue about their development in natural science. The pupils shall have the opportunity to explore and experiment. With the competence the pupils have demonstrated as the starting point, they shall have the opportunity to express what they believe they have achieved, and reflect on their development in the subject. The teacher shall provide guidance on further learning and adapt the teaching to enable the pupils to use the guidance to develop their competence in natural science.

Assessment of coursework

The grade awarded for coursework shall reflect the overall competence of the pupil in natural science after completing vg1 in the programme for hairdressing, floral, interior and retail design. The teacher shall plan and facilitate for the pupils to demonstrate their competence in different ways, including through understanding, reflection and deliberation, and in various contexts. The teacher shall award a grade in natural science based on the competence demonstrated by the pupil when the pupil has communicated knowledge about and understanding of the content of the subject and has seen interconnections. The grade shall also be based on the competence demonstrated by the pupil when working in a practical and exploratory manner.

Competence aims and assessment vg1 health and early development

Competence aims after vg1 health and early development

The pupil is expected to be able to

- explore a self-chosen research question relating to one’s own education programme, present findings and argue for the choice of methods
- carry out risk assessment of one’s own experiments and manage the resulting waste in a suitable manner
- explore and present technology relating to their own education programme and assess it in a sustainability perspective

- discuss current health and lifestyle issues and assess the reliability of information from different sources
- explain the functions of some nutrients and discuss why a varied diet is important in a health and sustainability perspective
- explore the properties and reactions of some substances and substance mixtures that are relevant to the education programme
- discuss the importance of microorganisms for the body and health

Formative assessment

Formative assessment shall help to promote learning and develop competence in the subject. The pupils demonstrate and develop competence in natural science in the vg1 programme for health and early development when they use relevant subject-related terminology, theories and models to explore, describe, explain and discuss relationships in and between natural-science phenomena. They also demonstrate and develop competence when they argue for the choice of methods, undertake ethical and safety assessments, reflect on findings and critically assess sources and information relating to their explorations and experiments. They also demonstrate and develop competence when they apply and reflect on natural-science practices and approaches and natural-science technology.

The teacher shall facilitate for pupil participation and stimulate their desire to learn by facilitating for varied, practical and exploratory ways of working. The teacher and pupils shall engage in dialogue about their development in natural science. The pupils shall have the opportunity to explore and experiment. With the competence the pupils have demonstrated as the starting point, they shall have the opportunity to express what they believe they have achieved, and reflect on their development in the subject. The teacher shall provide guidance on further learning and adapt the teaching to enable the pupils to use the guidance to develop their competence in natural science.

Assessment of coursework

The grade awarded for coursework shall reflect the overall competence of the pupil in natural science after completing vg1 in the programme for health and early development. The teacher shall plan and facilitate for the pupils to demonstrate their competence in different ways, including through understanding, reflection and deliberation, and in various contexts. The teacher shall award a grade in natural science based on the competence demonstrated by the pupil when the pupils has communicated knowledge about and understanding of the content of the subject and has seen interconnections. The grade shall also be based on the competence demonstrated by the pupil when working in a practical and exploratory manner.

Competence aims and assessment vg1 crafts, design and product development

Competence aims after vg1 crafts, design and product development

The pupil is expected to be able to

- explore a self-chosen research question relating to one's own education programme, present findings and argue for the choice of methods
- carry out risk assessment of one's own experiments and manage the resulting waste in a suitable manner
- explore and present technology relating to one's own education programme and assess it in a sustainability perspective
- discuss current health and lifestyle issues and assess the reliability of information from different sources
- explain the functions of some nutrients and discuss why a varied diet is important in a health and sustainability perspective
- investigate and assess the life cycle of various products in a sustainability perspective
- explore the properties of different materials and surface treatments and assess their use from a sustainability perspective

Formative assessment

Formative assessment shall help to promote learning and develop competence in the subject. The pupils demonstrate and develop competence in natural science in the vg1 programme for crafts, design and product development when they use relevant subject-related terminology, theories and models to explore, describe, explain and discuss relationships in and between natural-science phenomena. They also demonstrate and develop competence when they argue for the choice of methods, undertake ethical and safety assessments, reflect on findings and critically assess sources and information relating to their explorations and experiments. They also demonstrate and develop competence when they apply and reflect on natural-science practices and approaches and natural-science technology.

The teacher shall facilitate for pupil participation and stimulate their desire to learn by facilitating for varied, practical and exploratory ways of working. The teacher and pupils shall engage in dialogue about their development in natural science. The pupils shall have the opportunity to explore and experiment. With the competence the pupils have demonstrated as the starting point, they shall have the opportunity to express what they believe they have achieved, and reflect on their development in the subject. The teacher shall provide guidance on further learning and adapt the teaching to enable the pupils to use the guidance to develop their competence in natural science.

Assessment of coursework

The grade awarded for coursework shall reflect the overall competence of the pupil in natural science after completing vg1 in the programme for crafts, design and product development. The teacher shall plan and facilitate for the pupils to demonstrate their competence in different ways, including through understanding, reflection and deliberation, and in various contexts. The teacher shall award a grade in natural science based on the competence demonstrated by the pupil when the pupil has communicated knowledge about and understanding of the content of the subject and has seen interconnections. The grade shall also be based on the competence demonstrated by the pupil when working in a practical and exploratory manner.

Competence aims and assessment vg1 information technology and media production

Competence aims after vg1 information technology and media production

The pupil is expected to be able to

- explore a self-chosen research question relating to one's own education programme, present findings and argue for the choice of methods
- carry out risk assessment of one's own experiments and manage the resulting waste in a suitable manner
- explore and present technology relating to one's own education programme and assess it in a sustainability perspective
- discuss current health and lifestyle issues and assess the reliability of information from different sources
- explain the functions of some nutrients and discuss why a varied diet is important in a health and sustainability perspective
- describe different types of electromagnetic radiation and give examples of how radiation is used in wireless communication
- explore wave phenomena relating to sound and acoustics

Formative assessment

Formative assessment shall help to promote learning and develop competence in the subject. The pupils demonstrate and develop competence in natural science in the vg1 programme for information technology and media production when they use relevant subject-related terminology, theories and models to explore, describe, explain and discuss relationships in and between natural-science phenomena. They also demonstrate and develop competence when they argue for the choice of methods, undertake ethical

and safety assessments, reflect on findings and critically assess sources and information relating to their explorations and experiments. They also demonstrate and develop competence when they apply and reflect on natural-science practices and approaches and natural-science technology.

The teacher shall facilitate for pupil participation and stimulate their desire to learn by facilitating for varied, practical and exploratory ways of working. The teacher and pupils shall engage in dialogue about their development in natural science. The pupils shall have the opportunity to explore and experiment. With the competence the pupils have demonstrated as the starting point, they shall have the opportunity to express what they believe they have achieved, and reflect on their development in the subject. The teacher shall provide guidance on further learning and adapt the teaching to enable the pupils to use the guidance to develop their competence in natural science.

Assessment of coursework

The grade awarded for coursework shall reflect the overall competence of the pupil in natural science after completing vg1 in the programme for information technology and media production. The teacher shall plan and facilitate for the pupils to demonstrate their competence in different ways, including through understanding, reflection and deliberation, and in various contexts. The teacher shall award a grade in natural science based on the competence demonstrated by the pupil when the pupil has communicated knowledge about and understanding of the content of the subject and has seen interconnections. The grade shall also be based on the competence demonstrated by the pupil when working in a practical and exploratory manner.

Competence aims and assessment vg1 agriculture, fishing and forestry

Competence aims after vg1 agriculture, fishing and forestry

The pupil is expected to be able to

- explore a self-chosen research question relating to one’s own education programme, present findings and argue for the choice of methods
- carry out risk assessment of one’s own experiments and manage the resulting waste in a suitable manner
- explore and present technology relating to one’s own education programme and assess it in a sustainability perspective
- discuss current health and lifestyle issues and assess the reliability of information from different sources
- explain the functions of some nutrients and discuss why a varied diet is important in a health and sustainability perspective

- explore issues related to land use, explain how changes can affect ecosystems and propose sustainable solutions
- explain why some elements are important for life and assess how human activity can affect the cycles of these elements

Formative assessment

Formative assessment shall help to promote learning and develop competence in the subject. The pupils demonstrate and develop competence in natural science in the vg1 programme for agriculture, fishing and forestry when they use relevant subject-related terminology, theories and models to explore, describe, explain and discuss relationships in and between natural-science phenomena. They also demonstrate and develop competence when they argue for the choice of methods, undertake ethical and safety assessments, reflect on findings and critically assess sources and information relating to their explorations and experiments. They also demonstrate and develop competence when they apply and reflect on natural-science practices and approaches and natural-science technology.

The teacher shall facilitate for pupil participation and stimulate their desire to learn by facilitating for varied, practical and exploratory ways of working. The teacher and pupils shall engage in dialogue about their development in natural science. The pupils shall have the opportunity to explore and experiment. With the competence the pupils have demonstrated as the starting point, they shall have the opportunity to express what they believe they have achieved, and reflect on their development in the subject. The teacher shall provide guidance on further learning and adapt the teaching to enable the pupils to use the guidance to develop their competence in natural science.

Assessment of coursework

The grade awarded for coursework shall reflect the overall competence of the pupil in natural science after completing vg1 in the programme for agriculture, fishing and forestry. The teacher shall plan and facilitate for the pupils to demonstrate their competence in different ways, including through understanding, reflection and deliberation, and in various contexts. The teacher shall award a grade in natural science based on the competence demonstrated by the pupil when the pupil has communicated knowledge about and understanding of the content of the subject and has seen interconnections. The grade shall also be based on the competence demonstrated by the pupil when working in a practical and exploratory manner.

Competence aims and assessment vg1 restaurant and food

Competence aims after vg1 restaurant and food

The pupil is expected to be able to

- explore a self-chosen research question relating to one's own education programme, present findings and argue for the choice of methods
- carry out risk assessment of one's own experiments and manage the resulting waste in a suitable manner
- explore and present technology relating to one's own education programme and assess it in a sustainability perspective
- discuss current health and lifestyle issues and assess the reliability of information from different sources
- explain the functions of some nutrients and discuss why a varied diet is important in a health and sustainability perspective
- explore the properties and reactions of some substances and substance mixtures that are relevant to the education programme
- explain food safety and the importance of microorganisms for food production, operations hygiene and food processing

Formative assessment

Formative assessment shall help to promote learning and develop competence in the subject. The pupils demonstrate and develop competence in natural science in the vg1 programme for restaurant and food when they use relevant subject-related terminology, theories and models to explore, describe, explain and discuss relationships in and between natural-science phenomena. They also demonstrate and develop competence when they argue for the choice of methods, undertake ethical and safety assessments, reflect on findings and critically assess sources and information relating to their explorations and experiments. They also demonstrate and develop competence when they apply and reflect on natural-science practices and approaches and natural-science technology.

The teacher shall facilitate for pupil participation and stimulate their desire to learn by facilitating for varied, practical and exploratory ways of working. The teacher and pupils shall engage in dialogue about their development in natural science. The pupils shall have the opportunity to explore and experiment. With the competence the pupils have demonstrated as the starting point, they shall have the opportunity to express what they believe they have achieved, and reflect on their development in the subject. The teacher shall provide guidance on further learning and adapt the teaching to enable the pupils to use the guidance to develop their competence in natural science.

Assessment of coursework

The grade awarded for coursework shall reflect the overall competence of the pupil in natural science after completing vg1 in the programme for restaurant and food. The teacher shall plan and facilitate for the pupils to demonstrate their competence in different ways, including through understanding, reflection and deliberation, and in various contexts. The teacher shall award a grade in natural science based on the competence demonstrated by the pupil when the pupil has communicated knowledge about and understanding of the content of the subject and has seen interconnections. The grade shall also be based on the competence demonstrated by the pupil when working in a practical and exploratory manner.

Competence aims and assessment vg1 sales, service and tourism

Competence aims after vg1 sales, service and tourism

The pupil is expected to be able to

- explore a self-chosen research question relating to one's own education programme, present findings and argue for the choice of methods
- carry out risk assessment of one's own experiments and manage the resulting waste in a suitable manner
- explore and present technology relating to one's own education programme and assess it in a sustainability perspective
- discuss current health and lifestyle issues and assess the reliability of information from different sources
- explain the functions of some nutrients and discuss why a varied diet is important in a health and sustainability perspective
- explore the life cycle of various materials and products and assess them from a sustainability perspective
- explain current environmental challenges relating to trade and tourism and discuss them from a sustainability perspective

Formative assessment

Formative assessment shall help to promote learning and develop competence in the subject. The pupils demonstrate and develop competence in natural science in the vg1 programme for sales, service and tourism when they use relevant subject-related terminology, theories and models to explore, describe, explain and discuss relationships in and between natural-science phenomena. They also demonstrate and develop competence when they argue for the choice of methods, undertake ethical and safety assessments, reflect on findings and critically assess sources and information relating to their explorations and experiments. They also demonstrate and develop

competence when they apply and reflect on natural-science practices and approaches and natural-science technology.

The teacher shall facilitate for pupil participation and stimulate their desire to learn by facilitating for varied, practical and exploratory ways of working. The teacher and pupils shall engage in dialogue about their development in natural science. The pupils shall have the opportunity to explore and experiment. With the competence the pupils have demonstrated as the starting point, they shall have the opportunity to express what they believe they have achieved, and reflect on their development in the subject. The teacher shall provide guidance on further learning and adapt the teaching to enable the pupils to use the guidance to develop their competence in natural science.

Assessment of coursework

The grade awarded for coursework shall reflect the overall competence of the pupil in natural science after completing vg1 in the programme for sales, service and tourism. The teacher shall plan and facilitate for the pupils to demonstrate their competence in different ways, including through understanding, reflection and deliberation, and in various contexts. The teacher shall award a grade in natural science based on the competence demonstrated by the pupil when the pupil has communicated knowledge about and understanding of the content of the subject and has seen interconnections. The grade shall also be based on the competence demonstrated by the pupil when working in a practical and exploratory manner.

Competence aims and assessment vg1 technical and industrial production

Competence aims after vg1 technical and industrial production

The pupil is expected to be able to

- explore a self-chosen research question relating to one's own education programme, present findings and argue for the choice of methods
- carry out risk assessment of one's own experiments and manage the resulting waste in a suitable manner
- explore and present technology relating to one's own education programme and assess it in a sustainability perspective
- discuss current health and lifestyle issues and assess the reliability of information from different sources
- explain the functions of some nutrients and discuss why a varied diet is important in a health and sustainability perspective
- explore the properties of different materials and surface treatments and assess their use from a sustainability perspective

- explore and assess different methods for storing and transferring energy

Formative assessment

Formative assessment shall help to promote learning and develop competence in the subject. The pupils demonstrate and develop competence in natural science in the vg1 programme for technical and industrial production when they use relevant subject-related terminology, theories and models to explore, describe, explain and discuss relationships in and between natural-science phenomena. They also demonstrate and develop competence when they argue for the choice of methods, undertake ethical and safety assessments, reflect on findings and critically assess sources and information relating to their explorations and experiments. They also demonstrate and develop competence when they apply and reflect on natural-science practices and approaches and natural-science technology.

The teacher shall facilitate for pupil participation and stimulate their desire to learn by facilitating for varied, practical and exploratory ways of working. The teacher and pupils shall engage in dialogue about their development in natural science. The pupils shall have the opportunity to explore and experiment. With the competence the pupils have demonstrated as the starting point, they shall have the opportunity to express what they believe they have achieved, and reflect on their development in the subject. The teacher shall provide guidance on further learning and adapt the teaching to enable the pupils to use the guidance to develop their competence in natural science.

Assessment of coursework

The grade awarded for coursework shall reflect the overall competence of the pupil in natural science after completing vg1 in the programme for technical and industrial production. The teacher shall plan and facilitate for the pupils to demonstrate their competence in different ways, including through understanding, reflection and deliberation, and in various contexts. The teacher shall award a grade in natural science based on the competence demonstrated by the pupil when the pupils has communicated knowledge about and understanding of the content of the subject and has seen interconnections. The grade shall also be based on the competence demonstrated by the pupil when working in a practical and exploratory manner.

Competence aims and assessment vg3 supplementary programme for general university and college admissions certification

Competence aims after vg3 supplementary programme for general university and college admissions certification

The pupil is expected to be able to

- explain how the development of natural-science hypotheses, models and theories helps us to understand and explain the world
- assess and make programs that model natural-science phenomena
- describe the Big Bang theory, and the origin and development of the universe, and explain observations that support this theory
- explore and describe electromagnetic and ionising radiation and assess information on radiation and the health effects of various types of radiation
- explore and describe some central wave phenomena
- explain the main principles of wireless communication and give examples of applications of this technology
- describe DNA and how characteristics are inherited and explain how heredity is a precondition for evolution
- explain how climate changes affect evolution, the prevalence of species and biological diversity
- give examples of the use of biotechnology and discuss ethical questions related to biotechnology
- explain how some environmental toxins can accumulate in food chains and assess measures to protect health and the environment

Formative assessment

Formative assessment shall help to promote learning and develop competence in the subject. The pupils demonstrate and develop competence in natural science in the vg3 supplementary programme for general university and college admissions certification when they use relevant subject-related terminology, theories and models to explore, describe, explain and discuss relationships in and between natural-science phenomena. They also demonstrate and develop competence when they argue for the choice of methods, undertake ethical and safety assessments, reflect on findings and critically assess sources and information relating to their explorations and experiments. They also demonstrate and develop competence when they apply and reflect on natural-science practices and approaches and natural-science technology.

The teacher shall facilitate for pupil participation and stimulate their desire to learn by facilitating for varied, practical and exploratory ways of working. The

teacher and pupils shall engage in dialogue about their development in natural science. The pupils shall have the opportunity to explore and experiment. With the competence the pupils have demonstrated as the starting point, they shall have the opportunity to express what they believe they have achieved, and reflect on their development in the subject. The teacher shall provide guidance on further learning and adapt the teaching to enable the pupils to use the guidance to develop their competence in natural science.

Assessment of coursework

The grade awarded for coursework shall reflect the overall competence of the pupil in natural science after completing vg1 in the supplementary programme for general university and college admissions certification. The teacher shall plan and facilitate for the pupils to demonstrate their competence in different ways, including through understanding, reflection and deliberation, and in various contexts. The teacher shall award a grade in natural science based on the competence demonstrated by the pupil when the pupil has communicated knowledge about and understanding of the content of the subject and has seen interconnections. The grade shall also be based on the competence demonstrated by the pupil when working in a practical and exploratory manner.

Type of assessment

Assessment of coursework

Year 10: Pupils shall receive one grade for coursework.

Vg1 vocational education programmes: Pupils shall receive one grade for coursework.

Vg1 programmes for general studies: Pupils shall receive one grade for coursework.

Vg3 supplementary programme for general university and college admissions certification: Pupils shall receive one grade for coursework.

Examination for pupils

Year 10: The pupil can be selected for an oral-practical examination with a preparation part. The examination is prepared and graded locally.

Vg1 vocational education programmes: The pupil can be selected for oral-practical examination with a preparation part. The examination is prepared and graded locally.

Vg1 general studies programmes: The pupil can be selected for an oral-practical examination with a preparation part. The examination is prepared and graded locally.

Vg3 Supplementary programme for general university and college admissions certification: The pupil can be selected for an oral-practical examination with a preparation part. The examination is prepared and graded locally.

Examination for external candidates

Year 10: See the provisions in force for primary and lower secondary education for adults.

Vg1 vocational education programmes: The external candidate shall sit for an oral-practical examination. The examination is prepared and graded locally. Each county authority determines whether external candidates shall be given a preparation part for locally prepared examinations.

Vg1 general studies programmes: The external candidate shall sit for an oral-practical examination. The examination is prepared and graded locally. Each county authority determines whether external candidates shall be given a preparation part for locally prepared examinations.

Vg3 Supplementary programme for general university and college admissions certification: The external candidate shall sit for an oral-practical examination. The examination is prepared and graded locally. Each county authority determines whether external candidates shall be given a preparation part for locally prepared examinations.