

Biology - School Curriculum for Website

The Biology department at the DSJ comprises teachers that are highly skilled in the function they perform. We work very diligently so as to meet with the requirements as set out in the “Biology - Subject Policy Document” – 2011)

“The single most important task of all Biology teachers is to develop positive, but realistic attitudes – not only towards the subject content areas covered in Biology – but also towards the processes used in the subject. Specifically teachers need to promote positive attitudes with respect to the willingness of pupils to:

- Think(for themselves)
- Collect and use evidence,
- Develop opinions based on evidence
- Justify opinions
- Share ideas and opinions with others
- Build on the ideas of others
- Critically comment on the opinion/ideas of others
- Change ideas in light of new evidence
- Review procedures critically
- Apply knowledge and skills to everyday life

Biology teachers need to motivate their pupils with their own enthusiasm since attitudes are as much “caught” as taught.”

Our department comprises:

Mrs Rashika Nowbotsing – Department Head & NSC Specialist (IEB)

Ms Julia Guddat – German Abitur Specialist

Mr Wolfgang Pilshofer – German Arbitur Specialist

Ms Heike Wagner – German Gymnasium Specialist

Mrs Luise Granig – German Gymnasium Specialist & NSek Specialist

The school curriculum has been formulated so as to work closely with the German curriculum. Our curriculum also serves to meet the requirements of the stipulations of the Kultusministerkonferenz, “Kerncurriculum”.

Thus , we focus our subject content to the development of skills within the scope of Biology:

(Subject Policy Document 10.2. – Biology is a Science, a body of knowledge, and a process. During lessons the emphasis should be placed on the scientific approach and

skills which are fundamental to scientific study, rather than solely on factual knowledge. Learners should be encouraged to participate actively in lessons as far as possible.

As a consequence of the approach outlined in the paragraph above it becomes important to teach process skills such as

- Hypothesizing
- Observing
- Explaining
- Predicting
- Posing problems
- Raising questions
- Investigating
- Communicating
- Designing, applying and linking with technology, society and everyday life.)

During lessons it will probably be required that each learner should do one or more of the following:

- Answer revision/homework questions (preferably in writing, in the exercise book) that is marked by the learner , as soon as a consensus is reached in the class as to the correct answer.
- Work with other learners in a group to discuss/complete an activity
- Carry out instructions that lead to successful conclusion of lesson objectives
- Make and record observations
- Organize data
- Answer questions that direct observations during practical work
- Make suitable predications based on given information
- Investigate problems
- Explain results/findings
- Work-out exercises that reinforce new concepts
- Use relevant reference books and other media, and carry out tasks, or answer questions, in which newly acquired knowledge is applied

Teaching and learning is done with modern technological aids and modern methods. We actively participate in cross-curricular projects with other departments so as to allow learners the opportunity to inter-relate knowledge. Learning outside the classroom is encouraged, and we take learners into a stimulated environment so that they may apply facts to everyday life. Curiosity and critical thinking is nurtured in the expos, Olympiads and competitions that we urge learners into.

The department functions academically by assessing the learner continuously. The primary aim of continuous assessment is to monitor a learner's progress in the different components of the teaching and learning process. This includes:

- assessment of a learner's regular independent written work (classwork/homework exercises), assignments/projects based on knowledge, understanding of concepts and skills acquired
- assessment of a learner's involvement in the learning situation as shown by attitudes, knowledge, understanding and process skills. eg. during cooperative learning activities
- results obtained by the learner in diagnostic tests. (short tests and long tests)
- At the end of each half year the allocation of marks (weighting of components, independent work, practical work/investigations, diagnostic tests(short and long tests) for grades 5 - 9 is done as follows:

Continuous Assessment 66.67%	Formal Test (one in each half year) 33.33%	Total mark for the half year 100%
		This mark is then entered into the report as the mark for Biology for the half year

Assessment scheme for the German Abitur (grade 10-12) is as follows:

Continuous Assessment 50%	Formal Test (one in each term) 50%	Total mark for the half year 100%
		This mark is then entered into the report as the mark for Biology for the half year

Assessment scheme for the IEB – Life Sciences(Grade 10 – 11):

Continuous Assessment 40%	Formal Test (one in each term) 60%	Total mark for the half year 100%
		This mark is then entered into the report as the mark for Life Sciences for the half year

Assessment scheme for the IEB – Life Sciences(Grade 12)

Continuous Assessment 25%	Formal Test (one in each term) 75%	Total mark for the half year 100%
		This mark is then entered into the report as the mark for Life Sciences for the half year

Grade 5

Topic	Content	Methods/Skills										
<p>1. The Characteristics of Life</p> <p>2. The Human Body Plan</p>	<p>Learners are expected to understand the definition of “Biology” – the study of all living things (and comparisons to non-living)</p> <p>Introduce the characteristics of life displayed by humans. Learners are expected to link these characteristics to the different organ systems responsible for each characteristic</p>	<p>Learners provided with different objects/specimens/pictures to allow them to develop system/criteria that they would use to classify objects into living and non-living.</p> <p>Use examples that clearly illustrate each characteristic of life.</p>										
<p>3. Vertebrate Groups – Fish, Amphibians, Reptiles, Birds, Mammals</p>	<ul style="list-style-type: none"> • Introduce the term ‘vertebral column’ • Distinguish the 5 major vertebrate groups • Learners are expected to observe specimens of each vertebrate, describe the general body plan, make comparisons • Describe the environment (habitat), of each vertebrate • Provide a brief outline of the lifecycle of vertebrates <p>Possible Project work: Once all 5 classes are studied, learners should be able to formulate a comparative study of the vertebrate groups. This should finally be an independent activity. Learners are to reflect on the observations made of each group, and complete a comparison worksheet. This activity may be teacher guided/discussed in pairs/small groups, but the learner is expected to complete the comparison worksheet independently.</p> <p>Example:</p> <p>Reproduction:</p> <table border="1" data-bbox="432 1581 1350 1704"> <thead> <tr> <th data-bbox="432 1581 616 1615">Fish</th> <th data-bbox="616 1581 799 1615">Amphibians</th> <th data-bbox="799 1581 983 1615">Reptiles</th> <th data-bbox="983 1581 1166 1615">Birds</th> <th data-bbox="1166 1581 1350 1615">Mammals</th> </tr> </thead> <tbody> <tr> <td data-bbox="432 1615 616 1704"></td> <td data-bbox="616 1615 799 1704"></td> <td data-bbox="799 1615 983 1704"></td> <td data-bbox="983 1615 1166 1704"></td> <td data-bbox="1166 1615 1350 1704"></td> </tr> </tbody> </table> <p>Provide learners with the opportunity to compare each group with the vertebrate group before it, to explain how this vertebrate group has improved from the vertebrate group before it.</p> <p>The class teacher reserves the right to practice with learners the appropriate skills in biology in any lesson in which he/she deems applicable to the curriculum content.</p>	Fish	Amphibians	Reptiles	Birds	Mammals						<p>Learners differentiate vertebrates from invertebrates from given examples</p> <p>Learners draw a web diagram/family tree of the 5 vertebrate groups.</p> <p>Discuss the significance of this body plan to the life of this vertebrate. Make comparisons between their body plan and the body plan of the vertebrate under study.</p> <p>Observe/Comment on any special adaptations for survival in this habitat</p>
Fish	Amphibians	Reptiles	Birds	Mammals								

Grade 6

Topic	Content	Method/Skills
<p>Microscopy</p> <p>Term 1</p>	<p>Learners should be able to:</p> <ul style="list-style-type: none"> • Understand that life exists in a scale that is smaller than what the naked eye distinguishes. • Outline a brief history in the development of microscope. • Understand the term 'microscopic' and the need for the use of a magnifying object, eg the microscope. • Identify the different parts of a light microscope and associate the function to the working of a microscope. • Generate biological drawings 	<p>Microscopy workshop: learners undertake activities that allow them to confidently operate a simple light microscope.</p> <p>Learners develop wet mounts of stained animal and plant cells.</p> <p>Learners will make large clear biological drawings. Rules in developing biological drawings will be followed strictly.</p> <p>Learners make biological drawings of objects viewed with the naked eye, a magnifying glass, and a microscopic image and compare detail of their drawings.</p>
<p>Cells</p> <p>(Term 1-2)</p>	<p>Learners should be able to:</p> <ul style="list-style-type: none"> • Describe the structure of a typical animal cell, and Identify the internal organelles(nucleus, vacuole, mitochondrion, cell membrane, cell wall, chloroplasts) of the cell and provide functions for them • Make comparisons in the structure of a plant cell to an animal cell • Identify few examples of specialized cells • Cellular organization: learners are to realize that cells work in harmony with other cells around to complete the multi-cellular structure of a 	<p>Label diagrams of plant and animal cells. Follow rules of biological drawings to make their own labeled diagrams of plant and animal cells.</p> <p>Possible Project: Develop a model of a plant/animal cell from edible materials. Provide labels for the different structures. Tabulation of comparison to illustrate difference</p> <p>Analysis of structure to determine how the specialized structure assists in performing a more efficient function.</p> <p>Possible Oral Presentation: (3-5 minutes) learners research structure and functioning of any specialized animal/plant cell. Presentations should be accompanied by diagrams, posters, pictures, and a worksheet with information for other learners.</p> <p>Cells → tissues → organs → organ systems</p>

	complex organism.	→organism
<p>Flowering Plants (Angiosperms)</p> <p>Terms 2, 3, 4</p>	<ul style="list-style-type: none"> • Learners are expected to realize the difference between flowering and non-flowering plants. • Understand the importance of Genus and Species naming in classification • Learners understand that there are two types of flowering plant: Dicotyledonous (dicot) and Monocotyledonous (monocot) • Distinguish between the root and the shoot of a typical plant. • Identify and examine the different root systems in plants • Describe the process of osmosis • To identify the different parts of the stem • Describe the function of xylem and phloem • Vegetative Reproduction: describe atypical functions performed by roots/stems/leaves (support, reproduction, storage, protection) • Examine the structure of a leaf to identify the different parts of the leaf • Describe the function of the leaf as an organ of photosynthesis • Describe the structure of the flower 	<p>Discuss factors in identify plants. Create a very basic classification of the trees on the school grounds. Provide examples of the two types of plants from examples in their environment. Identify useful/medicinal plants in the environment and provide a possible oral presentation of plants observed/studied</p> <p>Possible Activities:</p> <p>(1) Learners select an appropriate specimen of a plant, dry and press it into their book, and label the different regions of the plant , and the structures.</p> <p>(2) Learners collect and examine specimens of the different root systems. Biological drawings of the root systems are generated. Comparisons between them are made. These comparisons can be used to understand the functions of roots in plants.</p> <p>(3) Fresh specimens (germinating onion) can be used to observe the different regions of the root. Learners identify these regions and describe the functions of the regions.</p> <p>(4) Stems of soft plants can be placed in coloured water to stain the xylem. Sections of the stem can be seen under the microscope to identify the xylem.</p> <p>(5) Learners collect specimens, pictures where roots/stems/leaves perform atypical functions. These are then examined and discussed.</p> <p>The function of the leaf is paralleled to a food factory.</p> <p>Compare and contrast flower structures.</p> <p>(6) Observe fresh specimens of flowers. Dissect flowers to identify different structures and determine their functions in the flower. (St Joseph's Lilly)</p> <p>(7) Observe pollen structure under the microscope.</p> <p>(8) Examine and compare the bean and maize seeds to identify their parts. Learners practice biological drawing skills in producing drawings</p>

	<ul style="list-style-type: none"> • Describe the process of pollination. • Describe the process of fertilisation. • Identify the two types of seeds, make comparisons in their structures and explain the function of the different parts of the seed. Understand the concept of “di-“ and “mono-“ • Comparing Monocot plants to Dicot plants • The study of two commercially important land plants in South Africa (Monocot: cereal plants & Dicots: Potato/Mango) 	<p>of the two seed types</p> <p>Learners use all the information learned thus far to make a total comparison between dicot and monocot plants.</p> <p>**Possible Experiment: (1)Germination of pollen in sugar solution to observe growth</p> <p>(2) Recording the germination of seeds(scientific method-factors affecting germination)</p> <p>(3) Use of vegetative organs for reproduction(Eg. African Violets, Dahlia, Tulips, Potato)</p> <p>Possible Project: Comparative research – Self Study in groups</p> <p>Learners compile a project into the study of the structure of the maize or mango plant to examine its anatomy. Work may be done in a group where an individual learner is assigned the task for the study of one part of the plant. This information is assembled and could be presented as a group project</p>
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The class teacher reserves the right to practice with learners the appropriate skills in biology in any lesson in which he/she deems applicable to the curriculum content.

Grade 7

Topic	Content	Methods
Microscopy (1 Weeks)	The learner should be able to: <ul style="list-style-type: none"> • Be familiar with the and functioning of a light microscope • Calculate the of magnification of an image 	Revision of Grade 6 work. Handling and working of the light microscope is made familiar. (Use worksheets from microscopy workshop). Learners need to understand how the image size is determined. Learners prepare slides.
Introduction to Invertebrates (1 week) (Insecta) Term 1-2	<ul style="list-style-type: none"> • Define an invertebrate • Classify different invertebrates • Classify insects • Examine a typical insect(Honey bee) to study body plan • Describe movement • Understand and explain the process of reproduction, and life cycle 	Compile a diagram to show the different insect groups. General characteristics of each group. Use of specimens/diagrams to classify insects- characteristics of the groups Generate biological drawings of insects Follow instructional prompt in a worksheets, and microscopic observations that allows them to investigate the body plan and external and internal structure of insects. Information worksheets describe the process of reproduction and life cycle in insects Possible Project: "Build a Bug" Learners use the knowledge gained to create an insect of their own. Ideally, this information should be delivered to the class as a 10 minute presentation
Invertebrates (Any Two- Hydra and Jelly fish/ Corals/ Sponges) Term 2	The learner should be able to: <ul style="list-style-type: none"> • Describe the body plan of - Hydra and Jellyfish/ Corals/Sponges • Discuss reproduction and mode of reproduction, locomotion ,nutrition 	Compare the body plan of Hydra, to Jellyfish/sponges/ corals Comparison of Nutrition, locomotion and reproductive strategies in Hydra and Jellyfish/ Sponges/ Corals. Possible Research Activity: Write a Coral Report on the fate of corals in the oceans

<p>Worms- (Earthworm/ tapeworm)</p> <p>Term 2-3</p>	<ul style="list-style-type: none"> • Use example of the earthworm to study the structure, reproduction, nutrition, locomotion in worms • Discuss the advantage of hermaphrodites • Explain the role of earthworms in the environment • Compare the earthworm to the tapeworm 	<p>Observe living specimens of earthworms to identify body structures, responses to environment</p> <p>Possible Role Play: In groups, learners research the importance of earthworms in the environment and create a TV documentary show that highlights and explains the role of earthworms in nature.</p> <p>Tabulate similarities and differences between earthworms and tapeworms.</p> <p>Tapeworm infections – preventative measures</p>
<p>Unicellular Invertebrate Organisms (Phylum Protozoa)</p> <p>Term 3- 4</p> <p>Ecology – Food Chains</p>	<ul style="list-style-type: none"> • Distinguish between a unicellular and a multi-cellular organism • Differentiate between prokaryote and Eukaryote organisms • Provide examples of protozoa and observe microscopic protozoans, describe structure, habitat • Classify protozoa • Describe movement(pseudopodia/flagella/cilia) and mode of nutrition(heterotrophic, autotrophic) in protozoa • Comparison of structure/locomotion mode/feeding/reproduction in the different protozoan groups • Investigate the cause of Malaria/Bilharzia <p>The learner should be able to:</p> <ul style="list-style-type: none"> • Describe basic food chains • Describe CO₂ – O₂ cycles 	<p>Microscopic examination of protozoa in pond water. Define terms: Microscopic/Unicellular(animal)/Eukaryote/Prokaryote/Parasite/Host</p> <p>Microscopy: preparation of wet mount slides of pond water sample</p> <p>Observe Movement (live specimens/videos)by :</p> <ul style="list-style-type: none"> ○ flagella – a thin long whip-like structure that rotates very fast to propel the organism forward ○ cilia – small, hair-like structures on the cell membrane that vibrate in rhythm to move the organism ○ Pseudopodia – temporary projections of the cytoplasm that allow the organism to glide forward. <p>Provide definitions to the terms: heterotrophic, autotrophic</p> <p>Possible Research: Ecological role (decomposer), food source for many organisms, medical importance – causes of disease, agriculture – disease to livestock and poultry</p> <p>Possible Project Activity: Learners trace the distribution of malaria/bilharzia in South Africa, factors that encourage the spread of malaria/bilharzia, habits to adopt to prevent the spread of malaria/bilharzia. Information can be organized to form an information brochure/poster</p> <p>Draw simple food chains that exist in habitats</p> <p>Chart the cycles in nature(CO₂, O₂, H₂O). Discuss pollution and its effects on these cycles</p>

Reproduction Term 4	<p>The learner should be able to:</p> <ul style="list-style-type: none"> • Describe the reproductive system in males and females. • Discuss personal hygiene and the importance of healthy sexual practices 	<p>Learner associate structure to function for the different reproductive structures.</p> <p>Learners engage in a discussion to criticize different sexual practices</p>
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Grade 8

Topic	Content	Method
<p>Human Body Systems – The Nervous System Term 1</p>	<p>Learners should be able to:</p> <ul style="list-style-type: none"> • Differentiate between sensory receptors and effectors • Describe the structure and function of sensory and motor neurons, create biological drawings and make comparisons • Describe a synapse and explain its significance in the nervous system • Identify neurotransmitter substances and describe their role at a synapse • Describe the structures and function of parts of the CNS. • Describe a reflex action • Describe the common disorders of the nervous system 	<p>Learners discuss stimuli, receptors, effectors and the need for communication and co-ordination of the body internally as well as externally.</p> <p>Information worksheets with detailed activities for learners. Parts are identified by relating them to their description and the function they perform. Microscope slides are viewed and rules for biological drawings are revised.</p> <p>Possible Research: Common neurotransmitters and their effects on the nervous system.</p> <p>Possible Research: Describe/explain effect of a common drug on the nervous system. This could be presented to the class.</p> <p>Possible Practical: Examine the brain of a sheep to locate the meninges and discuss the importance of skull, Cerebro-spinal fluid, meninges.</p> <p>Enact out the knee-jerk reflex to show involvement of CNS.</p> <p>Possible Research: Learners identify one common nervous disorder and describe/explain its effect on the nervous system. This is presented in the form of a brochure/poster.</p>

<p>1. Chemical Co-ordination (Hormones)</p> <p>Term 2</p>	<p>Learners should be able to:</p> <ul style="list-style-type: none"> • Describe the effects of adrenalin/thyroxin/GH/Insulin in the body • Understand the importance for homeostasis in the body 	<p>Information worksheets with activities for learners.</p> <p>Negative feedback activities to explain negative feedback mechanisms and how they operate, with special reference to glucose control of the blood, and diabetes</p>
<p>2. The Immune System</p> <p>Term 3</p>	<ul style="list-style-type: none"> • Describe common pathogens (viruses-HIV, influenza, measles/bacteria-TB/fungi- Athlete's Foot) and explain factors that promote their spread, measures to prevent their spread • Explain the role of antibodies • Discuss the importance of vaccinations to children 	<p>Information worksheets with activities for learners.</p> <p>Possible Research: HIV awareness among youth</p>
<p>Term 4 – Teen Brain Project</p>	<p>A wrapping up of the years work in a project</p>	<p>Learners follow a detailed structure that guides them into a study of the working of the teenage brain and the common external factors that could possibly hamper the efficient functioning of the brain.</p>

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Grade 9

Topic	Content	Method
<p>Reproduction</p> <p>Term 1</p> <p>Hormones</p> <p>Biotechnological advanced in reproduction</p>	<p>Learners should be able to:</p> <ul style="list-style-type: none"> • Understand the purpose of reproduction • Differentiate between sexual & asexual reproduction • Understand the significance of sexual reproduction • Describe reproductive behaviour in the wild, and significance of courtship • Explain the role of hormones: secondary sexual characters • Describe the structure and functioning of male and female reproductive systems • Describe and explain the menstrual Cycle • Describe the process of fertilisation • Describe the structure and functioning of the Placenta • Give an overview of development of human foetus – major changes that occur each month • Describe the process of cloning: Dolly the sheep/Futhi 	<p>Information worksheets with activities for learners.</p> <p>Possible Project :Comparison study of the different methods of contraception today“, analysis of the advantages and disadvantages of each</p> <p>Possible research: „Sexually transmitted diseases“</p> <p>Tabulate differences between the Male & Female reproductive systems and Gametes</p> <p>Graphical analysis of the levels of hormone, to trace the rise and fall of each during menstrual cycle</p> <p>Importance & impact of these advances eg cloning, tissue culture</p>

	the cow -	
Inheritance; (Mendelian Genetics) Term 2	<ul style="list-style-type: none"> • Differentiate between Mitosis & Meiosis. Mutations that could occur • Understand and apply Mendels Law 1 & law 2 to solve inheritance patterns: • Biotechnology: Genetic manipulation, Gene therapy – MS, Genetic Screening (egg cell & sperm) 	Complete comparative diagrams for meiosis and mitosis. Describe when meiosis could go wrong(mutations) Simulation Activities to apply mendelian laws for genetics
Evolution Term 3-4	<ul style="list-style-type: none"> • Understand that adaptation is the driving force of evolution • Describe major events in the history of the earth: • Provide evidence for evolution(fossils) • Describe the process of fossilization • Explain the significance of Transition Fossils • Compare the theories of LaMark to Darwin • Examine the structure of the pentadactyl limb • Understand Human Evolution as a science 	<p>Create a Geolical time scale to show the periods in evolution</p> <p>Possible research „Living Fossils“ : Example Gingko biloba/Coelacanth</p> <p>Possible research: Learners create cast, mould, permineralised fossils in plaster of Paris</p> <p>Learners examine the structure of the Archeopteryx and identify characteristics that classifies it as a transition fossil</p> <p>Learners use different examples to compare these theories</p> <p>Possible Research on the Otzi – The Ice Man, A. Sediba , Mrs Ples, Taung Child. Possible Visit to Maropeng/Wits Origins Center</p>

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