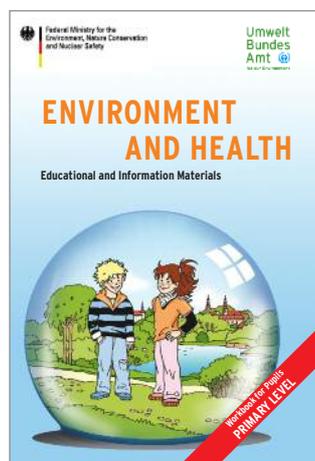




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The materials on “indoor air”, “noise”, “bathing water”, “radiation”, “household chemicals”, and “climate change and health” in the “Environment and Health - Workbook for Pupils” will help students become familiar with various aspects of the field of ‘Environment and Health’, so that they can draw conclusions on how to act themselves. With the help of age-appropriate worksheets, the children will gain a more in-depth understanding. The materials are intended to help teachers show their students how environmental conditions influence human health and wellbeing, and encourage them to develop an aware approach to dealing with these issues.

Students will plan and act as part of a group. Participatory learning and interdisciplinary knowledge acquisition will help them gain knowledge and acquire skills which will together enable them to think and act with an awareness of the longer term consequences. These are sub-objectives of education for sustainable development.

Introduction

Like all living things, people need an environment in which they can lead a healthy life, and which provides for physical, mental, emotional and social wellbeing. In other words, we need clean air, safe drinking water, healthy food, natural climatic conditions, a healthy environment in which we feel at home, clean lakes, rivers and oceans, and an intact natural environment where we can rest and recuperate.

People interact with their environment in a variety of different ways. Natural influences such as the heat of summer and ultraviolet radiation, as well as anthropogenic influences such as pollutants in the air and in manufactured products, toxic household chemicals and noise put pressure on the environment, on our wellbeing and indeed on our health. It is then important to understand how to deal with pressures of this sort, to avoid them as far as possible and to behave appropriately.

Because the environment is changing in many ways, a lot of people in Germany are concerned about the impacts this might have on human health. Three quarters of all Germans believe that environmental problems will affect the health of our children and grandchildren in the decades to come. Many people already feel that noise and air pollution are having adverse effects on them, and feel the impact of climate change at an individual level.

Education for sustainable development

You can find more detailed information on the Internet at www.transfer-21.de under 'Materialien/Grundschule', where you can also download teachers' guidelines and the CD-ROM “Zukunft gestalten lernen” (learning to shape the future). This information is only available in German.

Links to information in the web

You will find a wealth of information on the Internet, for example on the websites of the German Federal Environment Ministry (BMU) and the Federal Environment Agency (UBA):

http://www.bmu.de/english/health_chemical_safety/doc/41329.php

<http://www.umweltbundesamt.de/gesundheit-e/index.htm>

More links and information on “Environment and Health” can be found in the explanations for the individual worksheets.



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Indoor air

People in industrialised states typically spend a lot of time inside in closed rooms. Clean indoor air is important for healthy living. Room air is, however, not automatically clean; the air in our homes and at our workplaces in fact sometimes may contain hazardous substances. Vapours can be released from construction materials, furnishings and fittings, and cleaning and care products. These emissions can, under certain circumstances, have a negative impact on the health of room users.

Subject-related learning goals

The students should understand how important healthy air is for their well-being, both at home and in their classrooms at school. They should learn how important the sense of smell is, and how it can help us understand our environment. Students will learn that certain products can impact negatively on human health and contaminate room air, and will discover how to counter this problem. They will become familiar with the products that can pose a problem for room air, and will explore what countermeasures can be taken in addition to regular airing (conscious selection of furnishings and fittings, careful approach to redecorating). The students will learn that higher concentrations of carbon dioxide in the classroom can affect their concentration. They will conduct simple research into the physical principle of air exchange and come to realise the importance of airing a room in order to ensure a comfortable room climate and as an essential way of countering any contamination of the air in closed rooms. To wind up the unit, they can produce a leaflet giving tips on decorating rooms, with their own recommendations, and explanations as to why they recommend specific courses of action or products.

Worksheet 1: “The Smelling Game”

Students should practice using their sense of smell and recognise, identify and evaluate several different odours. They should encounter a variety of odours that they know from everyday life: some “harmless” or pleasant odours and some that are less pleasant or potentially harmful. Two plastic 35 mm film containers should be filled with each substance. You can put the substance on cotton wool or place the item in the film container. The containers should then be numbered or marked with a letter of the alphabet, shuffled, and placed before the child. The child should select one container. Blindfold the child or ensure that his or her eyes are firmly closed. Now the child should sniff the contents of the container. The aim of the game is to match up the pairs. Once the child has managed to match up all the pairs, he or she should attempt to identify the substances. After this, the child should once again sniff the samples and say what feelings the odours conjure up. Are they pleasant or unpleasant, neutral or disgusting? What do the children associate with the individual odours? You should use between five and ten samples, which means that you will need ten to twenty film containers. If less time is available for the game, you can of course play it with fewer samples.

“The Smelling Game” should cover as wide a range of odours as possible and should include artificial or potentially hazardous odours. We would suggest vinegar, spray deodorant, washing powder, shoe polish, nail varnish, soap, varnish, grated lemon zest, flowers (roses or other strongly perfumed flowers), pine needles or pine cones, strongly smelling cheese, orangeade, cocoa powder, basil, peppermint, camomile. These are only suggestions, however, and you should feel free to add your own samples.

N.B.

Get the student to sniff the samples carefully (put a small quantity of the substance to be tested on a cotton wool pad and use your hand to waft air from the sample towards the tester's nose). How pleasant or unpleasant is the odour?

Additional information for “The Smelling Game” can be found at

<http://www.games4youthgroups.com/station-games/Somethings-Smelly.html>

<http://practicallycreative.net/2007/10/15/the-smell-game/>

<http://faculty.washington.edu/chudler/chsmell.html>



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Worksheet 2: Smell - How does it work?

As an introduction you should look at the various figures of speech regarding noses and smell. What are they based on? You should prepare short texts which show how important the sense of smell was and is. By interpreting various figures of speech, children will quickly learn how important the sense of smell can be, and how it helps protect us.

You will find more examples of figures of speech related to the sense of smell and noses at <http://idioms.thefreedictionary.com/smell>

After this introduction, students should learn some basics about the nose and how the sense of smell works (at a simple level). They should think about hazardous, unpleasant and pleasant odours, where they have encountered these, and what they associate with these odours.

Discuss with your class hazardous smells that we can identify using only our noses: fungus, petrol, nail varnish, paints, turpentine, the smell of burning, tobacco, car exhaust fumes, adhesives. Who has already encountered these odours and what do they associate with the odours? Get the children to think of other examples.

The nose

The nose is an essential part of the human face and is part of the upper respiratory system. It is important for breathing and for our sense of smell. The two sides of the nose take turns at working, with shift changes every three to four hours. At any given time only one of our two nostrils is busy breathing and sniffing, while the other is having a rest. When we sniff a certain scent, it sometimes reminds us of an event that was in some way associated with this smell. Along with the scent itself, our brains save the memory of when and where we encountered the smell. When we encounter the smell again, we remember the previous event.

Noses help us taste

The following experiment will demonstrate the close link that exists between the senses of smell and taste. With the help of this experiment and the exploration and interpretation of pertinent idioms, the children will realise how important our sense of smell is. They should learn that our senses of smell and taste are closely related. It is only the combination of breathing in a certain scent and the identification of certain substances as we chew that allows us to identify food precisely.

Materials: food, drinking glasses, drinking straws, various red fruit juices (for instance raspberry, red current, cherry, red grape)

Method: The students cover their noses with their hands. They should then use the drinking straw or a testing beaker to taste one of the juices, and try to guess which flavour it is. After a few seconds they should remove their hands from their noses.

Information specially compiled for children on the nose and on the sense of smell can be found at

<http://kidshealth.org/kid/htbw/nose.html>

<http://www.thechildrenshospital.org/wellness/info/kids/20336.aspx>

Worksheet 3: Redecorating? Watch out!

Children spend a great many hours every day at school. It is especially important that the air inside schools is pleasant and healthy. Unfortunately many schools are short of the money they need to renovate and redecorate their rooms, with the result that the air quality and the structural and hygienic state of repair of the school buildings are sometimes not perfect. Although environmentally-friendly school furnishings are available on the market, not all schools can afford them.



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Suggestion

Bring a selection of redecorating products to school. Get the students to sniff the products carefully. (Put a small sample onto a cotton wool pad and use your hand to gently waft air from the sample to the students' noses.) How do the individual products smell? Do they smell of anything at all? How pleasant or unpleasant is the odour of individual products? Is there an association between the type of odour and the type of product? Do the children have any experience of intensive smells and the products that cause these smells (e.g. paint, varnish or adhesives)? What did they feel when exposed to these odours?

The children should then explore what we need when redecorating rooms (painting, wallpapering, purchasing new furnishings, laying floor coverings, etc.) They should learn that some of the products commonly found on the market can impact on our health. At home or at a local DIY store they should investigate the general instructions and warnings printed on packaging. Do quality labels exist? What labels can they discover? They should interview staff of DIY stores to find out more. What does it mean if a product is “solvent-free”, for instance? Are there alternatives to paints, varnishes, etc.?

The children should then consider the problem that non-toxic products or environmentally sound products are often significantly more expensive than traditional products. In some cases the colours are less vivid and the products are not available everywhere. One important fact that the children should retain is that it is vital to deal very carefully with building products. They can advise their younger brothers and sisters to avoid contact with these products, not to sniff them, and under no circumstances to drink them.

The Blue Angel symbol

DIY stores and specialist stores stock a wide range of paints and varnishes. If you want to avoid hazardous substances, you have to select the right products. The Blue Angel symbol can help you select the right products: varnishes, glazes and undercoats that bear this symbol generally have a very low solvent content, as a general rule less than 10%. This means that they are less harmful for the environment and for our health.

But even emulsion paints, which are generally considered to be environmentally sound, vary widely in quality. Since most of these products are used over a large area inside buildings, they can still have a negative impact on the immediate environment and on our health. The Blue Angel symbol is used for labelling low-emission paints in particular. As soon as the paint is dry it is quite safe to use the rooms again. If you elect to use wallpaper bearing the Blue Angel symbol, made of recycled paper, you will be making a valuable contribution to both the environment and human health.

More information available at

<http://www.umweltbundesamt.de/building-products/engel.htm> and www.blauer-engel.de/en/index.php

Answers

Question 1: Warnings or hazard symbols can be found on household chemicals such as cleaning materials, on wood preservatives, anti-rust agents, varnishes, paints, paint thinners, solvents and impregnating agents.

Question 2: The first symbol, the exclamation mark, is a general warning that is used frequently in everyday life. It can often be found on the packaging of household chemicals along with a warning to keep the product out of reach of children. To the right of this is the symbol for “irritant” (Xi) and “harmful” (Xh).

Below these the skull and cross bones indicate that a product is toxic, and beside this is a warning that rooms must be aired, followed by the symbol for “flammable” and finally the symbol for “corrosive”. You will find more information on the symbols used in conjunction with hazardous materials in the section on chemicals.

More information on symbols used to designate products containing hazardous substances and what the symbols mean can be found at

http://www.ngfl-cymru.org.uk/vtc/ngfl/science/103_new/asc1/hazardsymbol.htm

<http://www.guide-to-symbols.com/hazard/>



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General information on safe redecorating can be found at
<http://greenqueen.wordpress.com/tag/redecorating/>
Environmentally Friendly Home. Healthy Living. Blue Angel product guide
http://www.blauer-engel.de/en/consumer/lebenswelten/healthy_living.php

Worksheet 4: Going Stale

Students should learn that we breathe out carbon dioxide (CO₂), and thus release this gas into the air. Higher concentrations of CO₂ in the air around us make us lethargic, and make it more difficult for us to concentrate. They should understand how important it is to air rooms regularly and how to air rooms properly. They should learn how opening a window will replace the spent air in a room with fresh air and understand that a tilted window is much less effective than one that is wide open. They should learn that fresh air is an important “food” for our wellbeing. The class should nominate one person to be responsible for ensuring that the classroom is properly aired in future.

Answer

Question 1: Warm, spent air rises and moves out of the room through the open window, while fresh cool air flows into the room from outside at the lower edge of the window to replace it.

Question 3: The best way to air a room all year round is to open the window wide for a short period. Because the temperature difference between inside and outside is lower in summer than in winter, it takes longer in summer to air a room. In summer you should leave the windows open for at least 20-30 minutes, and repeat the procedure several times a day. You should preferably air at night when the air is cooler outside. Basements, in which the walls are cool all year round, should only ever be aired at night, in order to prevent condensation forming on the walls, which can lead to mould.

More information on how to air rooms properly can be found in the following publications:

Leitfaden für die Innenraumhygiene in Schulgebäuden: Umweltbundesamt (Ed.), Berlin, 2008

You can download the publication from the Internet at www.umweltbundesamt.de > Publikationen > Suche: Leitfaden für die Innenraumhygiene in Schulgebäuden

or order a copy by post from the following address: Umweltbundesamt, Zentraler Antwortdienst (ZAD), Bismarckplatz 1, 14193 Berlin, Germany. This information is only available in German.

Noise

Every day we are surrounded by a huge number of sounds and noises. We do not even consciously register a large number of them any more – they are considered subliminal noise (e.g. background music played in large stores). In modern life we are confronted by a large number of sound sources, which many people consider to be a nuisance. High sound levels risk damaging our ears. Sounds that disturb us, annoy us, or cause health problems, are termed noise.

This unit is intended to raise the awareness of students to noise both in terms of leisure time noise (listening to music, using headphones) and in the form of environmental noise (road traffic, railways, aircraft, construction sites, industrial noise, noisy neighbours), by establishing the link between noise and everyday life. It is intended to show students ways of dealing with noise. They will explore ways of reducing noise levels and protecting themselves and their environment from noise.

They should also think about their own behaviour in this regard (listening to music, leisure time noise, avoiding unnecessary noise). Thus the unit is also intended to help prevent students disturbing or endangering themselves or others with noise. A small series of tests to cap a noise source (noise protection) will give students an opportunity to test various forms of noise protection and to apply what they have learned in practice, as well as focussing on what they have learned and going into this in more depth.



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Contentual learning goals

When do we consider sounds to be noise? What influence does noise have on our life? How can we deal with it? Questions like this will be dealt with in this unit, which aims above all to make students aware of how best to deal with noise. Students will explore possible sources of noise in their environment, start a listening diary, learn how the sense of sound works, and finally look at means of active and passive noise protection.

Worksheets 5 and 6: What can I hear? / The Listening Diary

Children should listen consciously all day to the many sources of sound that surround them. To this end they should start a listening diary, in which they enter and assess all the sources of sounds that they become aware of.

Training our ears

If students are to train hearing and listening so that it becomes part of their active behaviour pattern in the long term, they need to practice with the help of games and fun activities. First of all students should learn specifically to hear – careful listening is by no means the norm! During a preparatory lesson students should train to listen precisely. They should learn that they will hear more if they listen. Get them to sit in a circle and close their eyes. You should sit in the middle of the circle. For five minutes the children should concentrate on all sounds that reach them – from the corridor, from the next-door classroom, traffic outside, birdsong, perhaps even the clock in the classroom.

Then you can make three or four very quiet sounds that the children should recognise – the ticking of an alarm clock, the clink of a spoon against a glass, a pen scratching on paper, etc. After the preparatory lesson, the children should be given the task of paying attention all day to the sounds they hear, assessing these, and documenting them in their listening diary.

Games to help practice listening can be found on the following websites:

<http://faculty.washington.edu/chudler/chhearing.html>

<http://www.listentoyourbuds.org/game2.php>

Worksheet 7: How we hear

Students learn, in simple terms, how the ear works. They should learn that noise can damage our ears (irreparably in some cases).

The ear

The human ear is a very important and very sensitive organ. It hears sounds coming from all directions at all hours of the day. Ears have no lids that can shut. They are always open and alert. When sounds are registered that our brains associate with danger or any other important event (such as the noise of our alarm clock in the morning), we wake up immediately.

The ear can be broken down into three parts: the outer ear, the middle ear and the inner ear. The outer ear begins with the auricle, the bit of the ear we see. It collects sound waves like a funnel and channels them to the eardrum through the auditory canal. In the auditory canal are glands which produce wax. The wax catches any dirt particles and carries them out of the ear, and also keeps the eardrum smooth and pliable.

The middle ear goes from the eardrum to the oval window of the cochlea. The eardrum is a thin membrane, which vibrates when sound waves hit it. Attached to the eardrum is the hammer, the first of three small bones or ossicles. The hammer passes on the vibrations to the anvil and the stirrup, as the other two ossicles are termed. This leverage steps up the vibrations which are then passed on to the inner ear.

The inner ear starts with another thin membrane, the oval window. Inside the inner ear we find the cochlea, which is the actual hearing organ. It is well protected, about 3 cm inside our skull. The cochlea contains the sensory cells,



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each one of which has a large number of tiny hairs that are set in motion by sound waves. They then send electric pulses to the brain, where the signals are translated into an impression of the sound heard. This allows us to determine whether the sound means danger, or whether it is only music.

Where does a noise come from?

We need both ears to tell us the direction from which a sound comes. If it is directly in front of us or directly behind us it takes exactly the same time to reach both ears, and the sound waves arrive simultaneously. If a sound comes from the side, the sound waves will arrive more rapidly at this side. This tiny time lag allows our brain to work out which direction the sound is coming from.

Impaired hearing as a result of loud music, headphones, etc.

Hearing impairments can be caused by one-off loud noises, like the bang of fireworks or a toy gun, or by repeated non-acute noise (e.g. noisy toys such as rattles, horns, toy guns or whistles held frequently next to the ear, listening to loud music through headphones, hobbies involving a lot of noise, attending noisy concerts or similar events, or using noisy DIY tools).

Children and young people enjoy listening to loud music. Studies in Germany have shown that children begin to use headphones to listen to music at a very early age: 10% of all 6-7-year olds and 50% of all 12-13-year olds had an MP3 player, while 43% of 6-13-year olds had an i-Pod, Walkman or Discman. One third of the young people listened to music using headphones for at least one hour a day. The problem is that initially hearing impairments are not generally noticed, and those affected believe that all is well. These appliances can generate extremely loud music over a period of many hours before requiring to be recharged, and modern headphones which fit inside the ear generate an extremely high noise level. Users risk exposing their ears to excessive noise levels for hours on end. Young people often use these appliances on the way to school. So that they can hear the music above the noise of road traffic, they often turn up the volume even louder, easily reaching noise levels that can cause lasting damage to their ears. The risk of accidents also increases with increased volume, because the listener no longer notices warning sounds. MP3 players or CD players should therefore be used with care. Music consumption should be limited to no more than one hour a day, and the volume should not be turned up full.

Experiment: What is noise?

Let the children gather round your desk. Place a bowl of water on the desk and hit the desk with the palm of your hand. Use the waves that appear on the surface of the water to explain the principle of sound waves and how they spread. Get the children to produce tones, for instance with the help of glasses or bottles filled with different quantities of water) or with the help of a board into which nails of different lengths are hammered, or with a trumpet made of paper and yoghurt cartons. The children should think about how they could make more different tones. Which tones sound pleasant and which do not? When is an “instrument” too loud? Are deep tones more pleasant than high tones?

School noise

Apparently classrooms in schools have become increasingly noisy. Complaints about noise at school have been increasing. Scientific studies have now been conducted into exceptionally high noise nuisance during classes. Poor acoustics in classrooms play a part here (rooms that echo). What are the consequences of noise levels and poor communication for students’ performance and for the working conditions of teachers?

More information is available at

<http://www.umweltbundesamt.de/laermprobleme-e/index.htm> and
<http://www.umweltbundesamt.de/gesundheit-e/index.htm>

Answer

Question 3: Sensory cells are damaged. As a result hearing is impaired, and you cannot hear so well. Headphones sit snugly at the entrance to the auditory canal, which means that the volume impacts more directly on your hearing.



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Worksheet 8: Put the Noise in a Box!

So that they can apply in practice what they have learned, the students should then conduct a series of experiments to block out noise. The children learn that noise can be kept out (double glazing, ear protection, noise protection measures in the field of structural engineering, at the workplace and on roads) and kept in (casing). To do so they should conduct an experiment. They should take a normal box made of cardboard or plywood and place it over a noise source. During the experiment the volume of the noise source should remain constant.

The box should then be insulated using a variety of materials (rugs, textiles, cushions, polystyrene, foam, paper, felt, etc.). The students will realise that not all materials reduce the noise level significantly (polystyrene, paper). To ensure an objective appraisal of the insulating properties of the materials used, you can use a sound level meter. You can buy one for the whole school for about €100 or hire one from local action groups or environmental agencies. These experiments will encourage students to think about their work, focus on their newly acquired knowledge, and apply what they have learned. Another way of going into more depth would be to look at ways of improving the acoustics of their classrooms. Or they could produce a poster giving an overview of the noise sources they have learned about, and the ways of reducing noise or achieving noise protection.

Answer

Question 3:

Sound insulation: ear protection (earplugs etc.), noise protection walls, noise protection windows.

Sound absorption: materials in rehearsal rooms, theatres and concert halls that absorb sound, or at home, e.g. carpets. Silencers can be found in car and motorcycle exhausts (and should not be removed because the owners believe that only an "untamed" engine sounds cool, thus generating unbearable noise levels for others).

Question 4: (selected examples)

Construction workers (jolters, pneumatic drills, etc.), metalworkers in shipbuilding and blacksmiths shops (metal working, sawing, flexing, etc.), welders, automobile mechanics, miners, airport apron workers, musicians, farmers (agricultural machinery), carpenters (saws) and all other people who occasionally use extremely noisy equipment for their work (e.g. landscape gardeners with leaf blowers and hedge cutters, forestry workers with chainsaws, firemen and –women and rescue services with saws and all the machinery required to rescue victims and clear roads etc.).

Additional project proposals

In order to explore in more depth the issue of noise and its impacts, you can suggest that your students try miming and making themselves understood using only gestures, that they learn basic sign language, that they spend one day with earplugs and keep a record, or that they listen to and put up with silence for a while, and keep a record of this.

Information on sound, ears, hearing and noise can be found on the Internet at

<http://hearcom.eu/main/Informationonhearing/Howwehear.html>

Special information for children

Information on all aspects of hearing specially written for children can be found at

<http://kidshealth.org/kid/htbw/ears.html>

<http://www.canadianaudiology.ca/consumers/children/>

"Noise in Educational Institutions"

<http://www.inqa.de/Inqa/Navigation/root,did=247776.html>



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Swimming in Natural Waters

Swimming is one of our favourite ways of spending hot summer days. Swimming in open water can, however, entail risks, and not only accidents. Swimming in open water can result in sickness with fever, diarrhoea and vomiting. How can we tell whether or not the water we want to swim in is clean enough, and what can we do to avoid polluting bathing water? These are the questions that will be dealt with in this unit.

Bathing water

Bathing water means lakes, rivers, streams and seas used primarily for bathing and swimming, where there is no permanent ban on swimming in place. The materials that have been prepared for this unit focus mainly on standing water, such as lakes and larger ponds. Large lakes, like Lake Constance, have a large number of bathing beaches, each of which is treated as a separate entity.

Pollution of bathing water

The hygienic quality of bathing water is adversely affected by pathogens in faecal matter released from sewage plants or entering the water as run-off from farmland and urban land. Sweat and excrement of bathers too can have a negative impact on the hygienic quality of the water. Small bodies of water used by a great many people, where no water flows into or out of the lake or pond, are worst affected. The rapid spread of algae can pose another health problem, e.g. the spread of blue-green algal blooms on hot summer days. In fact these are not algae at all but bacteria, and are known as Cyanophyceae to scientists. They produce metabolic toxins and allergens, which can cause conjunctivitis, skin rashes or chronic liver damage. The spread of the algae is accelerated by the inflow of nutrients, especially phosphorus and nitrogen compounds found in fertilisers used in agriculture. Rapid algal growth can also make the water extremely cloudy. Not only does this look uninviting, it makes it difficult to see under water and thus hinders lifeguards if they have to save swimmers who have got into difficulties.

Monitoring water quality at bathing beaches

To ensure that we can enjoy an untroubled swim, bathing water is monitored regularly throughout the bathing season using hygienic parameters. This is designed to protect our health. The quality of bathing waters is evaluated with the help of the previous season's test results, and a bathing water map can be produced. These results give a good overview of the general quality of the water, but they cannot be applied directly to the situation of bathing water at any specific time, since various environmental factors and the behaviour of bathing guests can result in short-term fluctuations in water quality. Because of this, most of Germany's 16 federal states post the most recent test results online, along with warnings of the spread of Cyanophyceae.

New EU Bathing Water Directive

Since summer 2008, the local authorities responsible (generally the health authorities) in each federal state have been monitoring water quality in line with the new EU Bathing Water Directive. According to the Federal Environment Agency this directive promises to improve German bathing beaches. An important new feature of the directive is that it makes it obligatory to identify the sources of contamination, so that water pollution can be ended with the help of targeted management measures. The new directive improves the protection afforded to swimmers, and attaches far greater importance to informing the general public. In future important information about the bathing site must be displayed on site, including information about any potential hazards caused by wastewater and about any ban on swimming.

The quality of bathing water is monitored during the bathing season (May/June to August/September). To this end, water samples are taken and tested and the bathing sites visited. Samples are tested for two types of bacteria found in animal and human excrement. For a bathing lake to be deemed safe, the concentrations of these bacteria may not exceed a predetermined level. As of 2012, in line with the EU Bathing Water Directive, information on water quality, sources of pollution and any ban on swimming must be made available at "an easily accessible place in the near vicinity of each bathing water". The information boards are not yet in place at all bathing beaches, but the general public is to be involved in drawing up the list of bathing waters. If your favourite bathing beach is not on the list, but is used regularly by a large number of people, you should contact the local authority responsible for bathing water



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(e.g. the health authorities). They will then decide whether or not it should be added to the list. You can also contact these authorities with any proposals, comments or complaints you have regarding bathing beaches. It is irrelevant whether the bathing beach is publicly managed or privately run. If a large number of people swim there regularly (the “large number” will be defined by the authority), the site must be registered with the authority and monitored. The fact that a bathing beach is not monitored does not automatically mean that the water quality need be poor, but it is impossible to be certain. Because of this uncertainty you are advised not to swim in unmonitored waters.

Do your bit

If you go to a bathing beach, you must respect certain rules in the interests of all bathers: these include a ban on ships and boats and on fishing, and on letting dogs off the lead or into the water. To protect the environment you are not generally allowed to light fires or to use soap or shampoo.

The weather and water protection

Hot, dry summers have a positive impact on the water quality, since pathogens are killed off by the intensive sunlight. On the other hand, however, the higher temperatures encourage algae to spread more rapidly. Rainy summers mean fewer swimmers and thus less dirt and fewer bacteria entering the water. Heavy rainfall can cause problems of its own though: surface run-off from farmland and residential areas can flush pathogens, nutrients and other harmful substances into the water. The inflow of nutrients encourages algal growth. Particularly high concentrations of pathogens can enter bathing water as a result of heavy rainfall where one single sewage system carries both wastewater and rainwater. If the treatment plant can no longer cope with the volumes of water, untreated water is released. Even when the sewage system separates wastewater from rainwater, however, untreated rainwater may still contaminate bathing waters.

In a rainy summer the bathers stay away, as do the pathogens, because it is often the bathers themselves who bring dirt and bacteria into the water. Algae do not grow so well when it is cool and overcast, while hot midsummer temperatures encourage their growth.

Heavy rainfall can also be a problem. Surface run-off from farmland and residential areas can flush nutrients and contaminants into the water. Too much rain or too much sun often aggravates problems that already exist. In waters that are already overfertilised because of nutrients from farmland, algae flourish even in poor weather. Where there is no retaining basin for rainwater, the rain can flush dirt and manure from fields unhindered into lakes and rivers.

Worksheet 9: Reading sheet – Good Signs and Bad Signs

Ideally you should begin the unit by getting the students to recount their experience of bathing beaches. What did they do there? What was good? What wasn't so good? Do they know the signs that indicate whether the water quality is good or bad?

The students should then read the introductory text in the form of a newspaper article on the topic of bathing water (Question 1), in which the most important terms relating to “good signs and bad signs” are listed. They learn that bathing water might, under certain circumstances, be unsuitable for bathing, and learn to identify the good and bad signs.

Good signs

Clear water, reeds at the edge of the water, water lilies, a pleasant smell or no smell, small fish can be seen near the edge, a clean environment – no rubbish lying around, little or no farming and/or settlements in the immediate vicinity.

Bad signs

In terms of algae: cloudy water such that if you stand in knee-depth water you cannot see your feet, froth at the edge of the water, greenish slime.



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In general: unpleasant smell (like something rotting), dogs in the water, lots of ducks/water birds, farming in the immediate vicinity, rubbish on the bank and/or in the water.

N.B.

Children with access to the Internet will find it exciting to investigate the water quality of the bathing beaches in their own area. Information is available online.

<http://europa.eu/rapid/pressReleasesAction.do?reference=IP/09/903>

http://ec.europa.eu/environment/water/water-bathing/report_2009.html

Answer

Question 2: Fertilisers (artificial fertilisers, animal manure or liquid manure) can be washed from farmland into bathing water, especially after heavy rainfall.

Question 3: For reasons of hygiene it is better to avoid the water because there is always a risk that animal excrement might enter the water and contaminate it with pathogens.

Additional questions

Get your students to search for articles in newspapers, books or on the Internet, and to collect these, in order to organise a poster exhibition at school.

Worksheet 10: How Clean is the Lake?

The children transfer what they have read on Worksheet 9 to the illustrations and thus check what they have learned. They should identify the signs of good and bad water quality and look for these on the illustrations.

Answers

Question 1:

Top picture, good signs: Forest, no farmland, reeds grow along the water's edge, water lilies, no rubbish, bins available for rubbish – a generally natural state of the environment.

Lower picture, bad signs: Farmland, cropland fertilised, lots of water birds, a dog in the water, froth at the water's edge, dead fish floating on the surface of the water, rubbish lying round.

Question 2: It is safe to swim in the lake shown in the top picture. It is clean.

Worksheet 11: Golden Rules

The students should reflect on what they have learned and put the rules listed into the correct categories, giving reasons. To apply what they have learned they could produce a guide to the good signs and bad signs. Now that they are “experts” in the field, they can sum up how we can easily recognise whether water is basically suitable for bathing or not. The guide should also explain what is allowed and what is not allowed when swimming. In addition to this they should draw up a table of “golden rules”, which lays out the most important rules of how to behave at bathing lakes. The guide and table could be published in the school magazine or on the school's website. The students can contact the local authorities, conservation groups, etc. to verify the results of their work and to consider what further joint action they could take to improve water quality.

Blue Flag

The “Blue Flag” is the first international environmental symbol. Since 1987 it has been awarded once a year to exemplary marinas and bathing beaches in some 40 countries. The “Blue Flag” environmental campaign is a non-governmental initiative, which works in line with the spirit of Agenda 21 to promote a more environmentally aware interaction with the landscape and nature. All marinas or bathing sites that are awarded the “Blue Flag” meet a long list of criteria, and must provide evidence every year of their exemplary work in the field of environmental communication. The water quality at bathing beaches applying for the “Blue Flag” certification is tested in terms of mi-



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crobiological, physical and chemical parameters in line with the EU's Bathing Water Directive at 14-day intervals. A distinction is made between criteria that are imperative and those that are deemed guidelines.

To gain the "Blue Flag" certification the marina or bathing beach must meet exacting guidelines, with maximum levels, which may not be exceeded at any point throughout the bathing season. Sewage disposal is also monitored in with the EC's Urban Waste Water Treatment Directive. At bathing beaches or sports clubs flying the "Blue Flag", residents, club members and guests are called on to deal appropriately with the environment and nature, and thus to help conserve them. A major priority of those awarded this annual honour is to educate tourists and residents on an appropriate code of conduct when dealing with nature. Correct behaviour in ecologically sensitive areas and within the area served by marinas, as well as the correct disposal of rubbish, such as used oil and bilge water, is obligatory. (more information: www.blaue-flagge.org)

Bathing bans

Bathing bans are generally imposed in Germany by the local health authorities and indicated by a sign at the bathing beach. One of the main reasons for bans on bathing at lakes are algal blooms, in particular blue-green algae, which can release toxins that are detrimental to human health. Even at bathing beaches that are regularly monitored, the water quality can be poor for a short time, e.g. after heavy rainfall, which can flush contaminants into the water. The safest approach is to check out the current situation on the Internet or by contacting the local authorities responsible (e.g. the health authorities) before going to a bathing beach.

Answer

You should: (2) Protect nature; (9) Look for green scum in the water; (6) Pay attention to warning signs; (10) Refrain from walking in the reeds around the lake; (5) Take our rubbish home with us.

You should not: (8) Swim in cloudy water; (7) Feed waterfowl; (4) Allow dogs to swim in the water, (1) Pee in the water; (3) Wash the car at the lake.

More information on bathing water is available at

EU Bathing Water Directive: http://eur-lex.europa.eu/smartapi/cgi/sga_doc?smartapi!celexplus!prod!DocNumber&type_doc=Directive&an_doc=2006&nu_doc=7&lg=en

Information published by the Federal Environment Ministry: www.bmu.de/english > Search: bathing waters

Information published by the Federal Environment Agency: www.umweltbundesamt.de > Search: bathing water

Data on the water quality at coastal bathing beaches: Umweltdaten Deutschland Online (Federal Environment Agency): <http://www.umweltbundesamt.de/daten-e/index.htm> > Search: bathing water

Radiation

We are surrounded by radiation wherever we are. Some radiation occurs naturally – background radiation from space, the radiation from radon gas released from the Earth's crust, visible sunlight, and the heat (infrared) and ultraviolet radiation from the sun. In addition to these, however, we are confronted with radiation from non-natural sources, generally from X-ray examinations, but also in other fields, such as medical technology, industrial plants and mobile phones.

What is radiation?

Radiation is a stream of energy or particles, emitted by a source. The most important and best known of these sources is the sun. Its radiation makes life on Earth possible, but at the same time it can pose a health risk for human beings. Human senses are unable to detect most forms of radiation.



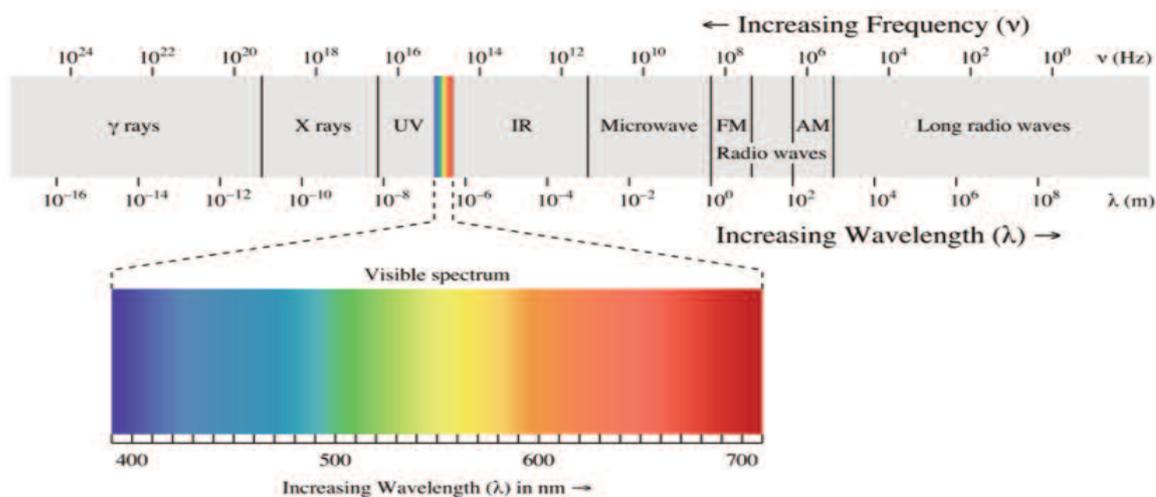
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Ionising radiation

The term ionising radiation is used to designate all forms of radiation whose energy is sufficient to release electrons from an atom or a molecule, and charge these electrically, i.e. to ionise them. This includes the radiation of the sun, in the form of X-rays and gamma rays as well as both natural and non-natural particle radiation from radioactive sources. This can occur, for instance, when atomic nuclei split either spontaneously or artificially. This radiation is both part of nature and the result of anthropogenic activities. It can, for instance in medicine, be used to help people, but it can also be extremely dangerous for human beings. Ultraviolet radiation marks the transition to non-ionising radiation, and is generally classed as such.

Electromagnetic radiation

With decreasing energy of particles, the wave character of the radiation becomes more pronounced. The radiation is then generally regarded as electromagnetic waves, consisting of linked electric and magnetic fields. In everyday life, we encounter electric, magnetic and electromagnetic fields in many forms. The most important sources of electromagnetic radiation are the sun (gamma radiation, X-rays, ultraviolet radiation, visible light, infrared radiation), radio waves, microwaves, power supply plants and household appliances. The only difference between these various sorts of waves is their frequency and thus their specific energy. There is, however, a continuous spectrum. Unlike sound waves, electromagnetic waves do not need a medium in order to spread. They can move through a vacuum at the speed of light, irrespective of their frequency.



Electromagnetic fields

All of us spend every day moving through more or less strong electromagnetic fields. In the home the sources of these electromagnetic fields are electric appliances such as hairdryers, shavers, toasters, electric stoves, televisions, mobile phones or computers. A distinction is made between high-frequency and low-frequency fields. Like optical radiation, they are classed as non-ionising radiation. In contrast to ionising radiation, such as X-rays, the energy of this radiation is inadequate to charge atoms and molecules electrically, or to ionise them. Nevertheless this type of radiation can have an impact on our health, and can affect the organism under certain circumstances.

Optical radiation, ultraviolet radiation

Optical radiation can be broken down into three sorts: ultraviolet radiation, visible light and infrared radiation. It is part of the electromagnetic spectrum of the sun, and is useful, but also hazardous for human beings. Optical radiation is mainly non-ionising radiation, although a small section of ultraviolet radiation (below 100 nm wavelength) has so much energy that it can ionise atoms or molecules (cf. section above). Ultraviolet radiation is generated by the sun or by artificial sources. The human eye cannot detect ultraviolet radiation, since the wavelength is shorter than the wavelength of light that is visible to the human eye. Some animals (insects, birds) can, however, see parts of the ultraviolet spectrum. The term "ultraviolet" itself comes from the fact that the spectrum of ultraviolet light begins



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beyond the spectrum of light that the human eye sees as violet, as a result of its shorter wavelength. If we are exposed to excessive ultraviolet radiation we can suffer sunburn or an increased risk of developing skin cancer later in life. This makes preventive measures very important in this field.

Radiation and the environment

In contrast to the era of nuclear testing in the mid twentieth century, when the environment was exposed to increased radioactivity, i.e. ionising radiation, we are today exposed increasingly to non-ionising radiation as a result of the onward march of modern technology. This includes both low-frequency radiation, such as that generated by electric power lines and electrical appliances in the home, and high-frequency radiation caused by broadcasting stations, relay stations for mobile telecommunication and WLAN, and appliances such as mobile telephones and hand-held telephone sets. The media have coined the term “electrosmog” in this context, meaning the various technology-generated electrical, magnetic and electromagnetic fields. Although the possible health impacts of this electromagnetic radiation on human beings and the environment have been the subject of studies for a number of years now around the world, some scientific questions have not yet been answered.

More information is available at

Federal Office for Radiation Protection: <http://www.bfs.de> > Ionising Radiation / Optical Radiation / Electromagnetic Fields

Worksheet 12: A Radiant World

The students learn that we are surrounded by radiation in our everyday lives, that natural radiation exists, such as the heat and light radiated by the sun, but that equally some radiation is artificial such as that emitted by mobile phones, radios, televisions and X-ray machines. They will discover that we cannot detect most forms of radiation without technical equipment. They learn that radiation can be useful, but that it can also have negative impacts, and that we must protect ourselves against certain forms of radiation – in this unit taking the example of ultraviolet radiation and the radiation caused by mobile phones.

An introduction to the unit

At the start of the unit, the students should think about the terms radiation and rays. Radiation is an exciting word – what does it mean to the children? Common examples from their everyday life could for instance be a ray of sunshine, a radiant smile, etc. But what lies behind these expressions? Can the students think of other examples?

After this the class should look at Worksheet 12, and on this basis discuss the sources of radiation that surround us in everyday life, the possible hazards they pose and how we can protect ourselves. They can look at the illustrations on Worksheet 12 and identify the individual sources of radiation, before tackling Question 1.

Possible questions that you could explore include the following: What do you associate with these? Who already has a mobile phone or a computer? Who uses a microwave oven? Who has ever had an X-ray taken? What do the children know about which radiation is dangerous and how we can protect ourselves?

The students answer Question 2 then. They should match up the protective measures and the sources of radiation. Explain to the children how important X-rays are for medical diagnosis for instance, and that they can save lives, but that at the same time, X-rays can damage their bodies. This is why, when X-rays are taken, the other parts of the body (especially the genitals) are protected by a lead apron. The children are bound to be familiar with measures that we take to protect ourselves from the sun's rays. The worksheet 14 “Rays from the Sun” goes into this question in more detail.

Answer

Question 2: The lead apron protects us from X-rays. Baseball caps, sun hats, sunscreen and sunglasses protect us from the sun's ultraviolet rays. The protective suits worn by fire-fighting personnel protect them from the heat of a fire, while the suits worn by steelworkers protect them against the heat of the molten steel.



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N.B.

This unit does not look at the issue of radioactivity, since this plays at most a very minor part in the day-to-day life of the children in contrast to ultraviolet radiation or radiation generated by mobile phones. What is more, there is nothing the children can do to protect themselves from radioactivity, again by contrast with ultraviolet rays or mobile phone radiation.

Worksheet 13: The Mobile Phone Experiment

Almost one in two children under the age of sixteen has a mobile phone today. Among ten- and eleven-year-olds the figure is as high as 35 percent. Although at primary schools a mobile phone is not yet considered an essential by many children, about one quarter of all eight- and nine-year-olds use a mobile phone regularly. It is thus becoming increasingly important for primary school teachers to deal with this still little explored issue in their classes. They should look at how a mobile phone works, what it costs, how it can be used safely, and at the health aspects of using a mobile phone, for instance, in interdisciplinary lessons. The aim of this unit is to ensure that children learn that mobile phones emit invisible radiation, which has an impact on the environment, and how they can best deal with this.

To this end the students should conduct a simple experiment, which demonstrates that a mobile telephone has an impact on its environment, even if they cannot see it. They can see the results. The children should recognise that the radiation caused by mobile phones affects the way other electrical appliances work, that the radiation goes through their bodies and that taking the phone into another room and putting more distance between the mobile phone and the other appliance can reduce or negate this impact.

Using rules of thumb for mobile telephones the children should learn a code of conduct for using mobile phones safely. At a suitable juncture you should also look at the “etiquette” of using mobile phones, e.g. not using a mobile phone at the cinema, turning the mobile off during classes, and not disturbing other people by phoning loudly, etc.

Some ideas for the experiment

The impacts of a mobile phone on electrical and electronic equipment are particularly obvious with a radio. If you use a computer, make sure that it is equipped with external loudspeakers and that these are switched on to ensure that the children appreciate the impact of the mobile phone. To be on the safe side, however, test the set-up in advance, since some loudspeakers are so well proofed that the impact of the mobile phone is at best negligible. If you are using a UMTS mobile phone you will have to switch over to GSM mode before conducting the experiment, because no impact will be seen in UMTS mode.

Answer

Question 2:

Experiment a: The radio or the computer loudspeakers hum and we hear interference when we phone out or in using a mobile phone. Experiment b: The same impact is achieved but is significantly less marked the further away the mobile phone is from the table. If it is far enough away (more than 5 metres) there may be no impact at all. Experiment c: Interference is heard on the loudspeakers, but the impact is significantly less because the human body absorbs some of the radiation.

Experiment d: There should be no impact on the radio or the computer loudspeakers. The radiation is reduced by the wall and by the distance between the mobile phone and the radio or loudspeaker.

Question 3: In spite of current trends, which seem set to allow passengers to use their mobile phones at will on board passenger aircraft, scientists from Carnegie Mellon University (CMU) in the USA have warned against the use of mobile phones and other electrical appliances brought on board by passengers during the flight. The potential electromagnetic nuisance caused by these appliances is greater than hitherto assumed, they say in an article published in the magazine “IEEE Spectrum”. The navigation systems of modern aircraft are particularly susceptible, claim the scientists.



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Most hospitals require you to turn off your mobile phone when you enter the building because they can interfere with highly sensitive medical equipment. Recent studies, however, show that mobile phones do not represent a hazard provided that they are at least one metre away from medical appliances. Mobiles are nevertheless still banned from operating theatres and intensive care units.

More information:

Information on using mobile telephones published by the Federal Office for Radiation Protection: “Teaching materials on mobile telephones (as of Grade 5)”: [http://www.bfs.de/en/bfs > Prints > Teaching material](http://www.bfs.de/en/bfs%20Prints%20Teaching%20material)
<http://electronics.howstuffworks.com/cell-phone.htm>
<http://www.youthinformation.com/Templates/Internal.asp?NodeID=91031>

Worksheet 14: Rays from the Sun

Dealing with sun protection in schools, and looking at proper protection from ultraviolet rays can help children and their families to be more aware of the hazards posed by the sun. The content matter can be best communicated if the topics and activities have a practical focus and if they correspond to the children’s own experience. The children learn that the sun’s light and heat do us good, physically and mentally, and foster vitality, but equally that sunlight has a negative impact on human beings. They learn to take precautions and accept responsibility for their own health. Finally, they help others to protect themselves from the sun.

At the start of this unit the students should say what they spontaneously associate with the sun. They are bound to mention light, warmth and feeling good (depending on the time of year), but some children might have negative experience to report. Who has had sunburn? How did it feel? What can we do to protect ourselves against sunburn? Building on the students’ existing knowledge, the lesson can go on to look at the topic in more depth. After this, the students should learn, in the teacher’s talk, that the sun has invisible rays, which are potentially hazardous for them – ultraviolet rays. You should make a clear distinction between the rays of the sun and ultraviolet rays, which account for only a small part of the sun’s radiation.

We need the sun’s rays to live. They are essential to make plants grow and provide us with heat and light. But they also include ultraviolet rays, which we need, but which can harm our bodies and wellbeing. Ultraviolet rays allow our bodies to produce vitamin D, which plays a vital role in the development of our bones, our immune system and the production of blood cells. For a healthy Northern European, between 10 and 15 minutes sunshine on face, arms and hands is quite sufficient to produce enough vitamin D for a whole day, though, even when the sky is overcast. Too much ultraviolet radiation can cause sunburn, prematurely age our skin, and cause skin cancer, inflammations of the eye and other eye conditions such as cataracts. Too much ultraviolet radiation can even weaken our immune system.

Look with your students in a simple way at how the strength of the sun’s rays changes in the course of a day and in the course of a year. The children should learn that around midday the sun’s rays, and thus ultraviolet rays too, are strongest, and that in the course of the year they are strongest between spring and late summer. The class should also work out the basics of the UV Index and thus learn to understand that the intensity of ultraviolet rays depends on various factors.

The UV Index

The UV Index (UVI) is an international standard. It identifies the expected peak daily ultraviolet radiation level at ground level. It is this radiation that causes sunburn. At the equator the UVI at sea level is about 12, given a cloudless sky. In Germany levels of up to 8 are reached in summer, and the levels in the mountains in southern Germany can be even higher. The higher the Ultraviolet Index on any given day, the more rapidly unprotected skin will burn.

The Ultraviolet Index depends primarily on the position of the sun in the sky; it thus varies most widely with the changing seasons and from one latitude to another. Thin clouds do little to reduce the Ultraviolet Index, and indeed



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certain sorts of clouds can actually magnify the radiation by scattering it.

The reflection of the sun's rays from sand and snow also affect the ultraviolet index. On snow, water and at beaches with light-coloured sand the ultraviolet radiation is thus much greater, which makes it all the more important to ensure you are adequately protected. These facts should be impressed on the children.

More information is available at: <http://www.bfs.de/en/uv>

Skin types and sun protection factor

Your skin type will determine how your skin reacts to ultraviolet radiation. There are six skin types (I–VI), but in Europe most people belong to skin types I–IV. While people with pale or freckled skin, fair or red hair and blue eyes (skin type I) have skin that burns easily and does not tan, people with light brown skin, dark hair and brown eyes (skin type IV) have skin that burns less readily and tans quickly. The realisation that there are different skin types and that everybody looks good with their own skin colour is the first step towards “sun-intelligent” behaviour.

The sun protection factor (SPF) of sunscreen products indicates how much longer you can expose your skin to the sun without burning with the sunscreen than without. Your skin's own protection time depends on your skin type, the UVI and the extent to which your skin is already tanned. It is important to realise that the SPF refers only to protection against UV-B rays.

More information is available at

http://www.cdc.gov/cancer/skin/basic_info/prevention.htm

<http://www.weather.com/activities/health/skin/> > Help Center > UV Rays 101, Skin Types, Top 10 Sun Safety Tips

http://kidshealth.org/parent/firstaid_safe/outdoor/sun_safety.html

http://www.gosunsmart.org/yourskin/yourskin_protection.shtml

Worksheet 15: The Sun Protection Reporters

The students should use this worksheet to conduct a survey among their schoolmates or friends. They should learn to minimise their exposure to ultraviolet rays and help others become aware of the risks involved. They should be able to explain the advantages of proper sun protection and should know the most important rules of sun protection. After the survey the questionnaires should be analysed and a table or graph produced to illustrate the responses. The students should be actively involved in this.

- What were the most frequent responses?
- Do the children surveyed protect themselves properly from the sun?
- How can we provide other students with better information?

The students should compile the results in the form of a report. Together they should then consider possible ways of improving sun protection at school.

Children's skin

Our skin is our single largest organ and protects us in many ways. This is particularly important for children. Their skin is much thinner and more sensitive than adult skin. Children's skin only starts to develop its own sun protection (increased pigmentation and thickening of the epidermis or outer layer of the skin) around the age of two. It is thus absolutely vital to protect children's skin carefully from the sun, especially from ultraviolet rays.

UVA rays cause the skin to age prematurely if we sunbathe to excess. Too much UVB radiation can lead to skin cancer. As much as 80 percent of the UV radiation we are exposed to in our entire lifespan is absorbed during childhood. To prevent irreparable skin damage, children's skin must be properly protected from the start.



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Point out to your students that they should never use solariums (tanning beds), even when they are grown up, since this constitutes an unnecessary and hazardous exposure to ultraviolet radiation.

The rules of sun protection

The following rules should be made clear to the children and discussed in detail during the lesson:

1. Let your skin get used to the sun gradually (but not by using a tanning bed!).
2. Light, loose-fitting, clothing that blocks sunlight can protect your skin from the direct rays of the sun.
3. Keep your head covered and wear sunglasses.
4. Stay in the shade in the middle of the day. (Remember the saying ‘Mad dogs and Englishmen go out in the midday sun’.)
5. Protect exposed skin by a high-factor sunscreen. Apply the sunscreen half an hour before you go outside.
6. Apply waterproof sunscreen at least half an hour before swimming.
7. Don’t forget specially exposed parts of your body such as your nose, ears and neck, the back of your knees and the back of your feet!
8. Children under the age of two should not be exposed to direct sunlight.

How can primary schools protect children?

Our schools can provide shade. Put up sun sails at suitable places over the playground, plant trees, and take into account the time of day and the UV Index when planning outdoor activities. If possible let the children play outside in the early morning hours. Do not schedule sporting activities for midday, and get them to run in a local wood rather than on the tartan track of a stadium. Point out how important sun hats and suitable clothing are, and make sure children are properly protected on field days and school trips. Be a role model. Make sure you too have a sun hat and sunglasses and always use sunscreen.

Experiments to demonstrate the impact of the sun’s rays/ ultraviolet rays

Experiment 1: The bleaching effect of the sun. Use a newspaper, cardboard or coloured paper, and plastic toys. The children should be put in groups and each group should be given two identical objects. One should be left in direct sunlight for a week, the other in the shade. Two objects with clear contours (e.g. Lego bricks) should be laid on a sheet of coloured paper. Get the children to guess what will happen. After one week you should examine and compare the objects and the paper.

Experiment 2: Determining the length of shadows. For this experiment you will need a yardstick or measuring tape, a pencil and chalk. On a sunny day the children should find a long pole, a street lamp or some other long straight object that is firmly anchored. They should measure the length of the shadow in the early morning, mid-morning, at midday, in the afternoon and in the evening. They can also mark the length of the shadow at each time on the ground using the chalk. What do they notice?

You will find more information about this experiment at:

<http://primary.naace.co.uk/curriculum/science/science2.htm>

More information

The Federal Office for Radiation Protection provides a wealth of information on this topic at <http://www.bfs.de> > Optical Radiation > UV Radiation and FAQs on the Topic

The Federal Office for Radiation Protection is currently working on teaching materials on UV radiation and sun protection for all grades. The materials should be available for downloading from the Office’s website as of autumn 2009.



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Climate Change and Health

Almost every day we hear or read in the media about the possible consequences of climate change. Primary school children too pick up the news and worry about what this might mean for them now and in future. Since the United Nations 2008 report it has been scientifically proven that the rising temperatures we have seen in recent years are not merely a short-term natural fluctuation but a long-term phenomenon. The evidence is irrefutable. Temperature change is primarily caused by human activities.

Little research has yet been done into the impacts of climate change on our health, but experts forecast that the consequences will be severe. The climate change already recorded, and even more the climate change now forecast, are expected to result in increased disease and deaths. The speed of climate change is particularly important in this regard. The world has always seen warmer and cooler phases (e.g. ice ages) but the changes were much slower, so that the natural environment had time to adapt to the changing conditions. Today global temperatures are expected to rise by up to 2°C by 2050 (as compared to the pre-industrial era). Rapid climate changes of this sort can also have serious impacts on our health. We have to make a distinction between direct and indirect impacts.

One direct impact is the additional pressure that heatwaves put on our bodies. One extreme example was the long hot summer of 2003, which cost about 70,000 lives in Europe. Elderly people, sick people and young children are particularly at risk from extreme heat. More frequent storms and flooding too will have a direct impact on our health and cause injuries, some of which may be fatal.

The indirect impacts include increased concentrations of fine dust particles and biological allergens in the air around us. This results in an increase in allergic reactions, such as hay fever and respiratory irritations and infections. The incidence and gravity of infectious diseases too, including those transmitted by animal hosts, will rise.

Tick-borne diseases such as Lyme disease and tick-borne meningoencephalitis too seem set to become more prevalent. In future diseases, which are today endemic in tropical or sub-tropical countries, may well be found in Europe too. In spite of what we sometimes hear or read, we need not, however, fear that malaria will return to Germany. The risk of this is minimal because of the high standards of hygiene and medical care.

The only effective way of reducing the impacts of climate change in the long term is to reduce greenhouse gas emissions. This applies in particular to carbon dioxide (CO₂). Over and above this, the development and implementation of adjustment measures is particularly important from the health point of view.

More information on climate change and our health can be found at

<http://www.euro.who.int> > Data and publications > Publications > Search: Climate

<http://www.ccah.cpha.ca/effects.htm>

<http://ecohealth101.org/>

Worksheet 16: Getting hotter!

Climatologists and weather experts are largely in agreement that climate change will make generally hotter summers in Germany. Higher temperatures are a stress factor for children. Infants and younger children in particular are less able to cope with high temperatures than adults. Children with heart problems, circulatory or respiratory disorders or problems with the lungs (e.g. asthma sufferers) as well as those with allergies often react strongly to great heat. They need special attention during heatwaves.

Introductory lesson

The students should report on what they already know about climate change. They should guess what impacts climate change could have on our weather. The teacher should then explain scientific findings to date in terms of expected heatwaves in summer and should explain how important it is that we protect ourselves from heat and how to deal with heat appropriately.



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The children should reflect on their own experience of summer heat and the impacts thereof. Do they know, for instance, what sunstroke and heatstroke are? Do they know how to protect themselves so that they do not get either, and what precautions to take? Have they ever visited a hot country? What do the people there do to protect themselves from great heat? Then the class should use encyclopaedias, age-appropriate literature and the Internet to find out more about summer heat, the consequences thereof and how we can protect ourselves. Ideally you should combine the issue of how we can protect ourselves from great heat with the issue of protection from ultraviolet radiation, which is part of the section on radiation in this module.

Information on the Internet is available at <http://www.bt.cdc.gov/disasters/extremeheat/>

Ozone and heat

Great heat almost always goes hand in hand with high ozone levels in Central Europe, because air pollutants from car exhaust fumes and industrial emissions react to form ozone under the influence of the sun's rays. The admissible limits are often exceeded in spring and summer. Ozone irritates mucous membranes (making our eyes and throats itch, giving us the impression that a heavy weight is pressing down on our chests and triggering pain when we breathe in deeply). It can also cause irritation and infections in the respiratory tract and the lungs, impair lung function temporarily, have a negative impact on our physical performance and cause respiratory problems. It also magnifies reactions to other air pollutants and allergens, such as pollen and animal hair. Children with respiratory diseases are especially at risk. Ozone can aggravate existing asthmatic complaints. Infants too suffer under poor air quality because their respiratory tracts are particularly sensitive. Should they have difficulties breathing or cough frequently, they might well have asthma, and a paediatrician should be consulted. Studies show that the negative impacts of heat and ozone are mutually reinforcing. This means that the hotter a summer day, the greater the impact of ozone on our health. This does not, however, mean we have to stay indoors on hot days. Normal physical activities pose no risk for healthy children.

Sunstroke, heatstroke and sunburn

On very hot days there is a risk of sunstroke or heatstroke. Children should avoid direct sun around midday when the sun is at its hottest and should avoid tiring physical activities. The normal metabolic processes in our bodies already generate heat: when we move, when we breathe, when our heart beats and when the other organs function. If our bodies generate more heat than is needed to retain our body temperature the excess heat has to be released into the surrounding. We sweat. The body's own temperature regulator can be overstretched when temperatures are very high, resulting in sunstroke or heatstroke.

Sunstroke and heatstroke generally begin with headaches, feelings of dizziness and/or feeling queasy. Sunstroke is caused by direct, strong sunlight on unprotected heads. The meninx is irritated. Symptoms of sunstroke include a very red, very hot head, cool skin, headache, agitation and dizziness, nausea, possibly combined with vomiting or even collapse. Extreme cases of sunstroke can even be fatal. Children are particularly at risk. Their hair still offers little protection, their skull is still thin. If infants spend too long in the sun they can become feverish, and turn very pale.

Heatstroke need not be caused by the sun. It comes about when the body's own temperature regulation system is disturbed as a result of being exposed to heat over a longer period (e.g. the body stops sweating). Hyperthermia is the result. The symptoms of heatstroke are a very red head, hot and dry skin, a dull expression, staggering, raised pulse and very high temperatures (of up to 43 – 44°C). Heatstroke can lead to a loss of consciousness or even death if left untreated. Sufferers should be placed in a cool place with their upper body raised. Cloths should be dipped in cold water, wrung out and used to cover them, and they should be fanned with fresh air. It is important to cool their head. If possible the sufferer should drink. We must also take care to protect ourselves from the sun's ultraviolet radiation, which damages the skin and, quite apart from sunburn, can cause skin cancer in the long term. The head and skin should be protected with the help of hats, suitable clothing and sunscreen. We can also protect ourselves by keeping to the shade, particularly at midday.



INFORMATION FOR TEACHERS

Keep drinking

When it is very warm, children should make sure that they drink enough at regular intervals. There are no black and white rules here as to how much a child should drink a day. Ideally they should drink a small glass, preferably of water, herbal tea or low-calorie, sugar-free drinks at regular intervals (during heatwaves once an hour). It is best to get children used to drinking regularly before the hottest season.

What can we do to protect ourselves?

- Keep rooms cool, and air rooms early in the morning and at night.
- Serve cool, light meals (e.g. melon, cucumber, fruit).
- Children need not spend all day inside even during heatwaves. Let them play in woods and parks with dense tree coverage. The air is cooler there and the ozone levels are lower.
- Schedule tiring activities and sport for the morning.
- Never leave children alone in cars or closed rooms.
- Get them to drink a lot (a glass of liquid an hour).
- Protect children from heat and the rays of the sun (appropriate clothing, sun hats, stay in the shade, use sunscreen).
- As a contribution to improving air quality and keeping ozone levels down, leave the car at home in hot weather.
- Sick children: Diarrhoea dehydrates the body very rapidly. Watch for apathy, tiredness, dry skin and lips. If in doubt don't wait, but consult your paediatrician immediately. Ask your paediatrician what special measures you should take if your child is asthmatic.

Information and warnings of heatwaves are available from DWD (the German Meteorological Office): [http://www.dwd.de/>English>Weather + Warnings> Official Warnings](http://www.dwd.de/>English>Weather+Warnings>OfficialWarnings)

Answers

Question 1: This Mexican is wearing a sombrero, a typical wide brimmed hat, whose name comes from the Spanish “sombra” or shadow. In Central and Southern America wide-brimmed hats made of straw or felt protect agricultural labourers from the sun as they work in the fields. This girl is having a siesta, or traditional Spanish midday nap. The word “siesta” comes from the Latin “sexta hora”, the sixth hour of the day, which for the Ancient Romans began at six o'clock in the morning. In Southern Europe this is the hottest part of the day, making it very tiring to work, especially out of doors. The Bedouin is wearing clothing typical for the people who live in the deserts of the Arabian Peninsula and North Africa. His head covering is known as a chech, or among the Tuareg a tagoulmoust. His clothing is long and loose providing good protection against sand, wind, intensive sun and heat. Various layers of clothing generate a cooling effect.

Question 2:

Point 1: Protect the skin from intensive sun and heat.

Point 2: In very hot weather our bodies need a lot of water, because we lose so much as the body sweats in order to regulate body temperature.

Point 3 and Point 4: At midday in particular you should have a siesta if at all possible. Too much physical activity further raises body temperature when the weather is very hot.

Point 5: You should eat food that is easy to digest to avoid putting further pressure on your body.

Worksheet 17: Thunder and Lightning!

As a result of climate change it seems likely that in future we will have to cope with more extreme weather events. Experts expect extreme storms with wind speeds of up to one hundred kilometres an hour, violent lightning storms, hail and rainfall so heavy that it causes flash floods. Children should thus learn the basics of how to cope with extreme weather events.



INFORMATION FOR TEACHERS

Introductory lesson

Every schoolchild has already experienced a violent thunderstorm and can report on it. In the lesson their experiences should be recorded and presented on the board. You should discuss the most important rules that the children already know and consider what other risks a thunderstorm brings, and how the children can protect themselves (e.g. from heavy rainfall/flooding, falling trees, violent gusting winds). What should they do, and what should they avoid? Why is it best to stay at home or not to seek shelter in tunnels or underpasses or dried out river beds/ close to streams during heavy rainfall?

Answer

Question 1: Three kilometres

Questions 2 and 3: Storm with strong gusting winds, falling trees and masts, lightning, hail and heavy rainfall with flash floods. Houses or buildings provide the best protection. On open ground squat down and curl up, ideally in a hollow or hole.

Where does lightning come from?

During a thunderstorm lightning occurs in various forms, most frequently as forked lightning. Lightning is an electric discharge caused by a very strong electric field that forms inside a thundercloud. A difference in voltage can occur inside any one cloud, or between two clouds, between a cloud and the surface of the Earth or between a cloud and the upper layers of the atmosphere. Differences in voltage can measure up to several million volts. These voltages are then equalized in a trice (on average 1/50 of a second). Currents of some 200,000 amps are generated. Lightning can reach a speed of some 350,000 km/h. The heat energy generated is such that the path of the lightning is hugely heated, producing a strong sound wave, which we hear as thunder.

Worksheet 18: Have a Good Look!

In the wake of climate change the risk of ticks is rising, since in a warmer climate ticks can spread into areas where they were not formerly found, or where they used to be rare. Ticks are active during mild winters too. To explain the problem of ticks to primary school children, you should discuss the issue in class. You can take a closer look at the behaviour of ticks.

Introductory lesson

The focus should be on explaining to the children the biology of ticks, i.e. their life cycle and their natural hosts in the forest, moorland and hillsides (mice, foxes, sheep, etc.) It is also a good idea to provide pictures of every stage of developments and compare sizes. In specialist literature and on the Internet you will find a large number of presentations that are also suitable for children. The students should know what ticks and tick bites look like, that ticks can carry dangerous diseases, what they should do (without panicking) if they suffer a tick bite, and how they can protect themselves from ticks. You should explain briefly the infectious diseases carried by ticks – Lyme disease and tick-borne meningoencephalitis.

What to do if you have a tick bite

If a tick has already buried itself firmly into your skin, a grown-up or doctor should remove it carefully using tweezers or special tick tweezers. You should never press the tick or treat it with adhesive, oil or other homespun remedies. These can encourage the tick to release dangerous bacteria into your body, raising the risk of infection. It is important when removing the tick to take a firm hold of its head and lever its body out. Never twist it, because the head could be severed from the body. If you are not certain that you have removed the entire tick consult a doctor, since the bite can otherwise become infected.

Ticks carry disease

Ticks themselves are not dangerous. They do however carry many diseases from their hosts, including two serious diseases, which can be dangerous for people. The best known of these is fortunately very rare: tick-borne meningoencephalitis. It is found in some parts of Europe, including Germany. Doctors or pharmacists can tell you the areas



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where this disease occurs. You can be vaccinated against it. If you check under meningoencephalitis on the Internet, you will find more information. Check out for instance these websites:

<http://www.nhs.uk/Conditions/Tick-borne-encephalitis/Pages/Introduction.aspx>

<http://www.rki.de> > English > Search: Ticks > "Tick Borne Encephalitis"

The second disease is unfortunately more prevalent and is often diagnosed too late. Ticks can carry a special type of bacteria (*Borrelia*), which cause borreliosis or Lyme disease. The disease can be treated with antibiotics once it has been diagnosed. It goes through several stages, which may be separated by periods of several largely symptom-free years. If you have had a tick bite, make a note of when and where. If you should later contract a disease, which your doctor cannot identify, it might be linked to the tick bite.

Sometimes a large red blotch may form where you were bitten by a tick carrying *Borrelia*. This may grow slowly over a period of several weeks to cover a large area, with clear contours. Even if this blotch goes away by itself, the *Borrelia* bacteria may still be in your body. Even after a few years they can cause serious diseases. If a red blotch like this appears following a tick bite you should always consult your doctor.

Answer

Question 2: Parts of your body where the skin is thinner, and which are particularly warm e.g. between your legs, at the back of your knees, under your arms, on the back of your neck, behind your ears and along your hairline.

Question 3: a) true; b) false; c) true; d) false; e) false.

More information on the issue of ticks is available on these websites:

<http://wwwn.cdc.gov/travel/content/mosquito-tick.aspx>

http://www.ci.orono.mn.us/tick_-_tips_&_protection.htm

N.B.

Beware Christmas trees! You can bring ticks into your house in a Christmas tree, particularly when the tree is freshly felled, and if the lower branches, which often grow in high grass, have not been removed. This is only a hazard in mild winters. When temperatures are low, with frosty nights, ticks seek shelter at ground level under piles of dead leaves, rather than sitting around on stalks of grass waiting for a host to pass.

Tip: Place your Christmas tree on a white sheet. After one or two days shake the tree gently and then shake the sheet out of the window, or from the balcony.

Worksheet 19: Ragweed Alarm!

Common ragweed, or *Ambrosia artemisiifolia*, comes from North America and was imported to Europe in the nineteenth century. Today it is widespread in various European countries, including Hungary, Italy and parts of France. In Germany it has been rare to date, but recently appears to be spreading. It is thought that it has been spread by bird food. Ragweed can be a nuisance for crop farmers as it is a particularly noxious weed, and many people are allergic to its pollen, which causes hay fever with all the usual symptoms. A large percentage of those allergic to this plant contract asthma.

Introductory lesson

With the help of the Internet students find out more about common ragweed. What does it look like? What are its most salient features? Where does it come from? How did it come to our country? Where is it found in Germany? How can we distinguish it from other species of *Artemisa*? They should learn that climate change encourages the spread of common ragweed and that it can be dangerous for people because it triggers allergies among those susceptible to hay fever. You should also look at what to do if you discover common ragweed.



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The children can then ask the local authorities (by telephone or e-mail) whether common ragweed has been identified in their area, and if so what is being done about it. They can draw up a short guide with photos, drawings and tips to inform their schoolmates, friends and family about common ragweed, which is still relatively unknown.

Answer

Question 2: Never touch the plant. Keep away from it and inform a grown-up so that the finding can be reported to the local environmental agency or plant protection agency.

The following Internet site provides information on Ambrosia:

<http://www.acw.admin.ch/themen/00576/01056/index.html?lang=en>

Household Chemicals

Modern life is today unthinkable without chemicals in the household. In many ways they make our life easier, but they can also be very bad for our health and for the environment, in particular if they are not properly used or if they are used too frequently or in excessive quantities.

In recent years more and more of these chemicals have been used in private households. They include cleaning and care products, beauty and hygiene products, and products used for leisure activities, in the garden and for DIY. The products are used in a wide variety of ways in the household: washing, cleaning and care products in the home, with a special focus on kitchens and bathrooms; paints, varnishes and turpentine for redecorating and renovating the entire house, and a number of products which can be used in the home and garden (scented oils, adhesives, pesticides, fertiliser, firelighters, paraffin, white spirit and petrol).

Chemicals can, however, also be “concealed” in a household, in particular as components of complex products, from which they can be released. Softeners and/or lead-based paints used in children’s toys are two examples, which are often reported in the press.

The cases of health problems and injury documented by German Toxicology Centres show that household chemicals are the most frequent cause of poisoning in the home. Acute health problems can occur when products are used incorrectly or when one product is mistaken for another. Even if they are properly used, however, some products can cause chronic health conditions. In addition to the acute cases registered by Toxicology Centres, low doses of household chemicals can accumulate to generate chronic problems. This need not be the case, however. In many cases optimum individual products are available, as are environmentally sound alternatives, which are also much better for our health. Traditional cleaning products for the home such as soap, lemon juice, salt, soda, bicarbonate of soda or individual cleaning products such as all-round cleaners, scouring powder and washing-up liquid are often at least as good if not better than many other chemical products.

In view of the sheer number and spectrum of products on the market it is not easy to make the right choice if you aim to use only products that are free of harmful substances in your home. Environmental labels and comparative product tests, however, can help you. The Federal Environment Agency has devised the Blue Angel label to help you decide. The sign is a voluntary way of designating products that are less harmful for the environment. You can find a current list of all Blue Angel eco-labelled products and services at www.blauer-engel.de/en/index.php.

There is also an EU eco-label, the Flower. All products bearing the Flower have been checked by independent bodies for compliance with strict ecological and performance criteria. You can find an up-to-date list of all products and services certified to use the Flower label at www.eco-label.com.

N.B.

Stiftung Warentest regularly tests household chemicals for harmful substances and ease of use, and publishes the results in its journal “Test”. It is surprising how often these reveal amazing differences between products regarding their content of harmful substances. You can find information on the test results and on the organisation Stiftung Warentest at www.test.de. This information is only available in German.



INFORMATION FOR TEACHERS

Learning goal

The students should explore a field, which is largely new to them. In the interests of education for sustainable development, they should gain an insight into the use of chemicals in the household, so that later, when they will probably be handling household chemicals themselves, they have a well-founded basic understanding of the field and the problems it raises. This lesson unit will give them an initial overview of the large number of household chemicals, firstly as the teacher gives a talk on the subject and secondly through their own research work. They should learn that it is important to handle these products responsibly. They learn to understand and comply with the safety instructions given, and work in groups and perform research to establish that there are other options that are better for the environment and for our health. In particular research on the Internet, in books and by questioning family members and friends about environmentally sound options that are better for our health should bring them new knowledge and understanding. One of the main learning achievements of this unit should be that students in future deal critically with household chemicals and above all that they are aware that there are more environmentally friendly options. To wind up the unit the class should prepare a small guide that can be published in the school magazine or on the school's homepage. A board game brings the lesson unit to a close.

Worksheet 20: Warning - Chemicals!

Preliminary remarks

From the outset you should make it clear to the children that there are good reasons why many of these products bear the warning “Keep out of reach of children”. Why? Where are these products kept in the children's homes? What experience do they have of these products? What do they know about them?

The students should identify these products firstly by means of the packaging. During the lesson you should discuss the fact that some of the substances contained in the products can endanger the environment, that they are particularly dangerous for water, that they can damage sewage treatment plants (see Water module) and that they must not be disposed of carelessly. Some of them actually count as hazardous waste.

Using the warnings and safety advice on the worksheet, the children should once again review what they have learned about health hazards and the right way to handle these products. This also links up with the section on Indoor Air, which also looks at the problems of using products that are environmentally hazardous and a health hazard when redecorating, and at the hazard symbols used.

The worksheet shows (vertically) the eight pictograms with safety suggestions used by the International Association for Soaps, Detergents and Maintenance Products (Association Internationale de la Savonnerie, de la Détergence et des Produits d'Entretien / A.I.S.E.), which are increasingly found on cleaning and care products (where the symbols are dark in the places that are light on the worksheet) and (horizontally) four of the legally prescribed symbols designating hazardous substances/ safety warnings which must be printed on all relevant products (always in bright orange with black writing).

The students learn that the toxicity of many products varies widely as does the degree of hazard they pose to the environment. There are some products, such as simple cleaning and care products of every sort, which bear only the A.I.S.E. pictograms. It should be pointed out to the children that the packages do not have to bear this safety information, because manufacturers are not legally required to use them and not all manufacturers are members of A.I.S.E.

Some more hazardous products, such as oven cleaners, pipe cleaners, turpentine, paint strippers, etc. bear the eye-catching orange hazard symbol, as they are required to do by law. It is absolutely forbidden for children to handle these products. Adults too should avoid them if at all possible. Cosmetics, however, are not required to use the orange hazard symbol indicating that they are hazardous for the environment: This makes it difficult to avoid cosmetics that are an environmental hazard. After this students should explore which less toxic or non-toxic alternatives exist, and which other options are less hazardous for the environment.



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Overview of the most common product groups

This list is intended to give an initial overview of the large number of household chemicals, but makes no claim to be exhaustive.

Kitchen

Oven and hob cleaners, glass cleaners, descaling agent, multi-fat cleaners, stainless steel cleaners, all-purpose cleaners, scrubbing powders and creams, washing-up liquids, dishwasher powder

Bathroom

Bath cleaners, household cleaners for floors and tiles, scouring powders or creams, toilet cleaners, toilet air fresheners, products for unblocking pipes, disinfectants

Cosmetics: hairspray, nail varnish, nail varnish remover

Living room

Scented oil for lamps, carpet cleaner, furniture polish

Washing (laundry)

Washing powder/gel etc., fabric conditioners, stain removers, bleach, water softeners

Garden/hobby/basement, storeroom

Fertilisers, insecticides, superglue/adhesives in general, firelighters, paraffin, white spirit, petrol, turpentine, varnish, leather impregnating spray, shoe cleaning materials, anti-freeze

Rules for handling household chemicals

When handling household chemicals, users must accept responsibility for using and storing the products properly:

- Household chemicals, like medicines, must be kept out of reach of children.
- Household chemicals should never be decanted into other containers, since they could then be confused with an entirely different product.
- Before using any household chemicals read the instructions on use and the safety information.
- When using dangerous household chemicals follow the safety measures explained on the product label.
- Like all other products, household chemicals must be properly disposed of so as to avoid endangering people and the environment.

N.B.

Should you have an accident involving household chemicals, e.g. where the chemical is swallowed by accident, you should immediately contact the emergency services.

More information on household chemicals:

Information on health-related aspects of household chemicals can be found on the Internet on the website of the Federal Office of Consumer Protection and Food Safety: www.bvl.bund.de > button "English" > "Commodities".

Information on poisoning and the risk of poisoning can be found on the website of the Federal Institute for Risk Assessment at www.bfr.bund.de > button "English".

You will find information on the environment-related aspects of household chemicals on the website of the Federal Environment Agency at <http://www.umweltbundesamt.de/index-e.htm>.

<http://www.sustainable-washing.eu/> > Sustainable washing and cleaning in the home



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Hazard symbols and safety information

http://www.baua.de/nn_39406/en/Topics-from-A-to-Z/Hazardous-Substances/TRGS/pdf/Hazardous-Substances-Ordinance.pdf?

http://en.wikipedia.org/wiki/Hazard_symbol

http://www.sustainable-cleaning.com/EN_safebehaviour.html (or <http://uk.cleanright.eu/>)

Information from the Federal Environment Agency

Brochure on environmentally sound washing at <http://www.umweltbundesamt.de/uba-info-medien-e/index.htm>

Alternatives to hazardous household chemicals at

<http://www.blauer-engel.de/en/index.php>

www.eco-label.com <http://www.pan-germany.org/gbr.htm>

Worksheets 21, 22 and 23: Household Chemicals – The Game

The game

The game consists of the two sheets 21 and 22. These should be copied, stuck onto cardboard and put together to make up the board. The game is broken down into several stations, which the players visit. There are three 'Chance' fields for every section. You will find the 'Chance' cards on sheet 23. These should be cut out, stuck on cardboard and placed at the correct station.

The rules

The game can be played with as many players as you like. Each player selects a figure and places it at the start. Each player must throw a six to move. After throwing a six the player throws again and moves the number of places shown on the die. On the way through the game, the player passes several 'Chance' fields. If the player lands on a 'Chance' field, one of the three cards from the pile for this section should be taken and the text read. Depending on what is written on the card, the player will move either backwards or forwards. Where there is a question on the card, the player must answer the question and then move two places forwards for a correct answer or two places back for a wrong answer. There are also three other 'Chance' fields with questions on hazard symbols. The player moves two spaces forwards for a correct answer and two back for a wrong answer. The winner is the player who reaches the End first. This gives the students a chance to have fun while reflecting on what they have learned. The game cannot replace the in-depth look at the topic in class, but rounds off the topic on a fun note.

Answer

Worksheet 20

Top row, from left to right: 7; 11; 2; 6.

Right-hand row, from top to bottom: 8; 10; 12; 9.

Left-hand row, from top to bottom: 5; 3; 1; 4.

Worksheet 21 and 22 (game board)

Kitchen: Hazard symbol 'skull and cross bones'; Answer 1.

Bathroom: Hazard symbol 'environmental hazard', Answer 1.

Hazard symbol 'cross': Answer 2.

Garden: Hazard symbol 'flame', Answer 1.

Worksheet 23

Living room, 'Chance' card 3: Answer b.

Kitchen, 'Chance' card 2: Answer b.

Bathroom, 'Chance' card 3: Answer b.

Garden/Basement, 'Chance' card 1: Answer b.



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General information on Environment and Health

Links

The websites of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) and the Federal Environment Agency (UBA) on “Environment and Health”

http://www.bmu.de/english/health_chemical_safety/doc/41329.php

<http://www.umweltbundesamt.de/gesundheit-e/index.htm>

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“Healthy environment – Our agenda for action” 135-page colour brochure, 2008 edition

<http://www.bmu.de/english/publication/publ/43739.php>

“Start in Life: Environmental influences on infants, unborn babies and fertility – Questions and Answers” 96-page colour brochure, 2008 edition

<http://www.umweltdaten.de/publikationen/fpdf-1/3756.pdf>

“Environmentally Friendly Office. Healthy Working” Blue Angel product guide 23-page colour brochure, 2008 edition http://www.blauer-engel.de/en/consumer/lebenswelten/healthy_working.php

“Environmentally Friendly Home. Healthy Living” Blue Angel product guide 35-page colour brochure, 2007 edition http://www.blauer-engel.de/en/consumer/lebenswelten/healthy_living.php

“A Healthier Home - But How? Practical Everyday Tips” 67-page brochure

http://www.apug.de/archiv/pdf/Healthier_Home.pdf

“CHILDREN! The link between the environment and children’s health” 45-page brochure

http://www.apug.de/archiv/pdf/Children_Children.pdf

N.B.

Much more materials on Environment and Health – brochures and links – are available in German. Please take a look at the German Version of this document (Lehrerhandreichung) to get this information.