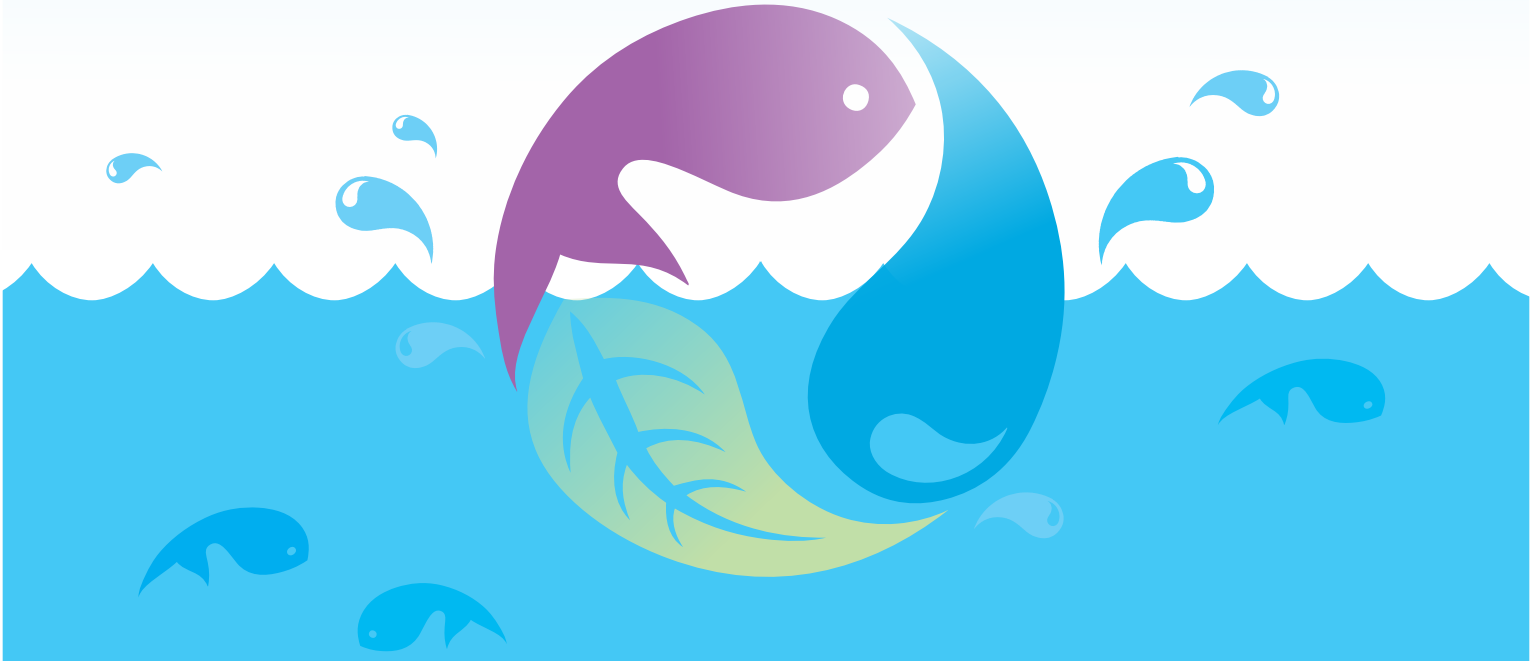
BALTIC ENVIRONMENT, FOOD AND HEALTH

FROM HABITS TO AWARENESS



TEACHER'S HANDBOOK

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This material reflects the views of the authors, and the Managing Authority cannot be held liable for the content of the information prepared by the project partners

Materials of the FOODWEB project are available on the web pages http://foodweb.ut.ee and http://natmuseum.ut.ee/foodweb.

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Preface

More or less, even if we realize it or not, we are affecting the surrounding environment. Substances that are emitted to air, water, and soil due to human activities will find their way back to us, for example, via our food. Looking at the wider picture, our lunch does not consist of simply potatoes, meat sauce, and salad, but also carbon dioxide emissions, nutrient releases to water bodies and used pesticides . All these factors also affect our health.

The purpose of the project "FOODWEB – Baltic environment, food and health: from habits to awareness." was to demonstrate the connections between food quality, human health, and environmental impacts. Awareness helps to choose meals which have the lowest environmental impact and the best quality.

This teacher's handbook will provide ideas and suggestions on how to take an integrated approach to food, health, and the environmental issues when teaching in basic school and upper secondary school. The hand-book can also be used for activities or inspiration by adult supervisors and training providers on the topics of the environment, health, and consumption.

The handbook is divided into four chapters, each of them focusing on a different topic: 1) contaminants in food; 2) life cycle and environmental impact of food; 3) making food, health and environmental choices; and 4) the Baltic Sea and the food industry. The material includes instructions for the teachers and work materials and group assignments for the students. Teaching aids are based on the web application created in the FOODWEB project and other materials available at the web page **http://foodweb.ut.ee**.

Let's make better choices!

Eva-Liisa Orula

March 2013, Tartu

The material's connection to the national curriculum in Estonia

The study aid "Contaminants in food" is mainly suitable for upper secondary school. According to the national curriculum, a graduate can apply the systematic knowledge acquired in biology, chemistry, physics and geography to resolve issues in the areas of natural sciences, technology and social sciences and to make reasoned decisions. Sociological issues include various problems which have their basis in natural sciences and yet receive coverage in society, incl. dilemmas. This study aid will provide many opportunities for resolving dilemmas.

The range of topics concerning the contaminants in food is also linked to the following upper secondary courses and topic areas.

One of the topics in the elective course "Applied biology" is the role of the food and pharmaceutical industry in the economy and everyday life. One of the suggestions for a practical assignment is to study the connection between applied biology and the food industry based on one freely chosen food group.

The elective course "Natural sciences, technology and society" has been planned as a module course where students solve issues they feel strongly about, making reasoned and competent decisions. This study aid can provide the basis for a whole new module for this course, while the material can also be used in the module "Toxic chemicals around us: how big is the risk?"

The material can also be linked to the topic in the II course chemistry, "Organic chemistry around us". An important aspect of learning about biologically important substances is compiling an analytical essay on food and nutrition myths based on the material discussed in class and using other information sources.

The topic "Common metals and their compounds" in the elective "Chemistry of the elements" also covers the environmental dangers posed by heavy metals. One of the practical assignments is to compile a short overview or summary of the topic based on materials from various different sources. Furthermore, the suggested learning method is active participation: role playing, discussions, debates, project based learning, compiling a study portfolio and a research project, incl. researching environmental issues and solving complex problems.

The topic of contaminants enters the curriculum of basic school in 8th grade health studies, under the topic "Health", which covers the impact of nutrition on the health, factors influencing nutrition and healthy habits, making healthy choices, and the responsibility to do so. The materials are also usable in 9th grade biology class, with the topic of "Digestion and elimination", where one of the expected study outcomes is to follow the principles of healthy eating and one of the practical assignments is an analysis on one's own eating habits

WORKSHEET **No. 1.**
Instructions for the teacher

Contaminants in fish

- **Age group**
  Upper secondary (16-18 year old students)

- **Teacher's guidelines**
  This task can be completed either individually or in pairs.

  When speaking about pollutants it is important to understand that the substances that have existed in the environment for millions of years can be relatively easily broken down by organisms. Man-made artificial substances, on the other hand, do not have close counterparts in nature (for example, PCB, dioxins, DDT), which is why they do not have effective mechanisms to be broken down either.

  Pollutants can enter the organisms for example fish, either via food chain or by accumulation through the gills and skin. Differences between accumulation rates are determined by the characteristics of the substance: whether it is soluble in water or in fats.

- **Equipment**
  Computers, tablets or smart phones with an Internet connection.

- **Resources**
  Web application "Contaminants in food".
  http://foodweb.ut.ee/Contaminants_in_food_86.htm

  Päivi Munne, "Selection of the main contaminant exposure pathways " (SYKE, 2013)
  http://foodweb.ut.ee/s2/111_94_92_Selection_of_the_main_contaminant_exposure_pathway.pdf

WORKSHEET **No. 1.**

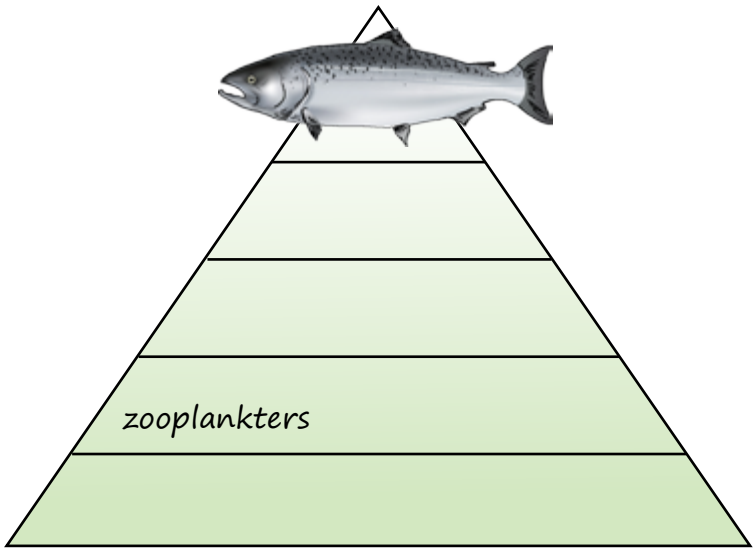
Instructions for the students

Contaminants in fish

People are producing various synthetic substances. These substances do not exist in the environment naturally, which is why they can cause problems when ending up in there. These substances are usually called contaminants. When they end up to the environment they can stay there for a long time. The substances do not break down because none of the organisms consider them as an energy source. Some of the contaminants can also accumulate to different organisms especially to their fat tissue or organs. Concentrations of these substances may also magnify through the food chain, being highest in the top predators like humans. Some of the artificial substances can also cause various health concerns.

Take a look at the web application "Contaminants in food" (**http://foodweb.ut.ee/Contaminants_in_food_86.htm**), Persistent organic pollutant wikipedia (**http://en.wikipedia.org/wiki/Persistent_organic_pollutant**) and DDT Wikipedia (**http://en.wikipedia.org/wiki/DDT**)Use the information to fill in the worksheet.

- *Complete the food chain of the Baltic Sea, filling in the species and organisms on appropriate levels..*



In which level of the pyramid, organisms have the highest concentration of contaminants in their tissues?

_____

Explain why the concentration of pollutants is likely to be higher in Baltic herring than in perch?

_____

Why do we find contaminants in fish? How do the contaminants end up to fish? Give two examples

1) _____

2) _____

It can be said that synthetic pollutants can be even more hazardous to sea than oil contamination, why is that?

_____

_____

What substance is DDT and what was it used for? _____

_____

Why has DDT been banned?_____

_____

- *Which contaminants can you be exposed to via daily meals and beverages? Use the web application "Contaminants in food" to find information for the following substances to fill in the table.*

Contaminant	How does it enter the food?	What are the potential harmful effects?	How to lower the risks?
PAH			
Dioxins			
Mercury			
Brominated flame retardants			

Which contaminants are found in the Baltic Sea fish, in quantities exceeding the recommended / tolerable limits?

_____

_____

Give an example how to lower the risks associated with contaminants in fish by using different cooking or preparation techniques?

The best way to have a balanced diet is to have an omnivorous diet, which consists of 75–85% plant based material and 15–25% meat based material. Keeping your diet as variable as possible is essential for human health. Food choices are made based on different criteria.

Compare fish and red meat in terms of health impacts and the possible risks they might pose! What are the pros and cons of each?

Pork:

Fish:

Give two arguments on behalf and two against eating the Baltic herring and red meat!

For

Against

Please note!

Food containing contaminants is not necessarily unsafe to eat. It all depends on the concentration of contaminants: if and how much it exceeds the daily limit and how big a part does the contaminated food item take up in our menu. It is important to consider your diet as a whole, not only based on the contaminants. A good diet is the basis of good health!

Group assignment **No. 1.**
Instructions for the teacher

Should we eat fish or not?

- **Age group**
  Upper secondary (16-18 year old students)

- **Equipment**
  Computers, tablets or smart phones with an Internet connection. Worksheet for each pair

- **Teacher's guidelines**
  Work is done in pairs
  The discussion network method involves different study skills, including speaking and listening, which develop negotiation skills and the ability to make well considered decisions. Working in pairs is a good way to make sure that everyone can participate. The assignment is easily graded, credit must be given for both the contribution to the group assignment as well as for writing one's individual summary. Using discussion network as a learning method, see the book by Doug Buehl, "Classroom Strategies for Interactive Learning" (Omanäolise Kooli arenduskeskus, 2001).
  Discussion network is found on page 11.
  Resources
  Finnish Food Safety Authorities
  http://www.evira.fi/portal/en/food/information+on+food/food+hazards/restriction+on+the+use+of+foodstuffs/dietary+advice+on+fish+consumption/

- **Activities**

- **Introductory discussion on fish and fish dishes**
  How do you feel about fish dishes?
  Have you ever gone fishing?
  What types of fish are caught from the Baltic Sea?

- **Filling in the discussion network in pairs**
  Divide students into pairs, and explain to them the structure of the discussion network. In this class, the basic question of the discussion network is whether to eat fish or not, i.e. whether the health benefits of fish outweigh the potentially harmful effects of contaminants. The task for the students is to find an equal number of arguments for both sides, regardless of their personal opinion. Students can find the information in Finnish Food Safety Authorities' websites (**http://www.evira.fi/portal/en/food/information+on+food/food+hazards/restriction+on+the+use+of+foodstuffs/dietary+advice+on+fish+consumption/**)

- **Group assignment**
  After filling in the discussion networks, the pairs must join into groups of four and make a conclusion on whether to eat fish or not. Students will probably be able to add even more arguments on both sides. Have the groups come up with some conclusions together and write them at the bottom of the page. Some possible conclusions are, for example, that eating fish is still a healthy choice as it contains fatty acids that are necessary for human health, or as the amount of contaminants in them is low, or that it is important to consider the location from where the fish was caught. The groups will then prepare a presentation on one of their conclusions.

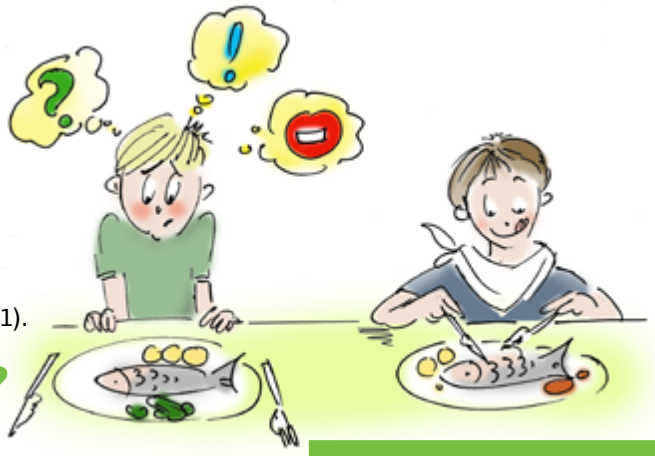
- **Presenting the conclusions**
  Each group will get a chance to present one of their conclusions and the reasoning behind it. The duration of a presentation should be 2–3 minutes. If the students want to, they can also discuss their disagreements. It is not necessary for all the groups to have similar conclusions.

- **Writing the summary**
  This is an individual assignment, where each student will express their own opinion on the issue. They can use the arguments proposed on the topic in the discussion network and jointly proposed arguments.

Discussion network

Adapted from D. Buehl's book

"Classroom Strategies for Interactive Learning" (2001).



Should we eat fish or not?

YES		NO
1. 2. 3. ...	**Arguments**	1. 2. 3. ...
	Is eating fish beneficial for you?	
	Conclusion	

GROUP ASSIGNMENT **No. 2.**
Instructions for the teacher

What should be sold at the school cafeteria?

- **Age group**
  9th grade and upper secondary level. (15-18 year old students)

- **Equipment**
  Computers, tablets or smart phones with an Internet connection.

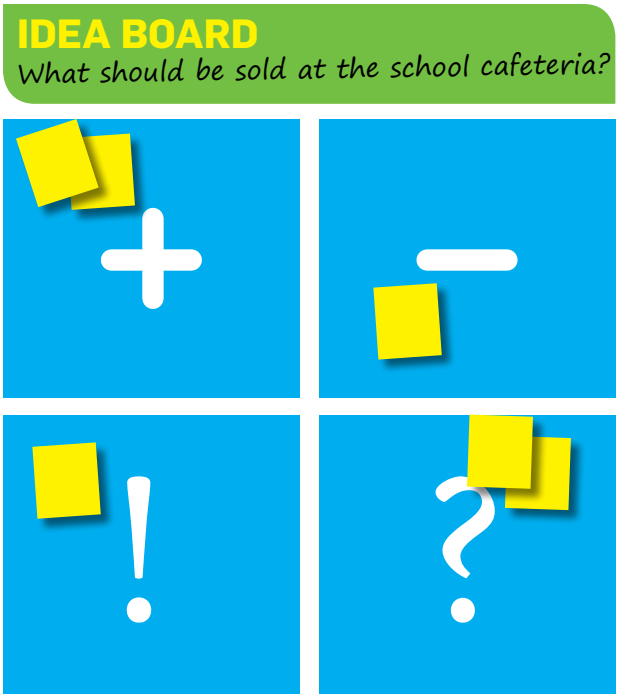
- **Teacher's guidelines**
  The purpose of this exercise is to practice resolving possible dilemmas and to learn about potential contaminants in fruits.

  It is necessary to take some time before starting this task, like at the end of last week's lesson, to explain to students the purpose of the idea board and having them to filling it in. Then the other activities take up at least a double lesson (2 x 45 minutes). Another possibility is to start the first lesson with the idea board and continue to the activity "Identifying interest groups and gathering information in pairs". In this case, searching for important facts will be left for homework. The next lesson should begin with a session of questions on what the students learned from their homework. This is an important part, as the new knowledge that was accumulated needs to be reinforced.

- **Resources**
  Web application "Contaminants in food".
  http://foodweb.ut.ee/Contaminants_in_food_86.htm
  Sirje Aher, "Collective learning in Basic schools on Food and Nutrition" (Tartu, 2012)
  http://foodweb.ut.ee/s2/100_73_48_Collective_learning_in_Basic_schools_on_Food_and_N.pdf

- **Activities**

- **Practice assignments**
  A week before starting the task, set up an idea board on the wall and divide it into four sectors. Add one of the following symbols to each sector: "+" (plus); "–" (minus); "!" (exclamation mark) and "?" (question mark). Pass Post-It notes out to students. Ask the students to write down ideas on the post it notes and to add them on the idea board. Positive ideas/experiences to sector marked with + and negative to sector marked with –. New ideas and questions to sector marked with ? and ! suggestions to sector marked with !. Everyone should add something to each of each sector.



- **Introduction**
  First go through the idea board together. Teacher will explain to the class that the cafeteria issue came up because there was a discussion among parents about the fruit sold in the cafeteria. Some parents claimed that tangerines should not be sold there, as they may contain some substances that might not be healthy. Others thought that it is still better to eat tangerines rather than candy. Together, a question is formulated and subsequently answered, for example, "What should and what should not be sold in the school cafeteria?" It is possible to formulate the question based on the ideas on the board.

- **Identifying interest groups and gathering information in pairs**
  This activity will identify the reasons behind the issue and potential relevant interest groups. The students will be collecting relevant facts on the topic.

  Some examples:

  Why can fruits be healthy/unhealthy?

  Which contaminants can be found in fruits and how have they ended up there?

  What are the potential harmful effects of these contaminants?

  Where do the fruits sold in the school cafeteria come from?

  How are fruits handled and sold?

  Which fruits have lower risks?

  Here are some sources where to find the answers:

  the web application "Contaminants in food", **http://foodweb.ut.ee/Contaminants_in_food_86.htm**;

  The students can choose whether to work in pairs or groups.

- **Expert groups**
  The previous task revealed which are the interest groups that need to be represented by experts. Form expert groups from the representatives of the interest groups. It is important to make sure that different interests are being represented among the groups. These could be, for example, nutritionists, the student council, owners of the cafeteria, parents, school administration, local fruit and vegetable farmers. The students will have to discuss and write down the interest group's position and arguments behind it.

- **Meeting of the decision committee**
  Hold a meeting of the decision committee The meeting can be led by the teacher or one of the students who is able to control the meeting. Pick a secretary who will write down the decision (either on the blackboard or using a computer, if it can be projected on a screen). After having heard all the expert groups the decision committee, will find a compromise solution. The decision can have separate subpoints, be comprised of different measures, or it can be an action plan.

- **Grading and assessment**
  Re-evaluate the final decision against whether the issue (what to sell and what not to sell in the school's cafeteria) was answered and if everyone's position was heard.

GROUP ASSIGNMENT **No. 3.**
Instructions for the teacher

Breaking the myths

- **Age group**
  9th grade and upper secondary level (15-18 year age students).

- **Equipment**
  Paperboards and writing utensils

  Computers, tablets, or smart phones with an Internet connection are recommended.

- **Teacher's guidelines**
  The purpose of this assignment is to break food related myths and to practice environmental thinking and argumentative skills.

  The activities can be planned so that assignments are given and explained in class, and information is searched for as homework. In this case it is not necessary to use computers in the classroom.

  This group assignment is mainly targeted at upper secondary students, as it can be too difficult for 9th graders to find justified arguments. The approach should be deeper than merely opinions.

- **Activities**

- **Brain storm**
  Use the brainstorming technique to come up with a list of food myths, for example: people should only eat vegetarian food; vitamins give you energy; pasta will make you fat; fasting will cleanse your body; Baltic fish are inedible due to contamination; eating meat and potatoes together is unhealthy; all E-additives are harmful, a protein based diet will improve your sports results, etc. The number of topics must be larger than the number of groups, to leave the students with a choice.

- **Group assignment**
  Divide the class into groups. Each group will choose one myth and study it. Groups must gather facts and other evidence to breaking the myth. It is important that all claims have scientific data behind them. Results are presented on a poster.

- **Group assignment presentations**
  Students present their posters to the class and justify their arguments with the facts they were able to find.

The material's connection to the national curriculum in Estonia

The general part of the current national curriculum for basic school includes topics like **"The environmental sciences and sustainable growth"** and **"Health and safety"**. Covering health and safety under natural sciences helps students to understand the importance of healthy habits and healthy eating. Students must be able to comprehend the connection between the environment and health.

Natural sciences describes competencies in natural sciences which helps a basic school graduates to make the environmentally sound decisions and estimate their potential environmental impact taking into account natural, economic, ethical and moral aspects, as well as social considerations.

By the methodological planning and organization of learning, the III school stage enables both individual and collective learning methods, and learning with computerized study environments and web-based materials to support the students' development into diligent and independent learners. Different learning methods are encouraged, incl. active learning (role play, discussions, debates, project based learning, etc.).

The contents of the materials concerning the life cycle of food and its environmental impact can be associated with the following study topics of the III school stage.

The topic of **"Ecology and environmental protection"** in **8th grade biology** must result in the following skills: resolving dilemmas concerning the protection of biodiversity, valuing biodiversity, and a responsible and sustainable attitude towards different ecosystems and habitats.

In **8th grade geography**, the topic of **"European and Estonian agriculture and the food industry"**, where the students have to investigate the sources of various food products and evaluate the prevalence of domestic and imported goods in different product groups, is directly linked to these worksheets.

Health studies, one of the social studies subjects in the **8th grade**, also covers the topic **"Health"**, which must result in the ability to analyse factors influencing our health decisions, and the ability to demonstrate efficient decision-making skills in a learning environment in the area of health issues both individually and in groups. The student must also be able to evaluate whether their daily menu meets the principles of a healthy diet.

At the upper secondary level the material can be used during IV course biology, along with the topic "Environmental protection". The assignments are also adaptable to a module course system and can be used with the upper secondary elective **"Natural sciences, technology and the society"**

In conclusion, every student needs to understand how nutrition affects our health, what constitutes a healthy lifestyle, and which choices to make in their everyday life. The contents and the methodical structure of the study materials are directly linked to the subject syllabi of the III school stage and will contribute to the learning outcomes. It is especially recommended for the 8th grade, where it will create possibilities for integrating different subjects and using project based learning, but it can be also adapted for the upper secondary level.

WORKSHEET **No. 1.**
Instructions for the teacher

From tomato to ketchup

- **Age group**
  8th grade, easily adapted for upper secondary level (14-18 year old students).
- **Equipment**
  Computers, tablets or smart phones with an Internet connection.
- **Teacher's guidelines**
  The purpose of the assignment is to teach students the life cycle of a product using the example of ketchup (**http://foodweb.ut.ee/tomato**). The model provides lots of learning opportunities. The worksheet will make the students focus on the model and helps them build an understanding of what needs to be considered to estimate the total environmental impact of a product.

  Assignments can be done both alone and in pairs.

  A good way to make an introduction is asking the students if they know what it takes to have ketchup on the table. An appropriate conclusion would be a brief discussion leading to the agreement that less processed, natural, and locally sourced products are better for the environment. Older students can be engaged into a deeper discussion on the different parameters of environmental impact: why have these choices been made, what is the carbon dioxide equivalent, why was water consumption accounted for, etc.

  When discussing how to reduce the environmental impact of food, it is appropriate to include the topic of the preservation of food: how often people go grocery shopping, whether they throw away food, for how long is food preserved in the refrigerator, how much energy does the refrigerator consume, etc. It is important to realize that not only the producer, but also the consumer must take responsibility for the environmental impact. This does not necessarily mean giving up the product altogether.
- **Resources**
  Siret Talve, "Ketšupi olelusring" (Tartu, 2012)

  http://foodweb.ut.ee/s2/111_232_82_Ketupi_olelusring.pdf

  Presentation by Siret Talve "LCA: olelusringi hindamine" (09.11.2012)

  http://foodweb.ut.ee/s2/19_216_77_LCA_olelusringi_hindamine.pdf

  Information on refrigerators' energy labels from the presentation by Siret Talve ja Juha Grönroos "Life Cycle Thinking (LCT) on examples of ketchup and fish" (10.10.2012)

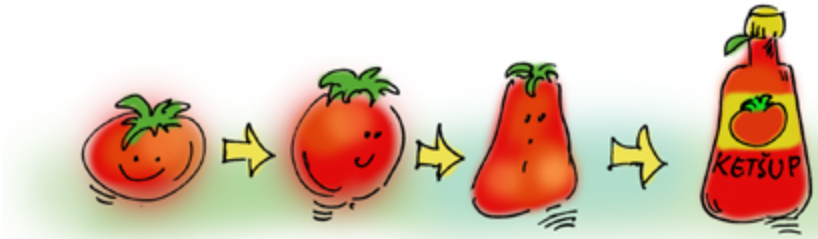
  http://foodweb.ut.ee/s2/109_185_67_Life_cycle_thinking_on_examples_of_ketchup_and_fis.pdf

  An article by Karin Andersson; Screening life cycle assessment (LCA) of tomato ketchup: a case study

  http://infohouse.p2ric.org/ref/37/36505.pdf

WORKSHEET **No. 1.**

Instructions for the students



From tomato to ketchup

Your task is to find out how we get ketchup from tomatoes, i.e. what kind of life cycle ketchup has. Answers to the questions on the worksheet are available in the web application "Ketšupi olelusring" at **http://foodweb.ut.ee/tomato**.

Look at the life cycle of ketchup!

What are the different stages in the cycle?

Read the information buttons in the menu on the left.

Columns on the right side show the environmental impact of the different options.

What is the environmental impact of the ketchup production? Underline the appropriate word as shown on the measuring columns.

The bigger the water and energy consumption is, the **higher/lower** the columns are.

The lower the columns are, the **bigger/smaller** the environmental impact gets.

The columns shows how much (CO2) is **consumed/released** within the activities.

What kind of environmental problems do CO2 and other greenhouse gases in the atmosphere cause?

_____

_____

Look at the bars in the right side – which means of transportation (stage 2) has a bigger environmental impact, a small truck or a big truck? Why?

Make your choices, starting from growing the tomatoes until they rend up to our table as a bottle of ketchup, and try to make the least environmental impact possible. When you have reached the end of the life cycle, write down your result.

According to my choices, the amount of resources necessary to make 1 kg of ketchup is _____MJ of energy and _____litres of water and it will emit _____ kg of greenhouse gases in carbon dioxide equivalent contributing to climate warming.

Which step is responsible for most of the greenhouse gases?

Which step demands the most energy?

Which step demands the most water?

Compare your results with a friend! Who managed to achieve the smallest environment impact? Did you make different choices compared to your friend?

As a consumer, how can you reduce the environmental impact of food?

The life cycle of ketchup

1 Growing tomatoes

2 Transport of tomatoes to the tomato paste production plant

3 The production of tomato paste

4 Transport of tomato paste to the ketchup factory

5 The production of ketchup

6 The packaging of ketchup

7 Transport of ketchup from the production plant to the wholesaler

8 Transport of ketchup from wholesaler to retailer

9 Store

10 Transport from the store to home

11 Preserving ketchup in the refrigerator

WORKSHEET **No. 2.**
Instructions for the teacher

We love chocolate!

- **Age group**
  8th and 9th grade, upper secondary level (14-15 year old students)

- **Equipment**
  Computers or tablets with Internet access for each pair.

- **Teacher's guidelines**
  The purpose of the assignment is to explain the life cycle and environmental impact of food on both the natural and social environment. The assignment can be completed separately or as a module in a study programme. If students have seen the model of the life cycle of ketchup (see worksheet "From tomato to ketchup"), then they already have the necessary background knowledge. It can be difficult for the students to comprehend how the different steps in the life cycle of chocolate affect the natural environment. This is why it would be best to discuss it together.

  As an introduction, you could talk about your favorite sweets and discuss where and how to get them. When making the conclusions it must be remembered that there is no single right answer. This is a good opportunity for the students to look at a problem with several solutions, practice making compromises, and express their opinions. While emphasizing the importance of making aware choices, avoid going to extremes or provoking ecophobia. At the end, you could offer some chocolates to students.

- **Materials on the life cycle**
  Web application "The life cycle of ketchup"
  http://foodweb.ut.ee/tomato
  Siret Talve, "Ketšupi olelusring" (Tartu, 2012)
  http://foodweb.ut.ee/s2/111_232_82_Ketupi_olelusring.pdf
  Presentation by Siret Talve "LCA: olelusringi hindamine" (09.11.2012)
  http://foodweb.ut.ee/s2/19_216_77_LCA_olelusringi_hindamine.pdf
  Some references
  http://foodweb.ut.ee/Kasulikud_viited_olelusringi_kohta_192.htm
  Presentation by Siret Talve and Juha Grönroos "Life Cycle Thinking (LCT) on examples of ketchup and fish" (10.10.2012)
  http://foodweb.ut.ee/s2/109_185_67_Life_cycle_thinking_on_examples_of_ketchup_and_fis.pdf
  An article by Karin Andersson; Screening life cycle assessment (LCA) of tomato ketchup: a case study (**http://infohouse.p2ric.org/ref/37/36505.pdf**)

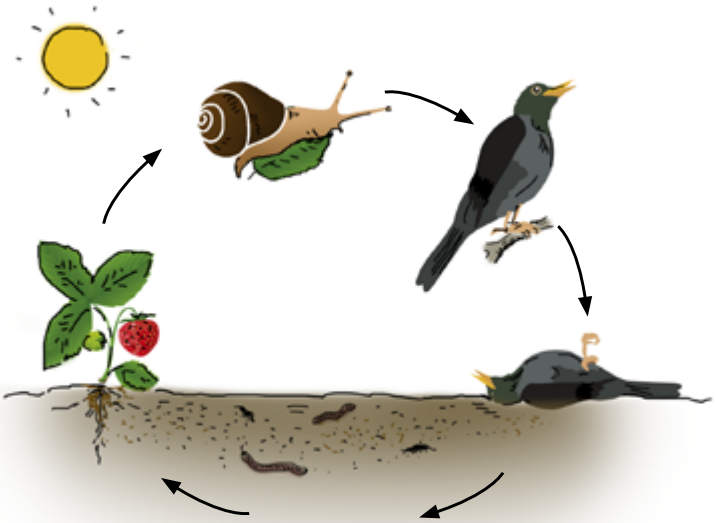
- **Materials on chocolate and its production**
  Wikipedia entry on chocolate.
  http://et.wikipedia.org/wiki/chocolate
  Mis on šokolaad?
  http://www.kalev.eu/magusamaailm/mis-on-sokolaad
  Article "Chocolate's child slaves - CNN's document film
  http://thecnnfreedomproject.blogs.cnn.com/2012/01/19/child-slavery-and-chocolate-all-too-easy-to-find/
  Original source: David McKenzie and Brent Swails "Child slavery and chocolate: All too easy to find" (CNN 19.01.2012)
  http://thecnnfreedomproject.blogs.cnn.com/2012/01/19/child-slavery-and-chocolate-all-too-easy-to-find/

WORKSHEET **No. 2.**

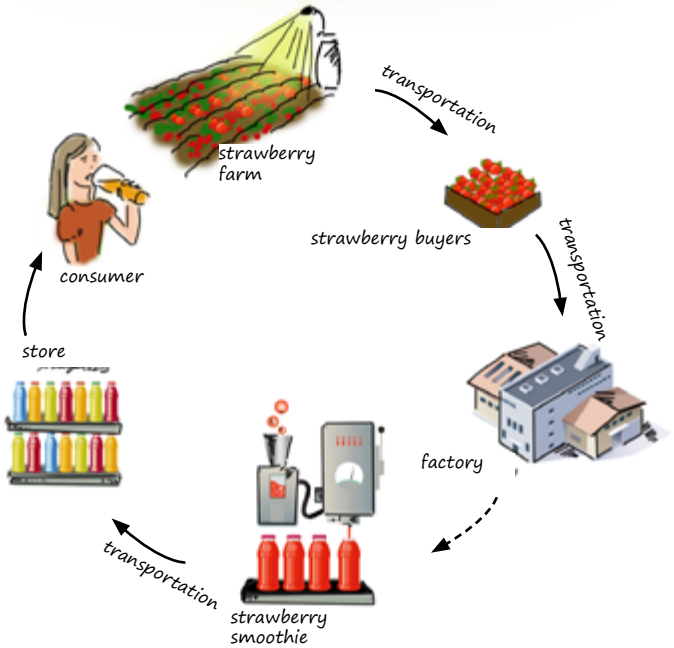
Instructions for the students

We love chocolate!

Everything we eat comes from nature. Look at the figures below and compare them!



- In nature, each ecological stage is using the substances from the previous stage. This circulation is powered by solar energy. Nothing is discarded, nothing is lacking



- Producing food and its transportation uses energy and creates emissions to the environment. Some of them (strawberry transportstems, for example) return to the natural circulation and do not pose an environmental problem. Some substances on the other hand (like residue from fertilisers and pesticides) can be harmful to the environment. Not all substances return to natural circulation – production equipment, as well as packaging and processing wastes, exit the circulation.

What makes the ecological and industrial cycle similar and on the other hand different?

Similarity: _____

_____

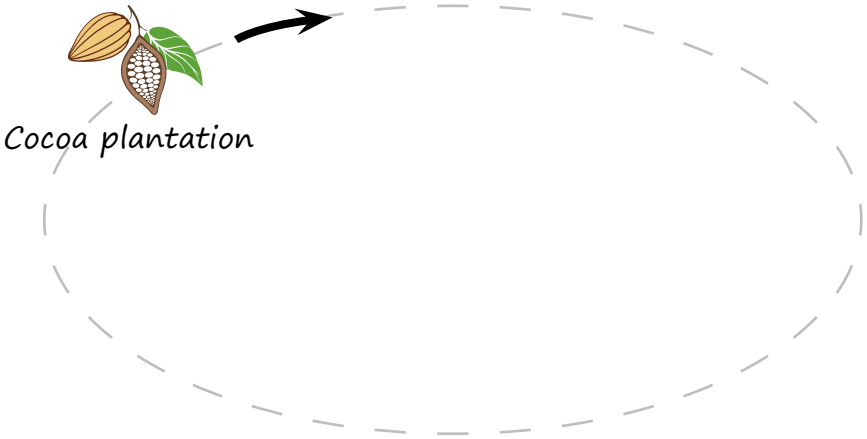
Difference: _____

_____

Do you know what a chocolate bar is made of? What is the difference between white chocolate and dark chocolate? Read the materials below concerning the production of chocolate. Draw up a life cycle of chocolate depicting each stage, from the raw materials to the person enjoying the sweets.

Wikipedia entry on chocolate. **http://et.wikipedia.org/wiki/chocolate**

Mis on šokolaad? **http://www.kalev.eu/magusamaailm/mis-on-sokolaad**



While enjoying our candy bar, we seldom think that our love for chocolate has a global impact. What kind of impact? Give two examples on how eating chocolate affects the natural environment

Stage in the life cycle of chocolate	Environmental impact

Each product has an environmental impact. Size of the impact, depends on the product. Which product has higher environmental impact a chocolate bar or a strawberry smoothie? Why do you think so?

What other problems are associated with the production of chocolate besides environmental impacts? Can chocolate also have a social impact? Look at a clip from the documentary- "Chocolate's child slaves - CNN's **http://thecnnfreedomproject.blogs.cnn.com/2012/01/19/child-slavery-and-chocolate-all-too-easy-to-find/p://www.fairtrade.ee/7-uudised/207-sokolaadi-lapsorjad-cnn-i-uuriv-**

Write a brief summary of the issue shown in the documentary.

Does this mean that we should no longer eat chocolate? Discuss with your teacher which choices or compromises we can make if we want to keep our sweet tooth.

GROUP ASSIGNMENT **No. 1.**
Instructions for the teacher

The best ketchup

- **Age group**
  8th and 9th grade. (14-15 year old students)

- **Equipment**
  Computers, tablets or smart phones with an Internet connection.

  Large sheets of paper and writing utensils for drawing the diagram.

- **Teacher's guidelines**
  The purpose of this assignment is to describe the life cycle of food products and assessing the environmental impact of different life cycle stages.

  Work is done in groups or pairs.

  The basis of the assignment is the model of the life cycle of ketchup (http://foodweb.ut.ee/tomato) and its informational buttons. The groups must investigate one of the stages in the life cycle of ketchup and analyze its environmental impact. Work done by each group or pair will comprise the whole life cycle of the product.

- **Resources**
  Siret Talve, "Ketšupi olelusring" (Tartu, 2012)
  http://foodweb.ut.ee/s2/111_232_82_Ketupi_olelusring.pdf
  Descriptions of different stages from "Ketšupi olelusring" by Siret Talve (Tartu, 2012)
  http://foodweb.ut.ee/Oppematerjalid_210.htm
  Presentation by Siret Talve "LCA: olelusringi hindamine" (09.11.2012)
  http://foodweb.ut.ee/s2/19_216_77_LCA_olelusringi_hindamine.pdf
  An article by Karin Andersson; Screening life cycle assessment (LCA) of tomato ketchup: a case study (**http://infohouse.p2ric.org/ref/37/36505.pdf**)

- **Activities**

- **Forming the groups and assigning the topics.**
  Divide the class into groups and assign each group one of the topics from the different steps of the life cycle of ketchup. The stages are as follows: growing the tomatoes, production of tomato paste and ketchup, packaging the ketchup and recycling the packages, marketing and transport of the ketchup, consuming ketchup and other tomato products.

- **Explaining the task to the students**
  Give the students a description and instructions of the task. Most of the material is available for the students under the information buttons on the left side of the web application. The group who gets the topic of consuming tomato products will also cover tomato products and the health benefits of tomatoes. Make sure to highlight the difference between the terms raw material (used directly in the product) and technological aids (i.e. washing agents used in the process, but not as part of the product).

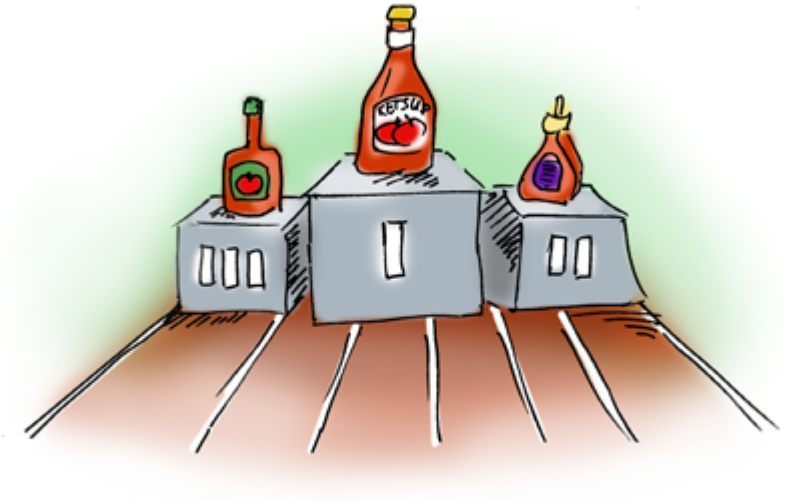
- **The students' independent work based on the instructions (p 24)**

- **The students' presentations**
  The groups will present their work in the order of the production cycle, starting with the growing of tomatoes. Hang the diagrams to the board or the wall. Encourage the listeners to ask questions.

- **Conclusion**
  The assignment can be ended with a competition to find a name for the new product. Collect suggestions for the suitable names, write them on the board, and vote for the winner.

GROUP ASSIGNMENT **No. 1.**

Instructions for the students



The best ketchup

- Look at the model of the life cycle of ketchup at http://foodweb.ut.ee/tomato with your group. Find and gather the following information on the production steps assigned to your group.
- What is the purpose and estimated outcome of this step?
- What kind of natural resources, raw materials, and other agents or equipment is necessary in this step? What will you need?
- What waste products are generated in the process? Is there any way to reuse them?
- How to minimize the environmental impact of the step?
- Discuss your answers in group and draw up a diagram for your production stage. Prepare to present your work, explain it, and answer the questions.

GROUP ASSIGNMENT **No. 2.**
Instructions for the teacher

Modelling the life cycle

- **Age group**
  Upper secondary (16-18 year old students)

- **Equipment**
  Large papers, pencils coloring supplies.
  If possible, a computer with Internet access.

- **Teacher's guidelines**
  The purpose of the assignment is to explain the life cycle and environmental impact of a food production. The assignment can be completed separately or as part of a module course. If the topic has already been covered with the students, they will be familiar with the term "life cycle" and it will be possible to get to work right away. If not, you could first go through the presentation "LCA: olelusringi hindamine"or read about the relevant concepts from the book "Olelusringi hindamine".

  Students are going to design the life cycle of the product of their own choice, describe its environmental impact, and give a presentation of their work. The life cycle doesn't need to be completely accurate. Students may also use their own imaginations.

  Students may look at the web application of the life cycle of ketchup; however, if the topic is familiar to them, this step can be skipped. In this case, the Internet connection is not important.

  Depending on the level of the students and their previous experience, the task can be made easier by assigning them a specific product, or limiting their choices only to dairy or cereal products, for example. Another option is giving to all groups the same package (like a bread bag), so that all groups will design their own life cycles which can then be compared later on. Then you can analyze if or why did they come up with different solutions, whether there are any stages missing, or any aspect overlooked.

- **Resources**
  Web application "The life cycle of ketchup"

  http://foodweb.ut.ee/tomato

  Siret Talve, "Ketšupi olelusring" (Tartu, 2012)

  http://foodweb.ut.ee/s2/111_232_82_Ketupi_olelusring.pdf

  Presentation by Siret Talve "LCA: olelusringi hindamine" (09.11.2012)

  http://foodweb.ut.ee/s2/19_216_77_LCA_olelusringi_hindamine.pdf

  An article by Karin Andersson; Screening life cycle assessment (LCA) of tomato ketchup: a case study

  (**http://infohouse.p2ric.org/ref/37/36505.pdf**)

  Siret Talve, Evelin Põld, "Olelusringi hindamine" (CyclePlan, Pärnu 2005)

  Mart Viikmaa, Urmas Tartes, "Bioloogia gümnaasiumile, II osa, 3. kursus" (Tartu 2008, lk 12, leiva- ja piimatoodete tehnoloogia)

- **Activities**
  Forming the groups, explaining the life cycle idea and the assignment.Students choose a food product and design a model of its life cycle.Students go through the model describing the life cycle of ketchup (http://foodweb.ut.ee/tomato) and, if necessary, improve their model.Students present their model and explain its environmental impact. Then, the audience can ask questions and give an assessment to their classmates' and their own work.

GROUP ASSIGNMENT **No. 3.**
Instructions for the teacher

Blueberry ice cream in Muuksiküla Village

- **Age group**
  8th and 9th grade, upper secondary level (14-18 year old students)

- **Equipment**
  Post-It notes and writing utensils for preparing the roles.
  A board for writing down the summary.
  Texts to be read.

- **Teacher's guidelines**
  The purpose of this assignment is to study the possibilities of producing food and to get ideas on how to minimize environmental impact and how to make environmentally sustainable choices.
  It can be used as either a single lesson or a part of a module course.
  Roles can be assigned by the teacher or the students. First share the roles to students, then give them the assignment.

- **Resources**
  Web application "The life cycle of ketchup"
  http://foodweb.ut.ee/tomato
  Siret Talve, "Ketšupi olelusring" (Tartu, 2012)
  http://foodweb.ut.ee/s2/111_232_82_Ketupi_olelusring.pdf
  Presentation by Siret Talve "LCA: olelusringi hindamine" (09.11.2012)
  http://foodweb.ut.ee/s2/19_216_77_LCA_olelusringi_hindamine.pdf
  Glossary
  http://foodweb.ut.ee/Sonastik_187.htm
  Silja Lättemäe, "Saare naised teevad ainsana mahejäätist" (Maaleht, 16.07.2010)
  http://www.maaleht.ee/news/uudised/eestiuudised/saare-naised-teevad-ainsana-mahejaatist.d?id=32136053
  An article by Karin Andersson; Screening life cycle assessment (LCA) of tomato ketchup: a case study (**http://infohouse.p2ric.org/ref/37/36505.pdf**)

- **Activities**

- **Introduction**
  To spark the students interest, the teacher is going to read the following story to the students or describe other similar events to them.

  > *It was a hot day, and the Muuksiküla shop had run out of ice cream. Vacationers had bought the last remaining blueberry ice cream on Sunday, and a new shipment was not due until Thursday. The shopkeeper told the villagers, who had gathered in the shop, that the ice cream had been produced in Italy, but the blueberries are sourced by the same buyers who pay the villagers for berries and mushrooms in the autumn. Ice cream producers get the milk from Denmark, sugar from Cuba and packaging from China. It was supposed to be the cheapest way and the ice cream is all right, too. After listening, the café keeper proposed that they could start producing ice cream in the village. "We have milk, we have blueberries and we have the people who can make it!"*

- **Discussion**
  Start the discussion with a question whether it is possible to produce the ice cream locally in a village. Does the shopkeeper's story about the Italian ice cream sound believable? Is the villagers' plan realistic? What do they need for implementing the plan? Would it be profitable?

Then, the teacher will refer to the article by Silja Lättemäe, (Maaleht, 16.07.2010), or read a section of it aloud.

> *Ladies from Kiratsi Village, Kaarma Rural Municipality, Saaremaa, began the production of farmer's ice cream. These ladies from Saaremaa are probably the only ones who have the capacity to offer such organic treats for their customers. Local people can tell you that the existing small device only makes five litres of ice cream at a time, thereby ruling out large-scale sales, and in fact there is not enough ice cream for everyone who is interested as it is. Saare Mahe provided the women of Kiratsi with a few dozen recipes for organic ice cream, including sea-buckthorn flavoured ice cream, but presently only the strawberry ice cream recipe is in use. Organic milk comes from the free-range cows belonging to a woman who has a farm in the nearby village. Any day now the new village house is going to be opened, along with a farm produce shop and farm produce café.*

- **Assigning the roles and explaining the task.**
  It would be best if each role was shared by 2-3 students. The different characters discuss with each other and perform their own point of view according to their role. The following questions can be answered to prepare the role.
  How can you participate to this effort? What is your role in the community?
  What is required for your part? What are the expected costs? What are the benefits for you?
  What are your advantages against mass production? How to evaluate your product or service?
  Possible roles (add or leave out as appropriate)

CAFE OWNER – you own a small café in the village centre, your clients are the villagers, along with a few odd passers-by. You also rent out the café for birthdays.	**STUDENT –** you would love to earn some extra money in the summer by picking blueberries.	**ARTIST –** you have just bought a farmhouse for a studio space.
GRANDMA – you are a bit of an older lady, but still in good health; you do not go to work and spend your time with gardening and crafts.	**GRANDPA –** most of your time is spent with beekeeping, but you also like to play music and sing in a choir.	**GRANDKID –** you have just finished basic school and you are spending your summers at your grandparents' place in the countryside – with no computer and bad cell reception, but two nice dogs and a horse.
DAIRY FARMER – you are the only dairy farmer in the village and you have four cows – too much milk for your own family, not enough to sell to large buyers.	**FARMER –** you have sheep and large grain fields, you employ three people and you have four kids.	**POST OFFICE CLERK –** you just lost your job because the post office closed.

- **Holding a meeting**
  The leader of the meeting will be the village elder, who can be played by either one of the students or the teacher. First, everybody will introduce themselves. What takes place next is a discussion of the issue, during which answers to the following questions are to be found.
  Are all the necessary resources available (people, raw materials, machinery, etc.)?
  What else needs to be done?
  Why should people who visit the store buy our product?
  How to introduce the product to the consumers?
  Which factors will contribute to the production cost and is it competitive?

- **Conclusion**
  All proposals/opinioins are written on the board. Together a decision is made on when to start the production and when the first batch of Muuksiküla's blueberry ice cream will be ready.

The material's connection to the national curriculum in Estonia

The national curriculum for basic school has **"Health and safety"** as one of its main topics. The material covered under natural sciences should give the students an understanding of the importance of a healthy lifestyle and healthy diet. The student must be able to comprehend the connections between the environment and health. The material directly involves the following topics of the national curriculum.

The result of the topic **"Health"** in **8th grade health studies** is the ability to analyze factors influencing our health decisions, and the ability to demonstrate in a learning situation efficient decision-making skills in the area of health issues, both individually and in groups. The student must also be able to evaluate if their daily menu meets the principles of a healthy diet. The study programme covers the impact of nutrition on health, factors influencing nutrition and healthy habits, making healthy choices and the responsibility to do so.

9th grade biology covers the topic **"Digestion and elimination"**, where the learning outcome results in the ability to follow the principles of a healthy diet. A practical assignment is analyzing one's own eating habits.

Upper secondary elective course called **"Natural sciences, technology and the society"** integrates different topics of natural sciences into study modules, teaches complex problem solving skills and making informed decisions while taking into account factors of natural science, technology, the economy, and social and ethical issues.

The material here is relevant to the modules concerning nutrition, for example, "Supplements: for or against?", "Genetically modified food: good or bad?", "Weight loss pills: does the pharmaceutical industry serve the interests of the people", and other issues concerning nutrition.

The material can also be tied to the elective course **"Applied biology"** which covers historically formed domains in agriculture, food and pharmaceuticals industry and energetics, their role in the economy and everyday life. A practical assignment is to investigate the connection between applied biology and the food industry based on one freely chosen food group.

WORKSHEET **No. 1.**
Instructions for the teacher

Nutrients, food and health

- **Age group**
  9th grade.

- **Teacher's guidelines**
  This activity is suitable for learning or revising the topic of digestion in 9th grade biology, and it can also be adapted to a materials open test.

  It would be best to read the instructions before using the Foodplate web application. Make sure to insert the user information (gender, age and weight), as it will affect the calculations and results given by the application. You can also insert information for an imaginary test person (for example, a 15-year old girl who weighs 50 kg).

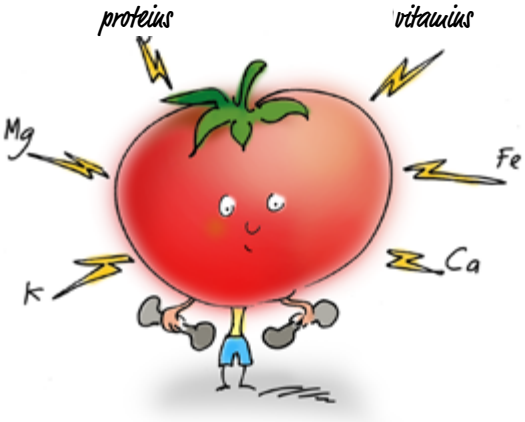
  Equipment

  Computers, tablets or smart phones with an Internet connection.

- **Resources**
  Foodplate web application
  http://foodweb.ut.ee/foodplate/?lang=et

  Sirje Aher, "Collective learning in Basic schools on Food and Nutrition" (Tartu, 2012)
  http://foodweb.ut.ee/s2/100_73_48_Collective_learning_in_Basic_schools_on_Food_and_N.pdf

WORKSHEET **No. 1.**
Instructions for the students



Nutrients, food and health

Fill in the worksheet. Find answers from your biology textbook and the following sources:

Foodplate web application

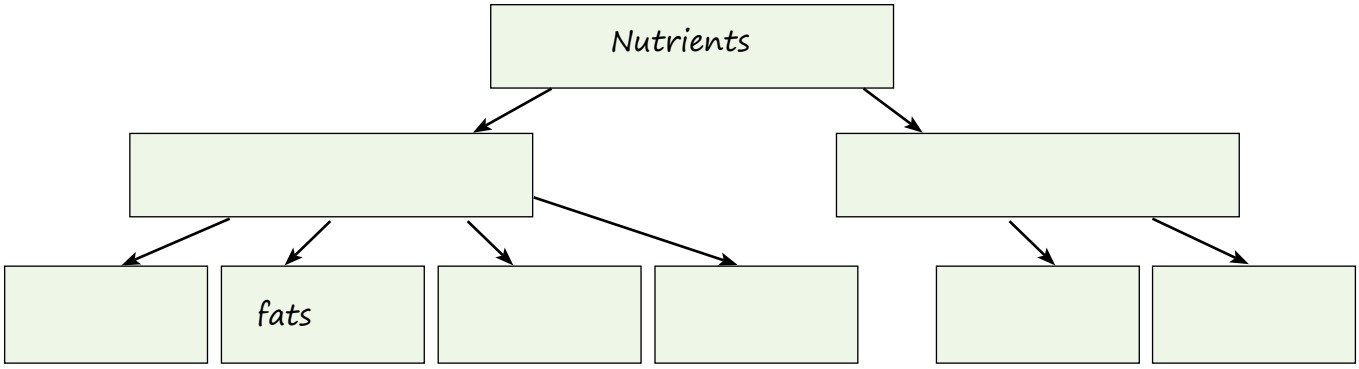
http://foodweb.ut.ee/foodplate/?lang=et.

- **Different types of food and nutrients**

Food provides us energy and building materials for the body. Food will be usable as an energy source when it has been digested (broken down) and the nutrients (products of the breakdown) have been absorbed in the circulatory system.

Try to recall the difference between food items and nutrients. Write down the connection between them.

Fill in the diagram of nutrients with the appropriate terms: vitamins, proteins, micronutrients, carbohydrates, water, macronutrients, and minerals.

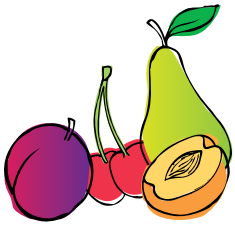


Underline nutrients in the following list: **flour, egg, protein, meat, milk, water, bread, vitamins, fats, and fruit.**

- **Vitamins**

Which vitamins are found in these food items? Write down the vitamins found in the foods and their use in the body.



- **Enzymes**

What are enzymes and what is their connection to vitamins?_____

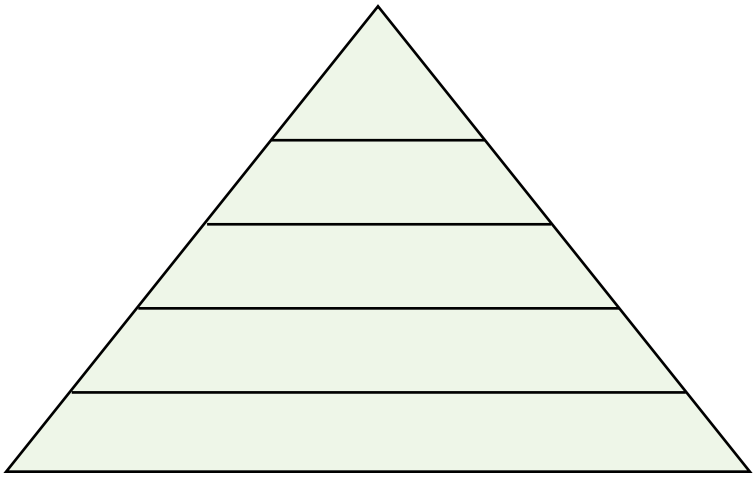
_____

Which nutrient does the following enzyme break down? Connect the pairs!

Pepsin	Carbohydrates
Amylase	Proteins
Lipase	Fats

- **Food pyramid**

Fill in the food pyramid by writing four different foods on each level.



- **Food and energy**

People need food to fulfill the energy need. Some people need more energy than others. Write down three factors influencing our energy needs.

1) _____

2) _____

3) _____

At the school cafeteria you can choose whether to have boiled potatoes or carrots with your meal. Compare their energy, vitamin, and mineral content

Food item	Energy content	Vitamin and mineral content
Potato		
Carrot		

Why are carrots better for you than potatoes?

_____

_____

Why are potatoes better for you than carrots?

_____

_____

WORKSHEET **No. 2.**
Instructions for the teacher

Determining if a food is healthy

- **Age group**
  9th grade and upper secondary level. (15-18 year old students)

- **Teacher's guidelines**
  The purpose of the assignment is to learn about healthy food and evaluating whether a food item is healthy or not. The students will compile their meals at the Foodplate web application and evaluate them from different perspectives (**http://foodweb.ut.ee/foodplate/**). The students can evaluate their home meals, meals from the school cafeteria, other restaurants or cafés.

  It would be best to read the instructions before using the Foodplate web application. Make sure to insert the user's information (gender, age and weight), as it will affect the calculations and results given by the application. You could also insert information for an imaginary test person (for example, a 15-year old girl who weighs 50 kg).

  Work is done in pairs.

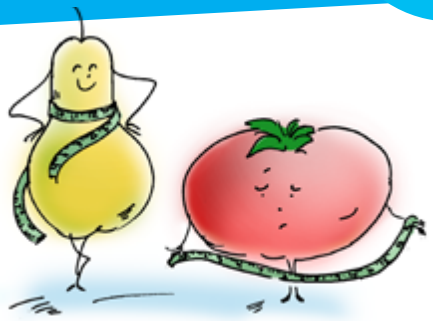
- **Equipment**
  Computers, tablets or smart phones with an Internet connection.

- **Resources**
  Foodplate web application
  http://foodweb.ut.ee/foodplate/

  Web application "Contaminants in our food".
  http://foodweb.ut.ee/Contaminants_in_food_86.htm

  Ampser, a nutrition calculator for students at
  http://www.ampser.ee

WORKSHEET **No. 2.**
Instructions for the students



Determining if a food is healthy

- **Planning a meal**

  Fill in the worksheet in pairs. Describe to each other a tasty, interesting or otherwise noteworthy dish. Take a look at different lunch meals from cafes in the Internet or analyze the meal served in the school cafeteria.

  Open the Foodplate application (http://foodweb.ut.ee/foodplate/) and insert the backround data for the person who is eating the meal(gender, age, weight). See how the application works. Look at the different indicators of the model: energy content, nutritional value, environmental impact, and exposure.

  Make yourself a lunch by dragging and dropping the food items onto your plate. Write down the meal on the worksheet and give it an appropriate name (i.e. schoolboy's meat loaf). Ask another pair about their meal and tell them about yours. Write the second meal beside your meal.

  You now have two meals.

Our meal

The other meal

- **Analysing the meals**

  Analyse both meals using the food plate model.

Indicator	Our meal	The other meal
Energy content		
Nutrition		
Environmental impact		
Contaminants		

- **Evaluating the meals**

  For whom is your meal attended to (their gender, age, weight?)?

For whom is the other meal attended to? _____

Use your table to find answers to the following questions.

Which meal has the correct energy content? Why do you think so?_____

_____

Which meal has a lowest environmental impact?

_____

- **The environmental impact of food items**

  Open the Foodplate application http://foodweb.ut.ee/foodplate/ and enter the user information. Compare the food items below and discuss in pairs which of the food items has a higher environmental impact. Underline the food item and include an explanation.

Potatoes – Pasta

Pasta – Rice

Pork fillet – Chicken fillet

_____ _____ _____

_____ _____ _____

_____ _____ _____

Salmon fillet – Baltic herring

Milk – Yoghurt

_____ _____

_____ _____

_____ _____

- **Conclusion**

  Answer the questions. Discuss between pairs.

  What requirements healthy food needs to fulfill? _____

  _____

  What factors have influence on the environmental impact of the food item?_____

  _____

  How can pollutants end up in food items?_____

  _____

GROUP ASSIGNMENT **No. 1.**
Instructions for the teacher

Food to the table with help from bacteria and fungi

- **Age group**
  Upper secondary (16-18 year old students)

- **Teacher's guidelines**
  This task will give students an overview of food items produced with biotechnology. The method of this task is idea mapping, and it can be done either in groups or pairs. Idea mapping is a way to systematize and visualize information.

- **Equipment**
  Computers, tablets or smart phones with an Internet connection.
  Paper boards or large sheets of paper and colored pencils.

- **Resources**
  Foodplate web application
  http://foodweb.ut.ee/foodplate/
  Web application "Contaminants in food".
  http://foodweb.ut.ee/Contaminants_in_food_86.htm

- **Activities**
- **Introduction**
  Remind the students how to compile an idea map. Show them the Foodplate web application. Divide students into groups or pairs and explain the task to them.

IDEA MAPPING
Instructions for the students

With your group (or partner), choose a food item group which uses biotechnology in its production. Your task is to make an idea map out of terms and keywords and their relation to each other.

Use different colors and visual devices (arrows, circles, illustrations) to highlight the keywords and connections, in order to make the map memorable and effective. The contents should reflect information about the chosen food item: its production, use as food, nutritional value, health effects, energy content, potential contaminants, environmental impact, handling, etc.

- **Presenting the idea map**
  Idea maps can be presented either by a presentation or in poster format. The class will be divided into visitors and presenters, who stand beside their posters and provide explanations. Later, the students switch parts.

- **Making a conclusion**
  In the conclusion everyone has the chance to speak, giving an example of what they learned from their own work and from other idea maps.

GROUP ASSIGNMENT **No. 2.**
Instructions for the teacher

Planning a balanced diet

- **Age group**
  8th and 9th grade, upper secondary level (14-18 year old students)

- **Teacher's guidelines**
  Divide the class into groups and let them to get familiar with their topic. Then divide the groups again so that new groups include at least one expert from each of the initial groups.

  The assignment will result in a menu where the knowledge and opinions of all experts has been considered. This activity will give an opportunity to practice teamwork, where each team member will be responsible for their area of expertise.

- **Equipment**
  Computers, tablets or smart phones with an Internet connection.

- **Resources**
  Foodplate web application
  http://foodweb.ut.ee/foodplate/
  Web application "Contaminants in food".
  http://foodweb.ut.ee/Contaminants_in_food_86.htm
  Ampser, a nutrition calculator for students at
  www.ampser.ee

- **Activities**

- **Introduction**
  For the introduction, students will give some examples of food items or meals which are healthy or unhealthy, while being tasty or not tasty. Ask the following questions.
  Is healthy food always tasty? What about the other way around?
  How to prepare food that is healthy and tasty at the same time?

- **Group assignment**
  Training the specialists Divide the students into four groups. Topics and questions for the groups are given below.

  Food's energy content What does the energy content of food items indicate? What factors does it depend on? What are the units of the energy content? How to compare the energy content of different food items? How much energy does the human body need and what does it depend on?

  Nutritional value What are macro- and micronutrients? What are vitamins and why do we need them? Which minerals are found in food? How to compare the health benefits of different foods based on their ingredients?

  The environmental impact of food What is the environmental impact of food? How do you evaluate it? What does it depend on? Why can the environmental impact of the same food item vary to a great extent? Provide some examples on how to reduce the environmental impact.

Contaminants in food What are contaminants and how can they end up into the food we eat? What kind of food can potentially contain more contaminants? How do you use the database of contaminants to get information?

Each group must learn the topics below and figure out the answers to the questions. Each student will make notes on the group's topic and will serve as an expert in this area in the next stage of the assignment.

The stage of planning a healthy diet The groups are divided again, so that each group will have at least one expert for every topic. The new groups will put together a balanced meal (either school lunch, birthday dinner, catering for sports day participants, etc.). While gathering the proper meal all proposals from all four experts must be taken into account. **The final goal is to put together a menu which is healthy, contains an appropriate amount of energy and has the least possible environmental impact.** Use the Foodplate application to choose the components for your menu (http://foodweb.ut.ee/foodplate/).

- **Conclusion**

  Groups present their menus to each other and give arguments on its composition, commenting on whether they had to make compromises with any of the components or their amount, so that the final product would reflect all of the aspects.

GROUP ASSIGNMENT **No. 3.**
Instructions for the teacher

Keeping the breakfast for yourself

- **Age group**
  8th and 9th grade.

- **Teacher's guidelines**
  The purpose of this assignment is to teach the principles of healthy eating. Students will also practice how to make right dietary choices by analyzing their own diet and using the Foodplate web application.

- **Equipment**
  Computers, tablets or smart phones with an Internet connection.

- **Resources**
  Foodplate web application
  http://foodweb.ut.ee/foodplate/
  Ampser, a nutrition calculator for students at
  www.ampser.ee

- **Activities**

- **Introduction**
  Start the group discussion with the saying "Keep breakfast for yourself, share your lunch with a friend, give your dinner to an enemy". Where does the saying come from? Point out to the students that while it is necessary to eat something for dinner, a large meal is not recommended at a late hour, since the digestion process will interfere with your sleep. What should you eat for breakfast? Why should you avoid skipping breakfast?

- **Using the Foodplate web application**
  Students will analyze their breakfast with the Foodplate application and calculate its energy content, nutritional value, and environmental impact.

- **Comparing the different types of breakfast (in pairs)**
  Students compare the results of their work in pairs and find advantages and disadvantages for both breakfast menus. After that students may take a look at the work done by other pairs, present their results, and look for similarities between the different menus.

- **Conclusion**
  A summary is made of all the menus, and four sentences are written on the board to give an overall description of the students' menu (i.e. nobody drinks coffee in the morning, half of the students eat porridge in the morning, girls do not eat cheese in the morning). Students will give an evaluation of their classmates' eating habits in the morning.

RESEARCH ASSIGNMENT
Instructions for the teacher

Our daily bread

- **Age group**

  8th and 9th grade, upper secondary level (14-18 year old students)

- **Teacher's guidelines**

  This is a creative assignment suitable for the 8th grade, but it is usable, either in part or as a whole, by older students. 8th grade students will need certain background knowledge, and therefore it is recommended that they have completed one of the previous group assignments or the worksheet "From tomato to ketchup". The task will not pose difficulties for upper secondary students and they will be able to get acquainted with the topic fast, so just provide them with links referring to the materials at http://foodweb.ut.ee.

  The whole study module consists of four (45-minute) classroom sessions and hours allocated to practical work (about six hours total). If students are only preparing the theoretical plan of the experiment, then the module will take four classroom sessions. Just a theoretical introduction to the lesson and filling in the worksheet will take two lessons.

  For the introduction, use a brainstorming procedure similar with the round table alphabet. Students receive a grid where each of the squares has a letter inside it. The students will have to find a word or phrase which is connected to the topic and starts with the given letter. The table will help the students to remember terms, facts, and relations. When all the letters of the round table alphabet are used, it will take two lessons to complete the task and fill in the worksheet. When your time is limited to a single lesson, then it is possible to speed up the process by dividing the letters between different teams. When filling in the worksheet, students can use the web pages referred to in the materials.

  When completing the whole module, then the recommended schedule looks like this:

  - **first lesson** – introduction and filling in the worksheet;
  - **second lesson** – choosing the research topic, making a plan and presenting it to others;
  - **third and fourth lesson** – practical work; the amount of time taken by the research project depends on its topic and it can include homework or activities outside school (baking bread at home, assessing the assortment of products in a store, etc.);
  - **fifth lesson** – summarizing the work, compiling presentations or posters;
  - **sixth lesson** – presentations, reports, or poster presentations (poster board), analyzing one's own work and self-assessment.

- **Resources**

  Web application "Contaminants in food".

  http://foodweb.ut.ee/Contaminants_in_food_86.htm

  Web application "The life cycle of ketchup"

  http://foodweb.ut.ee/tomato

  Ampser, a nutrition calculator for students at

  www.ampser.ee

Study aid of the Volovox project, “The chocolate challenge. Quantitative sensory evaluation of food”
http://www.ut.ee/volvox/materials/ChocolateChallenge_est.pdf

- **Activities**
- **Introduction**

  Filling in the round table alphabet (pg. 41) either in groups or pairs. Each group will receive a grid with a letter in each of the squares. Each square has to be filled with the name of a healthy food item, or a term which is connected to the production of food and begins with the letter given in the square. When students have prior knowledge of the environmental impact of food, they can use the terms they already know in the assignment. A time limit must be set for filling in the worksheet.

  When the squares have been filled in, ask the students to share their words and terms with the rest of the groups.

  After filling in the alphabet, a midterm review is made to find out whether someone managed to fill in all the squares. Then you ask the students what is the healthiest fast food, in their opinion. Namely, the slogan for national Bread Week, held in October 2012, was “The healthiest fast food”. The discussion will be lead to rye bread as our traditional food.

- **Rye bread worksheet**

  Students fill in the rye bread worksheet (pg. 42).

- **Planning the research**

  Students will put together their plan for the research project (“Our daily bread” worksheet, Planning the research, pg. 45).

- **Practical assignment**

  The work will be carried out according to the plan and schedule of the research project as they were compiled (“Our daily bread” worksheet, Planning the research, pg. 45).

- **Preparing a presentation**

  Group assignment. Students prepare a PowerPoint presentation, poster or exhibition of their work.

- **Conclusion and assessment**

  Students make their presentations and provide feedback. Encourage the audience to ask questions and express their opinions. Ask the group who is making their presentation what did they learn from the research project. Students will provide an individual self-assessment after listening to the other groups. Each student will assess their work and their contribution to the group assignment.

RESEARCH ASSIGNMENT
Instructions for the students

Our daily bread

In each of the squares, write the **name of a healthy food item**,

or a term which is connected to the **production of food** and begins

with the letter given in the square.

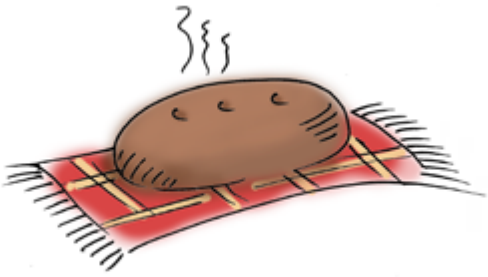
Write it in the grid, next to the appropriate letter.

The following materials can help you:
the web application “Contaminants in food”,
http://foodweb.ut.ee/Contaminants_in_food_86.htm;

Round table alphabet of connections (by D. Buehl, 2001).

A	**B**	**C**	**D**	**E**	**F**	**G**
H	**I**	**J**	**K**	**L**	**M**	**N**
O	**P**	**Q**	**R**	**S**	**T**	**U**
V	**W**	**X**	**Y**	**Z**		

RESEARCH ASSIGNMENT
Instructions for the students



Rye bread

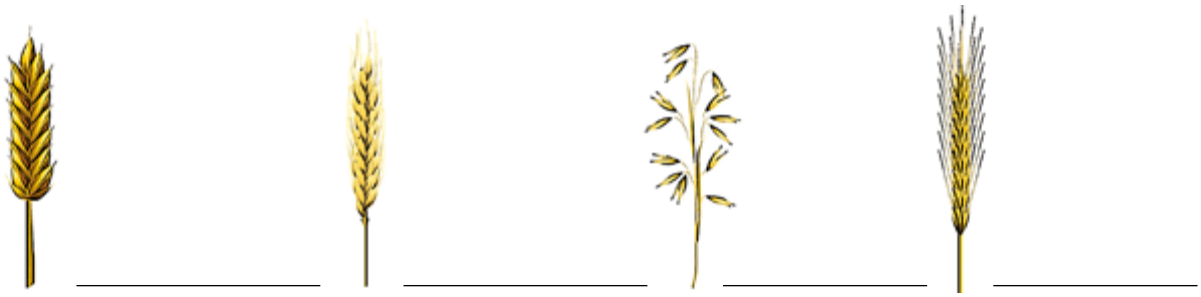
- **History of rye bread**

  When did rye bread become prevalent in the area of Estonia?_____

  Which grains were used for bread before that?_____

- **Grain**

  Fill on the name of each grain.



- **Flour**

  Explain the differences of various types of flour.

  Whole grain flour_____

  Meal _____

  Semi coarse flour _____

  Wheat flour _____

  What kind of flour is used for making rye bread?_____

- **The life health benefits of bread**

  Compare the energy content and vitamin and mineral content of wheat and rye flour. Fill in the table.

	Wheat flour	Rye flour
Energy content		
Vitamin content		
Mineral content		

Rye bread is rich in fibre. Why does the human body need fibre?

- _____

Why is rye bread considered healthy?

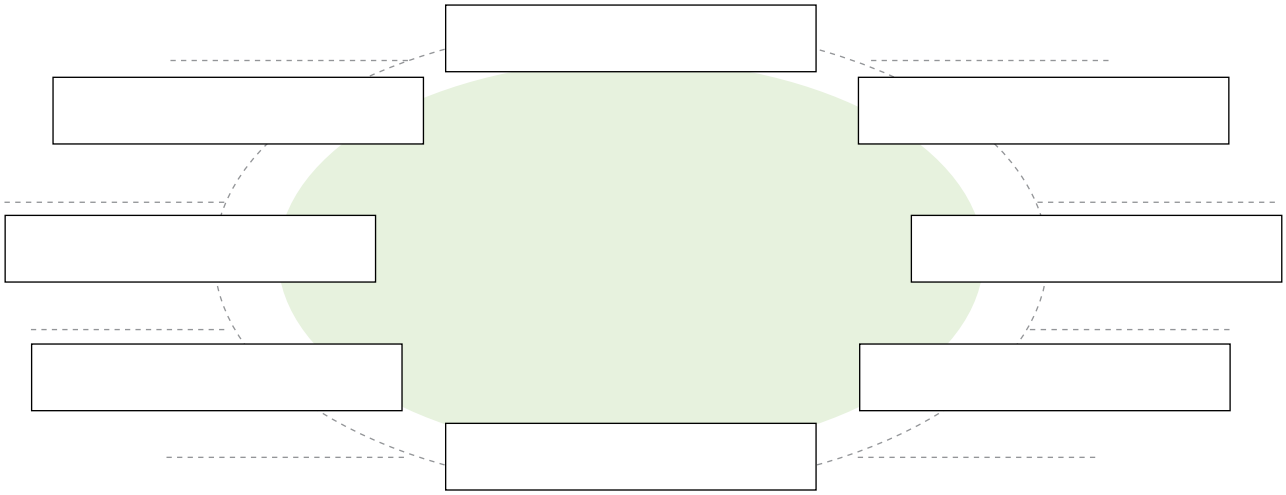
- _____

- **The life cycle of bread**

  Draw a diagram on how rye bread arrives from the field to our table. Fill in the following stages in the appropriate box.

  Bread production, growing the grains, packaging the bread, grain depository, grain dryer, mill, bread on the store, bread on the table.

  When the goods are transported between various production stages, add the name of an appropriate means of transportation to the lines connecting the different boxes (boat, plane, car, train, etc.).



- **What factors affect on the environmental impact of bread?**

  All products influence the environment. When is the environmental impact lower and when higher? Fill in the squares of the table according to the example.

Lower environmental impact	Process	Higher environmental impact
	Farming and cultivation of grains	
	Transportation of grains	
Example: energy produced from locally sourced biofuel.	Grain drying	*Example: buying energy sourced from oil shale.*
	Milling flour from grains	
	Baking bread	
	Selling bread	

- **Can bread be unhealthy?**

  All ingredients which have not been added to food on purpose, but may enter in it accidentally while processing or producing it, are called contaminants. Study the web application “Contaminants in food”, http://foodweb.ut.ee/Contaminants_in_food_86.htm ; Cite three examples of contaminants that can be found in bread and how?

Hazardous substance	What poses the risk?	How does it enter the bread?	How to reduce the risk?

RESEARCH ASSIGNMENT
Instructions for the students

Our daily bread

Planning the research

Make a plan for a research project with your group mates. Pick a topic, make a plan for the research project and carry out the plan.

- **Choosing a topic and making a plan**
  Discuss with your friends what, would you like to know about rye bread and which topics you could study. There are a great number of potential topics. A few options are given below, but you can also pick your own topic.

  The data of the research should be explicit and measurable, so that it is possible to draw conclusions later. Quantitative data (any measurable and countable data) can easily be draw into graphs and analysed. If your data is qualitative (for example, smell, taste or color) then you have to come up with a scale you can describe your results on.

- **Possible topics**
  Studying how bread is consumed You can study which breads people eat, how much bread they eat in a week, how is it preserved at home, what is done with leftovers, etc.).

  Studying differences between types of bread What are the differences between different types of bread? Explain the raw materials and technology used. Have a bread tasting session, and study the smell and taste of breads and the preferences of different people. What does the word *organoleptic* mean?

  The selection of breads in stores Study the types of bread available in stores and production companies; how the stores plan their assortment of goods, if there is sufficient information for the consumer on the packages; if and where are organic products available, what happens to unsold bread etc.

  Making your own bread at home Study what is a starter and what kind of different starters there are; how does the taste of home-baked bread depends on the time the batter was raised, the recipe, the way it was baked, the oven it was baked in, etc. Try to make your own bread, and take a look into the different methods of baking it. Have a bread tasting session to see if home-made bread will win more points than bread bought from the store. Discuss, with each other whether the tastier bread is also healthier, etc.

  Starter versus yeast When is yeast used for raising the dough and when the starter? What are the specific benefits for each, and which one should we prefer when baking bread?

After you have decided the topic, write it down.

Our topic: _____

How are we going to carry out our project? Write down the different stages of the work and their schedule.

Research plan and schedule

Activity	Time	Notes

After completing the research, write a proper project report.

Brief summary of the activities What are the main results and conclusions of your study?
Did anything go against your plans? Why?
Evaluate your work. How satisfied are you with the work and the results? What was your contribution to the work?

The material's connection to the national curriculum in Estonia

The national curriculum for basic schools includes among its main topics **"The natural environment and sus-tainable growth"** and **"Health and safety"**. The materials on "The Baltic Sea and the food industry" are directly connected to the following topics in the national curriculum.

The topic **"Baltic Sea as a habitat"** in **6th grade natural sciences** covers the ecosystem of the Baltic Sea, its environmental issues and related human activities. A practical assignment is to analyze issues concerning the Baltic Sea based on different sources and to describe coastal habitation and human activities.

Another relevant topic is **"Nature conservation and environmental protection in Estonia"** which covers the consumer habits and estimation of environmental impact.

Completing the topic of **"Ecology and environmental protection"** in 8th **grade biology** covers the valuing of biodiversity, and a responsible and sustainable attitude towards different ecosystems and habitats.

In the **III school stage** the IV course in biology has the topic **"Environmental protection"**. At the end of the course, the student will acknowledge have knowledge on the connections between nature, technology and society, and can explain the importance of sustainable growth on the personal, local, national and international level. The student will also resolve environmental dilemmas based on local examples, taking into account scientific, economic and ethical aspects, along with legislation. The studies are supported by methods of active learning: role playing, project-based learning, compiling a study portfolio and research project, practical works and research. One of the practical assignments is an analysis of one's daily activities at valuing a responsible and sustainable way of life.

Connections between the materials "The Baltic Sea and the food industry" with the elective course of applied biology are given in chapter III, "Food, health and the environment – how to make aware choices?, The material's connection to the national curriculum".

WORKSHEET **No. 1.**
Instructions for the teacher

The Baltic Sea and the people

- **Age group**
  6th grade.

- **Teacher's guidelines**
  The worksheet is to be used in connection with the topic of the Baltic Sea in 6th grade. It is filled in either individually or in pairs. The worksheet can be accompanied with the topic of the environmental impact of recreational fishing, which is a good time to have the students look at the fishing calculator. Take the time to provide additional explanations on what is an environmental impact and which are the factors influencing it.

- **Equipment**
  Computers, tablets or smart phones with an Internet connection for gathering information.

- **Resources**
- **Materials for the students**
  study kit of natural science (textbook)
  HELCOM (http://helcom.fi/)
  Baltic Sea Portal (http://www.itameriportaali.fi/en_GB/)

- **Materials for the teacher**
  environmental impact calculator for recreational fishing
  http://foodweb.ut.ee/Fishing_calculator_122.htm;

  the purpose, methodology and data of the fishing calculator
  http://foodweb.ut.ee/Kalakalkulaatori_eesmark_metoodika_215.htm

WORKSHEET **No. 1.**
Instructions for the students

The Baltic Sea and the people

You have 35 minutes to complete the worksheet.

Use the following textbooks and web sites to find the answers:

The Baltic Sea Portal

(http://www.itameriportaali.fi/en_GB/)

HELCOM

(http://helcom.fi/)

Who should be concerned about the health of the Baltic Sea and why?

Fill in the names of the countries surrounding the Baltic Sea on the map!

During the past decades the sea has been loaded with heavy pollution. While the countries surrounding the Baltic Sea have agreed to keep the Baltic Sea clean, there are still many risks. Explain how the following may end up in the sea:

pollutants:_____

detergent residues: _____

oil: _____

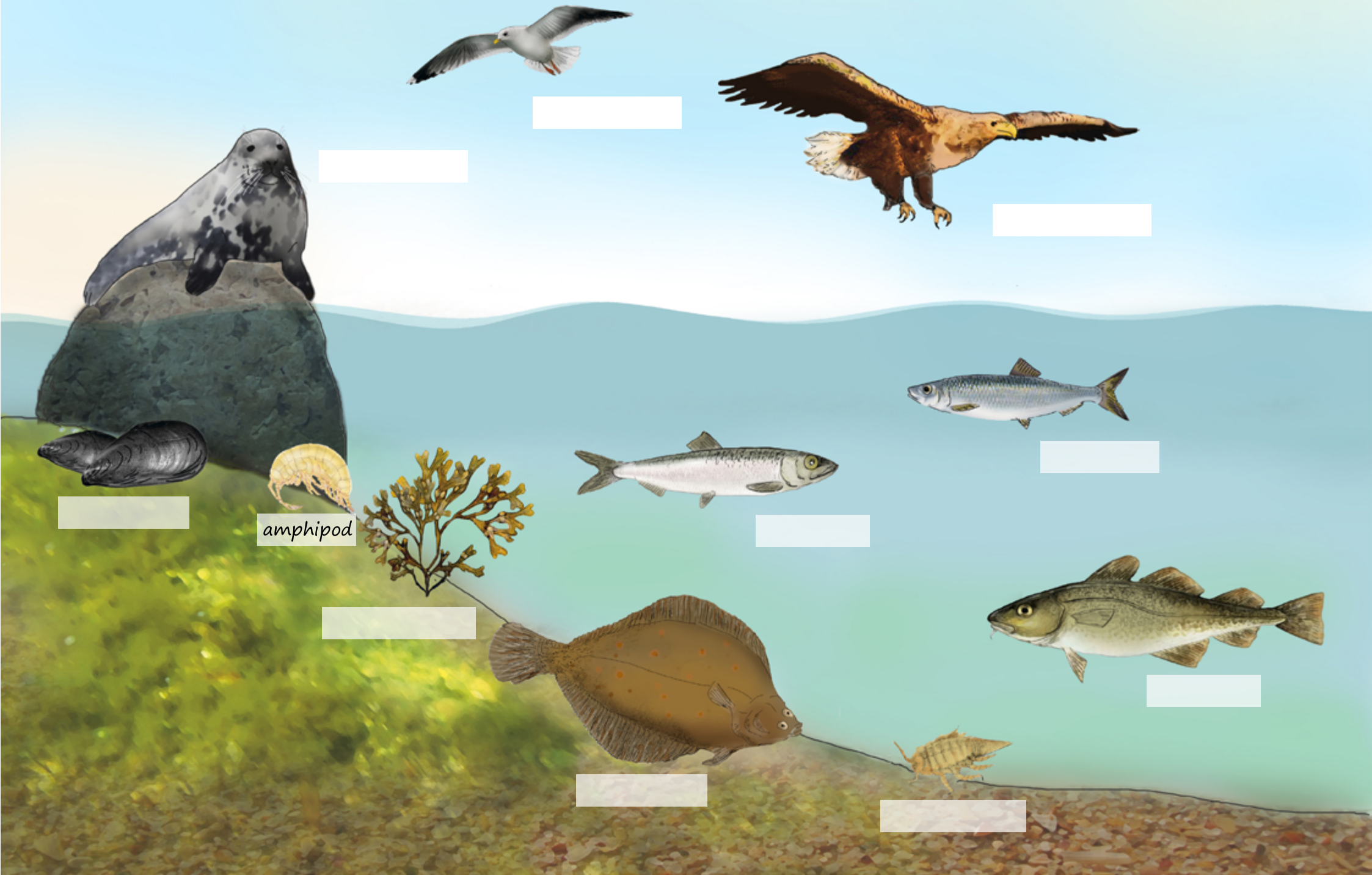
pesticides: _____

pollutants emitted to air from the chimneys: _____

What kind of connection is there between fertilizing the fields and the fish resources? Organize the processes listed in the table in a logical order and mark every box with an appropriate number.

Lack of oxygen for fish	
Fertilizers ending up to the rivers from the fields	1
The concentration of nutrients in the water bodies	
Decomposition of plant matter consumes all the oxygen	
Algae and aquatic plants proliferate	
Rivers carry polluted water to the sea	

Do you know which creatures inhabiting the Baltic Sea? Fill in the names of the species and the food network by connecting the species with arrows.



As a result of human activities, toxic substances can end up to the water bodies and, from there, the invertebrates. How can they end up to the body of the white-tailed eagle?

Environmental contaminants can be absorbed to fish through their gills. How can they end up to humans?

- **Commercial fishing in the Baltic Sea**

  Commercial fishing means that fish are caught in very large quantities. Which are the main species of the Baltic Sea's fishing industry?

  Agreements are made between countries on how much fish each of them can catch during a specific year. Explain why the countries are unable to simply decide for themselves.

- **Advantages and disadvantages of eating fish**

  List three reasons why eating fish is good for you.

GROUP ASSIGNMENT **No. 1.**
Instructions for the teacher

Fish cookbook

- **Age group**
  5th–6th grade and 7th.–9th grade. (11-15 year old students)

- **Teacher's guidelines**
  The groups gather information on a fish species and different dishes that can be made from it, and compile a page for a cook book. Depending on the assignment, gathering information can be done as a preparatory homework so that it is not necessary to use the Internet in class. The assignment can be integrated with art class. It is possible to grade the process of the work, the result, as well as the design of the product.

- **Equipment**
  Drawing papers, colored paper, pencils, art supplies, old magazines and other equipment for making a recipe book.

  Computers, tablets or smart phones with an Internet connection for gathering information.

- **Resources**
  Foodplate web application
  http://foodweb.ut.ee/foodplate/

  Web application "Contaminants in food".
  http://foodweb.ut.ee/Contaminants_in_food_86.htm

- **Activities**

- **Dividing into groups and explaining the task.**
  It would be best if each group would have 2–5 students. The task is to compile a cookbook of fish dishes. It is advisable to limit the selection to the fish of the Baltic Sea; but it is possible to widen the scope by including ocean fish and other types of seafood (crabs, shellfish, algae, squid, etc.). Students can choose a species or a group of organisms. Each group is responsible for two pages in the cookbook, one describing the fish and the other the fish dish. The papers are bound together into a fish cookbook for the class.

GROUP ASSIGNMENT **No. 1.**
Instructions for the students

Fish cookbook

Your task is to compile a cookbook of fish dishes. Each group is going to prepare and design two pagesto the book: one for describing the fish species or sea organism of your choice and the other the dish made from it.

- **Practice assignments**

  Together with your group mates, try to find as much information as possible on your fish species and dishes made from it. You can use the Internet and other cookbooks or interview some specialists. Divide the tasks of finding different types of information among the group.

  The page about the fish should include information on the biology of the species, its habitat and other basic information like how it looks like, is it also caught commercially, does it have strong stocks in the Baltic Sea, how is it caught, etc.

  The page about the fish as a food item could include information on why is the fish valuable, how it is processed and prepared what kind of meals can you make from it. The recipe can include a list of ingredients necessary for making the dish and instructions on how to do it.

  Review the material you have accumulated and **make a selection** of what to use on your page.

- **Compiling the pages**

  Write down to the first page the general information about the fish and to the second page information about the chosen dish. You can use drawings, magazine cuttings, photos made of the completed dish, etc., for decorating the pages.

  Design the title page and bind the pages for the class **fish cookbook**.

GROUP ASSIGNMENT **No. 2.**
Instructions for the teacher

Social networks of the Baltic Sea

- **Age group**
  8th grade. (14 year old students)

- **Teacher's guidelines**
  The assignment is based on the RAFT strategy, which incorporates the elements of a role, its audience, text format and the topic(*role, audience, format, topic*). The RAFT strategy develops imagination and creativity and provides motivation for writing. Students choose or draw their character from a raffle, get into the role and write on the topic assigned to them based on the text type characteristics and addressing it to a given audience. This assignment makes the students analyze the material from another point of view, which creates a good basis for covering the topic of the relations between organisms and biodiversity.

- **Resources**
  Doug Buehl, "Classroom Strategies for Interactive Learning" (Omanäolise Kooli arenduskeskus, 2001).
  Anda Ruskule, Merle Kuris, Gustina Leiputé, Markus Vetemaa, Šarū nas Zableckis, "See the Baltic Sea. Unique assets we share. " (Baltic Environmental Forum, 2009)
  http://www.visitbalticsea.net/download/Book_EE.pdf

  Study environments of the natural science education centre of Tartu University.
  http://bio.edu.ee/

  The Baltic Sea Portal
  (http://www.itameriportaali.fi/en_GB/)

- **Activities**
- **Introduction**

  Describe to the students the study method and explain them the assignment. Once the students understand the method, they can choose the audience, format and topic themselves – and they will probably come up with some amazing ideas. When using the method for the first time, it is better when the writing assignment has a firm framework provided. The table gives examples of possible roles, audience groups, text formats and topics.

Role (Who?)	Audience (To whom?)	Format (What?)	Topic (About what?)
scientist	the public	newspaper article	Oil spills threaten birds
grey seal	weather station	inquiry	Ice conditions next winter
codfish	investigative journalism	letter of complaint	Cod has a lack of offspring
fisherman	fish quota commission	letter of protest	Why can we not fish for Baltic herring year-round?
water louse	other sea creatures	search announcement	European sea sturgeon missing!
algae	the Sun	love letter	Sun, my love...
holidaymaker	social network	blog entry	Natural sandy beaches are disappearing
salmon	the court	an action	Why is free movement restricted?
Highland cattle	Facebook friends	advice	How to maintain coastal pastures?
Chinese sleeper	Chinese mitten crab	phone conversation	How's the family?
8th grade student	teacher	letter of explanation	Why I use obscene language for fish liver oil?

- **Group assignment**

  Choose your roles or have the teacher assign them. The students sharing a role will then form a group so that they can discuss the positions of their role.

- **Individual assignment**

  The writing task is carried out individually.

- **Presentation**

  Ask a few students to read their work or compile a separate folder of the texts.

GROUP ASSIGNMENT **No. 2.**
Instructions for the students

Social networks of the Baltic Sea

Discuss your character in groups.

Describe the characters personality traits?

What is their character like?

What could be their main convictions?

What interests them?

What worries them?

What information do you need for completing your writing assignment?

Find information about your character and take notes. You can write them in the table below.

Personality traits	
Interests and concerns	
Information about the role	

Write a text on the given topic and give it a title. Everyone writes the text by themselves.

GROUP ASSIGNMENT **No. 3.**
Instructions for the teacher

Seals, cormorants and coastal fisheries

- **Age group**
  Upper secondary (16-18 year old students)

- **Teacher's guidelines**
  This is an assignment for solving a conflict. Consider this issue from different viewpoints, in order to achieve a decision that takes into account all the parties. The assignment will cover the topics ecosystem of the Baltic Sea and fishing.

- **Equipment**
  Computers, tablets or smart phones with an Internet connection.
  Papers and pencils for making the posters.

- **Resources**
  The Baltic Sea Portal
  (http://www.itameriportaali.fi/en_GB/)

  Game and fisheries research
  (http://www.rktl.fi/english/fish/baltic_sea_research/grey_seal_cormorant/)

- **Activities**
  Introduction

  Read an article from the newspaper by Madis Filippov, (Postimees, 25.02.2010).

  Coastal fishermen believe that the large number of cormorants and seals have been causing irreparable damage to the fish reserves, fishing equipment and productivity, which is why the state should start paying compensation to the fishermen.

  "The issue with cormorants is that they are eating all our eels", says Mati Heinments, Chairman of the Board of the non-profit Saarte Kalandus. "We no longer find small eels in the coastal traps any more, but only large ones who come from rivers and lakes".

  According to Heinments, there are whole colonies of cormorants on the islands in Väinameri. "They are taking our net traps so that we would not be able to fish, but no one takes anything to keep cormorants from fishing", he says.

  /.../

  "Seals and cormorants are more important that the coastal fisherman", he adds. "Coastal villages have been disappearing as it is."

/.../

Mart Jüssi, head of the Riigikogu's environmental committee, remains sceptical about the impact of seals and cormorants. He says that no predator can wipe out their prey. "It does not make sense to blame a predatory bird or animal for the loss of fish, because there has to be another factor, and this factor is humans"; he says.

- **Formulating the issue and identifying interest groups**
  Ask the students how they understood the contents of the article. Have them express different opinions. **Formulate** together the **issue** covered in the article. Discuss who could the **relevant interest groups** be and write them on the board (for example, fishermen, local community, environmental activists, seals or seal specialists, cormorants or ornithologists, environmental officials).

- **Group assignment**
  Divide the students into groups. Each group will represent one of the participants and explain their position on the issue. Results are presented on a poster.

- **Explaining the different positions and looking for a common solution**
  The groups present their positions to each other and provide different arguments. The idea is to achieve a common conclusion. It is important that all parties are able to express themselves. A common decision is made along with suggestions on further actions. The decision is written down or displayed in a visible place.

- **Grading and assessment**
  Grading is based on how suitable the compromise solution is. Each group will get a chance to communicate their assessment.

GROUP ASSIGNMENT **No. 3.**
Instructions for the students

Seals, cormorants and coastal fisheries

Gather the **important facts**.

Find out the different points of view **of your interest group**. Give fact-based **arguments** for your viewpoints. Expressing only emotions is not enough.

Provide your **solution or suggestion**.

Describe your viewpoints to the other participants and **listen to their arguments**.

Analyze what you heard and try to achieve a **compromise solution** which considers all the viewpoints.

Compile a written **decision** as a joint proposal on how to resolve the issue. You can also apply various conditions and requirements.

Evaluate the proposed solution. Does it satisfy all parties? Does it take into account everyone's opinions? Could the achieved solution actually work in practice?