



Collective learning in Basic schools on Food and Nutrition

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Introduction

Collective learning covers a wide spectrum of learning types and includes many actors in this process. It can be learning between teams, organizations, communities and societies. At the center of collective learning lies team work, discussion and sharing of ideas (T.N. Garavan, A. McCarthy, 2003).

The current paper discusses collective learning and its interpretations in basic school, looks into possible ways of fostering collective learning and discusses tools to create a collective learning environment. It is important to note that collective learning is not the only way to refer to this process, this paper will mention collaborative learning and cooperative learning.

Collective learning is learning in social interaction. It is a shift from typical teacher-centered and lecture-centered learning. In collective learning this type of activity does not disappear entirely but it goes together with active group work and student participation. (B.L. Smith, J.T. McGragor, 1992) It encourages students to review and support each other's individual progress but also to see a bigger picture of group work.

At the heart of collective learning lies teamwork, team building and dialogue. It refers to teaching each other, developing listening and learning skills to become a better communicator, putting learning processes of different students together, teaching to relate to each other's experience and sharing this experience. In other words, it promotes the idea of students working together (Slavin, 1991). Collective learning is beneficial not only for students as they work in groups on a particular project but also for teachers who can work together and share their experience to improve the study process.

Addressing the issue of why we need collective learning will be brief as it is widely believed that collective learning has the potential to solve the world's problems faster and more efficiently. Speaking globally, it might be what is vital in the process of collective learning is to facilitate the learning environment, to create an atmosphere where students are not afraid to speak up, share their ideas and as the result will be willing to implement them in future. It is important to keep in mind that it is necessary to have a culture of collaboration in which students are willing to talk to each other and see how it can benefit their studies. The characteristics of collaborative community are multiple, among them are the sense of shared purpose, respect for difference, participation, communication, commitment and openness.

As communication skills lie at the heart of collective learning process, it is important to use methods that enhance this process.

Encouraging children to learn and to discover and not to lose this ability throughout the study process is part of what collective, cooperative and collaborative learning is about. It is an important stage where movement from passive learning to active learning occurs, students are willing to undertake their own initiative and learn how to learn better.

Collective, collaborative and cooperative learning are valuable because they are not detached from reality and how research and work are being done outside of the classroom. Large companies like Amazon, IBM, P&G are using networking and outsourcing as a vital

part of their marketing, promotion and research strategies. Brainstorming sessions are widely used with involving high level officials, office workers, customers and their families.

Another example is “innovation jam” where people are asked to supply ideas for future innovation, to dream about how things can be done otherwise and make their suggestions.

A recent collaborative project which also fosters collective learning has been done by the European Union and is called “United Dreams of Europe”. This project not only asks people of Europe to supply their dreams about how Europe should look like in future but also has a learning aspect to it i.e. participants can read what people in other countries have to say and also upon completion every participant gets a book with “dreams” and information about the European Union projects and future prospects. Everyone who takes part not only brainstorms ideas for the future of Europe but also learns at the same time what the trends are, what other people are thinking and helps to realise what you own ideas are and how you can fit into the bigger picture. The current example, also has an element of a jigsaw puzzle activity which is a collective learning tool.

In order to illustrate collective learning in practice, let us bring out one more example which is truly global. The project is called Duolingo but before explaining how it works it is necessary to go a little bit further.

The idea has to do with how to make captchas (a captcha is a type of challenge-response test used in computing to ensure that the response is not generated by a computer) which everyone around the world uses to identify themselves while logging into their e-mail account or any other account they have on-line. This menial task should serve some practical purpose. The developers of the idea have realised that people who use captchas lose 500.000 minutes all together on typing this code. The developers of the idea decided to use this time in a more valuable way by giving people words from books they are trying to digitalize where computers cannot recognize them. As a result instead of typing random words people digitalize a library where very old books are saved. However, this is not yet a collective learning outcome that has been achieved. The developers went further and created a massive-scale online collaboration for translating the WEB. This is what is known today as Duolingo project where people learn a new language online for free at the same time by translating the articles on the WEB. It has been calculated that if 1 million people use Duolingo to learn a language, the entire content of Wikipedia can be translated into Spanish in 80 hours. This project and many other collaborative ventures illustrate how our skills in collective learning have potential to improve the overall situation more efficiently and learn at the same time, something that is inherently part of every human being and must not be lost and facilitated in every way.

According to Arthur Warmoth, 1998, positive outcomes of collaborative learning include:

- Critical thinking skills
- Problem solving skills
- Group process skills
- Mutual support and motivation
- Peer accountability
- Laboratory for ‘real life’ knowledge work
- Reflective insight into the learning process

Collaborative learning is a strategy that permits students and instructors to make good use of new information technologies. However, it does so while keeping human relationships, both among students and between students and instructors, at the center of the educational process.

This paper concentrates on collective learning methods best suitable in basic schools. None of the examples of the activities will be more time consuming than is appropriate in a school and will hopefully help teachers to prepare different types of lessons according to the principles of collective learning. The examples gravitate around food and nutritional issues as these form the core of the ERDF Interreg IVA project FOODWEB that fosters nutritional awareness among the public. At the target age, pupils have not yet fully developed their nutritional habits, so the examples should encourage healthy nutritional habits and avoid possible eating risks such as malnutrition and binge eating, insufficient variance, etc. As some foods provide certain nutrients in large quantities and lack others, sufficient variance in eating habits will reduce the risk of consuming unhealthy foodstuffs or toxins in large quantities and provide for a balanced diet.

Teamwork as basis for collective learning

Collective learning is centered around skills for teamwork. Collective and collaborative learning differ from traditional teaching approaches because students work together rather than compete with each other individually. It is important to keep in mind the setting, the class structure and dynamics, the flow of information and commitment of students to the task i.e. the aspects that create a collective learning environment. Setting and class structure should be taken into consideration before any type of group work. The way students are divided into groups depends on the learning outcomes.

In this respect it will be relevant to give example of a jigsaw strategy as a tool for collective learning. Students are divided into groups and are given a topic that is connected with processes or structure or some historical event. The topic in turn is also divided into subtopics which are distributed among groups. Throughout this activity, students have to research their topic in small groups and then add their part of information to the bigger picture teaching others about what they have researched. When students complete collaborative projects of this kind, both individual and group work are encouraged, where individual work is encouraged but also sharing the information, putting it into use and communicating with other are important part of the process (V. Diaz, M. Brown, J. Saimons, 2010).

Naturally, both collective learning and traditional teacher-centric teaching requires rules set by a teacher, but the rules in collective learning provide pupils with more opportunities to communicate giving the teacher valuable feedback regarding the knowledge and skills that pupils possess, such that the teacher can tailor the required methods to best suit the particular pupils and class. The table below lists characteristics of a teamwork-based and a teacher-centric teaching process (adapted from Saloviita, T., 2006).

Learning process based on teamwork	Teacher-centric teaching process
Pupils have more opportunities to talk on topic to demonstrate prior knowledge and will understand the topic better in the end	Limited opportunities for a pupil to express one's opinion/position/knowledge
The reflections on a topic will have immediate feedback from the team and will thus need to pass a social check	The teacher only receives information regarding a pupils knowledge if he or she checks it.
In organizing work in class, one can take into account the individuality of pupils	Mostly frontal teaching
Pupils generally find it easier to ask for help from peers rather than teachers	Little opportunity for demonstrating initiative
The communication skills of pupils improve through constant practice	Communication follows the lead of the teacher
A pupil can use one's strengths to support himself in communication while improving one's weaker sides	Pupils have few opportunities to showcase

Group work cannot be always used and on every topic. Work in a group improves the result if the tasks include utilizing existing skills or knowledge. When synthesizing new knowledge or working on previously unknown skills, group work can hinder the result of an individual. In these cases, one should prefer the teacher to provide and explain the information, supported by traditional teaching methods.

Organizing group work

A teacher should begin by introducing the topic at hand – this can take the form of providing a brief summary of the topic or by asking pupils to say what they know about the new topic. After that, one should divide the pupils into groups. The manner of this process should support the goals of the teacher. The work should be begun with tasks for individuals or pairs, this guarantees that a pupil will have the longest possible period of being active on the task, despite being part of a group. Afterwards, the work is coordinated, and the task of providing a group result is begun. The teacher should observe the work, and support when and where necessary. It is essential to conclude with a summary that does not merely recount the result, but also reflects on the process of reaching conclusions.

Timo Saloviita (2006) recommends one to prefer small groups as that maximizes the contribution of each pupil. He also pointed out the fact that once the group reaches 6 or 7 members, the effect is the same as traditional frontal work.

Number of pupils	Contribution of active members
2	50%
3	33%
4	25%
5	20%
6	17%

The same fact have been noted in group work with adults: groups of 7 members or more no longer result in highly effective learning. Participants themselves seem to prefer 5 member groups. Results show that groups of 3-4 participants provide best results, pairs come second. Yet, teachers can help large groups attain good results by creating an environment where each member believes that they can contribute to a good final result which would lead to his individual work being noticed and praised. Best results are attained in groups where members have different knowledge, skills and characteristics. Provided that the environment allows for communication and expression of opinion. For example, one should not seat two people that are known to generate conflicts next to each other. To encourage communication, sometimes one should form random, rather than pre-formed, groups. There are many ways to form random groups, for example by holding a number of pieces of rope such that each pupil takes one end of a piece of rope. Pairs are formed between pupils holding the same rope. Or, pupils can form two circles (one external, the other internal, but equal in number). The pupils in one circle will walk clockwise, the pupils in the other circle counter-clockwise. When the teacher says stop, pupils standing next to each other in the two circles will form pairs. One can form groups of four by adding a second round.

Sometimes it is necessary to form the groups in beforehand to save time, avoid conflicts or improve productivity. In this case, it is helpful to place signs with numbers on tables or to write names on the blackboard.

When preparing a group work session, one should not only think about the goal of teaching a topic, but also plan aspects that improve social skills, such as:

- ⊙ speaking
- ⊙ listening
- ⊙ cooperation
- ⊙ evaluation.

One can divide roles inside a group: reader, listener, writer, explainer, summarizer, questioner, generalizer, etc

The methods and problems/solutions of group work

One of the more common problems of group work¹ is **unequal distribution of labour** between group members. The “lazy” members put their trust in the few dutiful and smart doing most of the work. This problem can be overcome by assigning roles for each member of the group.

For example, one can divide labour as follows. Pupils are divided in pairs such that each pair reads a text the teacher provides. The first pupil will retell the text, while the other listens and provides comments and questions unfounded claims. In case of issues, both use the text to verify. After this part, pairs are combined to form groups of four to draw a thematic mindmap (the theme is provided by the teacher). Each pupil receives a minute to present his ideas while others listen. When necessary, the text is used to verify. The teacher will keep the time and ensures that everyone speaks on the topic. The group will then draw the mindmap. It would be good for the groups to present their mindmaps and to hang them on the classroom wall later.

¹ This section follows Timo Saloviita (2006).

Another method for avoiding inequality in labour distribution in pairs is to give a task with two elements. For example, one might ask pupils to compare the eating and breathing. One pupil will receive a text on eating, the other on breathing. The pupils will check each other's notes and, if necessary, improve them together. If there is a dispute, the pupils should foremost ask other pairs, and if that fails then the teacher. The pairs will decide which format (table, schematic, text, ...) they will use to convey the result. The teacher observes progress and intervenes if any pair is dominated by a single pupil. The results are presented in groups of about eight pupils.

Another often occurring problem is the **lack of participation of some pupils**, either when some pupils do not want to work and disturb others or when decisions are made by the principle of who speaks the loudest. People sometimes talk more than they listen, which will lead to only a few people contributing. This problem can be solved by giving careful thought to the method of dividing into groups and by agreeing on rules. It would be ideal to discuss, agree on and to record these rules on the wall of the classroom in the beginning of the school year. Each group work session will include a task to follow these rules

An example of rules for group work:

- ⊙ Join your group quickly and quietly
- ⊙ Take all necessary stationery with
- ⊙ When the group requires more stationery, it will assign one member to get it
- ⊙ Concentrate on your own task in the group
- ⊙ Work in your own group, and try not to disturb other groups
- ⊙ Talk quietly but clearly
- ⊙ Listen to what others say
- ⊙ Listen to the teacher's instructions and follow them
- ⊙ If you require help, first ask for it among your group
- ⊙ Help other members of your group
- ⊙ Keep stationery in good order, whether it belongs to you or others.

Use motivation tactics to hold each person responsible for his actions -- for example, remind students that their participation in the group and their individual work are both being graded.

When group work has started, **pupils can get excited so that they forget to work quietly**. To solve this problem, the teacher and the pupils can agree on a common signal for overly loud speech. When a pupil sees the sign, he will stop whatever discussion he is participating in and remains silent. Other pupils will note the silence, and will also quiet down. After such a hiatus, the renewed discussion will be quieter. Another way to approach the problem of noise is to move pupils closer together.

Another possible issue with group work is **making too fast decisions, not considering alternatives**. For example, when disagreements are put to a vote without being discussed. This often happens if one pupil dominates others because he provides solutions while others merely accept these. This requires the teacher to intervene and to show which other aspects need to be taken into consideration before deciding on the issue.

Sometimes the mood in the classroom is not productive. Team member's ideas might be dismissed or even ridiculed and their views ignored, or there are arguments between members of a group. In this case, one should give up on group work and to concentrate on increasing the motivation of pupils. Perhaps one should use a different method for dividing

pupils into groups. The goal is to generate **a great deal of discussion** in which everyone participates. Group members **listen** to each other and everyone's ideas are heard. Members **feel free to criticise** and to say what they think but this is done in a **positive, constructive manner**. There is a **supportive, informal atmosphere** where members feel able to say what they think.

Methods of group work

1. Making a list by having one paper that circulates around the room so that each pupil can add an item. The circulation continues until no-one can generate more items for the list. Then, pupils will evaluate the list using the same method, each speaks in turn to express his opinion.

This method is suitable for testing understanding of a topic.

2. Interviewing each other in teams of three. Pupils will take turns being the interviewer, interviewee and secretary.

This method is suitable for retelling personal experiences.

3. Each member of a group will receive a number. Each group will have a member 1, 2, etc. The task is to ensure that each member will know every answer to questions on a topic. For example, if the task is to know about the effect of seasons on bodies of water, then each pupil will be responsible for his own knowledge and of that of his group members. When the allocated time runs out, the teacher asks for example number 2's in groups to choose another member to answer the question. The teacher may ask additional questions from other members of the group. If the answer is correct, the whole group is praised, not only the presenter.

4. One plays cards with a partner. One side of the cards have a question, the other an answer. The person to play a card reads the question, and allows the other to read the answer. He then asks the question while concealing the answer, to test the short term memory of the other pupil. If the pupil gives the correct answer, he or she receives the card, if the answer is incorrect, the card is returned into the pack after the pupil to play the card gives a hint. When the person who answers gets hold of all the cards, the roles are reversed.

Summarizing and assessing group work

Making a summary is crucial for group work. It should not be neglected or left out. If one runs out of time, one should schedule it for another day. Participants need to talk about their results and conclusions. This improves presentation skills and affirms the pupils that their work was important.

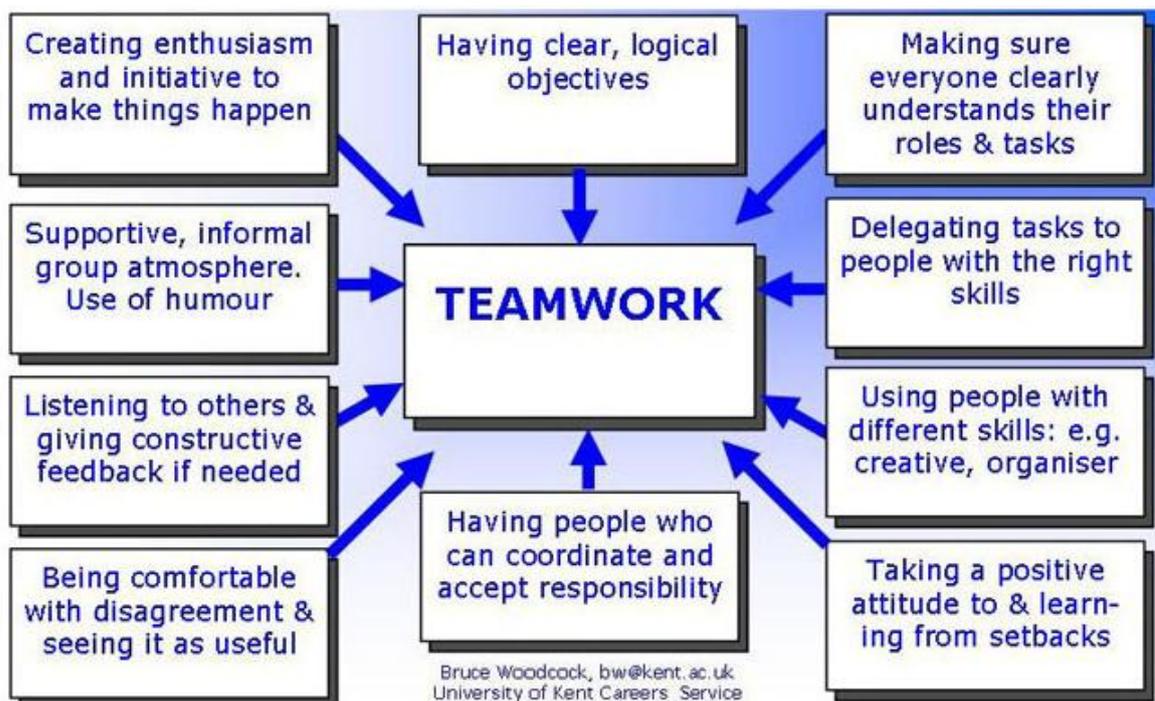
Listening to groups in turn takes a great deal of time. One can have the groups present to each other. For example, if one has six groups, one can make two circles, one internal and the other external. When each pair of groups has presented to the other, the circles can rotate so that new pairs are formed. This allows group members to talk about their results at length.

If research was done, then the results can be summarized in writing, for example as a poster that is placed on the wall so that each group can present the poster to passers by. Usually a poster session or poster presentation is the presentation of research information by an individual or representatives of research teams at a congress or conference with an academic or professional focus. In a class it can be organised basically in the same way – a team prepares the poster with the results of their work. A member of the group will be introducing the ideas and answering questions posed by classmates.

“One remains” – method: All except for one group member leave for other tables, leaving the remaining member to present to the newcomers.

Assessment is a complicated issue in collective learning. Traditional forms of assessment are difficult to use. Below are some suggestions for assessment, e.g. Washington Center's Evaluation Committee has developed a handbook describing experiences on assessment on undergraduate level. The handbook can be found at <http://www.evergreen.edu/washcenter/resources/acl/index.html>. Even though the handbook is written for undergraduate level, the content includes many useful tips for a basic school teacher.

The characteristics of an effective teamwork by Bruce Woodcock, University of Kent Careers Service:



Observer assessment form for group exercises used in University of Kent Careers Service <http://www.kent.ac.uk/careers/sk/teamwork.htm>

Participation

- Participates enthusiastically in discussion.

Spoken Expression

- Expresses his/herself clearly and coherently.

Originality of Ideas

- Introduces new ideas.
- Builds constructively on the ideas of others.
- Brings a fresh approach to a problem.

Quality of Thought

- Analyses a problem well.
- Gets to the root of the problem.

Influence on Others

- Makes a point which is accepted.
- Influences the direction and nature of the discussion.

Open Mindedness

- Listens to carefully to other member's views.
- Incorporates the points made by others into their own.

Facilitation of the Discussion

- Makes a direct attempt to help another person.
- Squashes a dominant interrupter to allow someone else to make a point.

Judgment

- Discriminates clearly between the important and the trivial.
- Does not allow his/her feelings to sway decisions.

Another form for assessment includes judgement on a person's cooperation skills and the course of cooperation. This was used by Anna Chan Rekate and Martha Ehrenfeld http://www.thirteen.org/edonline/concept2class/coopcollab/implement_sub1.html.

Group Work Assessment Sheet

by [Anna Chan Rekate](#) and [Martha Ehrenfeld](#)

Student's name: _____

Date: _____

Class: _____

Type of work or project: _____

1. Who did you work with in your group? Describe one thing that each person contributed to the group to make the project successful.

Name: _____

Contribution: _____

Name: _____

Contribution: _____

2. Were there any conflicts that came up? Describe how you solved this problem.

3. How was doing this activity with the group different than if you were to do it alone?

4. List three suggestions about how the group could have done something differently.

a. _____

b. _____

c. _____

5. What did you do to contribute to the success of the activity for the group?

5. What did you do to contribute to the success of the activity for the group?

6. What would you change about your own contributions to the group?

7. What did you enjoy most about working with this group?

This kind of evaluation gives a good analysis of the process. Reflection of the process is a valuable part of the learning.

Examples on collective learning activities for basic school

Labeling food

Instructions for teachers:

Below you will find three different texts on labeling food. The information comes from the website of the Ministry of Agriculture of Estonia <http://www.agri.ee/toidu-margistamine-2/> .

Make copies such that a pair of pupils will receive one of the texts. For example, for 24 pupils you will need four copies of each text. Two pupils read the text together, with one summarizing the most important points in the text for the other from a consumer's point of view and the most interesting facts from a reader's perspective. (Alternative: the pupils discuss which are the most important facts in the text.)

The class is then divided into four groups so that each group would have a pupil that has read each text. One does not need to split up the original pairs.

Each group answers the questions in the table below. The questions can only be answered by using information from each of the three texts. No single text will provide an answer, the answer must be reached through discussion in the group.

After the table has been filled, the answers of the three groups are compared orally. The pupils are encouraged to bring in their own experience with food labels – what have they read on a package, which information do they use when choosing between products.

Food labels should not mislead a consumer but rather provide accurate information about its nature, origin, ingredients and other important characteristics to help distinguish it from other similar foods. Labeling, advertising and other forms of presenting food should not refer to features of the food that prevent, cure or mitigate disease symptoms.

One should not confuse a name (for example: Smoothie) or a trademark (for example Tropica) with a description of the product (for example juice, chocolate, honey, jam, etc). If the food product does not have an established description, one should use a well known name or description such as “muesli” or “cheese dessert”. Cheese is regarded a dairy product, which constrains the producer because then only any glaze or added layer around the “cheese” may contain vegetable fats.

Similarly, “cream ice cream” and “sundae” are well known names for products that do not contain vegetable fats. Only a simple “ice cream” may (in addition to dairy fats) include vegetable fats.

Food ingredients are ordered on the label according to percentage included in the product with the highest percentage first. The names of ingredients also follow the rules of food labeling. For example, one must clearly distinguish between cheese and cheese-like products with vegetable fats.

Certain ingredients can be represented by a general term. For example, natural flavourings or spices can go under the general term “flavourings”, different species of fish can be referred to as “fish” etc.

Additives are marked on the label using the name of the group, which is followed by the name of the additive or a EU numbered identifier. For example, the preservative potassium sorbate is the same as E 202. The main groups are the following: food colouring (E 100-199), preservatives (E 200-299), antioxidants (E300-399), emulsifiers and stabilizers (E400-499), acidity regulators, flour, anti-caking agents, thickening agents, flavour enhancers, sweeteners, etc.

2.

Food ingredient percentages are marked on a label when they occur in or are associated with the name of the product. Also, when a particular ingredient has a symbolic or visual marker on the label, or is definitive in characterizing that food product.

For example, in the case of a strawberry yogurt, one can find out how much strawberry and strawberry jam it contains, as the percentage of that ingredient must be listed in either the ingredient list or food name.

When a product is called “strawberry flavoured syrup”, one can assume that the taste has been achieved using flavouring agents, and strawberries might not be used in the making of the product.

A percentage of an ingredient is also listed when that ingredient is central in the characterization of that product. For example, a sausage is assumed to include pork or beef, and percentages of those ingredients need to be on the label.

Net quantities of liquid foods are marked in volume (eg. liters) and other foods in mass (eg. kilograms) units. Foods that include a liquid part (for example olives), the ingredients and net quantity is marked by the words “at least ... g”. For example, tuna in salt water will include a label that states the quantity of tuna.

Perishable foods include the last date of consumption, while others foods have a “best before” date. The former foods may not be eaten past the marked date as unhealthy microorganisms will have developed inside it. This also means that such products may not be sold under any conditions after that date. Foods labeled “best before” may be sold after that date but only if the food retains its quality and the consumer is clearly informed of its status.

The country of origin or area needs to be on the label if its absence might severely mislead a consumer. The evaluation of the possibility to be misled must take into account the markings on the entire package, including trademarks, logos and pictures. For some products such as beef, wine, honey, certain fruits and vegetables the country of origin must always be marked.

For processed foods, the country of origin is the country of preparation.

Information on energy value, proteins, fats, carbohydrates and other nutrients are listed under servings. Although this information is included on the labels of many products, it is currently not mandatory. It only becomes mandatory in case a food is claimed to be, for example, "low fat", "E-vitamin rich", "high fiber". "Fat free cottage cheese" makes a claim towards its fat content, so it will include a label that provides the above nutritional information for a serving of 100g. Vitamins and minerals will also be marked for a serving of 100g or 100ml, and include the percentage of a daily recommended dose for an adult. It is important to list ingredients that are main causes of allergic reactions, even if these are included in an additive or an ingredient referred to under a general term, as food allergies are incurable and can only be prevented by avoiding allergy causing products. The list of main causes of allergic reactions include gluten, crustaceans, eggs, fish, peanuts, soybeans, milk, nuts, celery, mustard, sesame seeds, sulphur dioxide and sulphites.

4.

We often see food packages with text, images or symbols that make claims towards the nutritional or health value of the product within. On the one side, these assist the consumer in choosing a product, on the other hand, they require critical evaluation to avoid being misled. This does not mean that the contents of the product would be worse without the claim. If some ingredient is clearly referred to on the package, it must also include a label that gives the quantity of the ingredient in the product.

Some more common claims regarding food products

“Sugar free”, “high fiber”, “low salt”, “contains calcium”, “source of vitamin C”, “low fat”, “low energy” and the like have clear regulated conditions for use on a food label. One should avoid products which state that there is a lot or very little of some ingredient without a clear quantity being marked on the label. “Increased/reduced X content” is a comparison between a product and a like products. The label must show the extent to which the ingredient content is changed. Also, one should be able to tell whether for example a reduced fat content is not counteracted by an increase in carbohydrates or salt.

“Light”, “lite” must have an energy value or ingredient reduction of at least 30% compared to a like product. The label must state which content is reduced.

“Healthy”, “functional”, “good for digestion/skin/figure, etc” is ambiguous and one should search the label for a clearer explanation.

“Contains probiotics” marks a product that must contain bacteria that fulfill a role in the organism. The package should specify the role, because it depends on the bacteria.

Sometimes, nutritional value is falsely associated with notions that refer to modes of production instead. “Organic”, “eco”, “bio” are labels for organic production, and they provide no information regarding the ingredients. An organically farmed carrot might not include more vitamins than a regular carrot, nor are ingredients in an organic carrot more “lively” or different in their effect. One should be informed when purchasing food products.

Discuss within the group and answer the questions in the table below.

<p>1. According to which principle are ingredients listed on a label?</p>	<p>2. How much must a product differ from a like product to be referred to as “light” or “lite”?</p>	<p>3. How can one distinguish by name alone between products that include strawberries and those that merely have strawberry flavourings?</p>
<p>4. Which are the names for ice cream products that only contain dairy products?</p>	<p>5. When must a label list information on energy value, proteins, fats, carbohydrates and other nutrients?</p>	<p>6. If the package of a brand of bread says “gives strength to work hard”, should one assume than another brand of bread does not provide strength to work hard? How should one choose between the two brands?</p>
<p>7. When is food product labeled as “best before” and when is there a date of consumption?</p>	<p>8. Why must a label list ingredients that are main causes of allergic reactions?</p>	<p>9. Discuss and write up a list of crucial information that should be checked on every label of food before buying the product.</p>

Working in pairs to research the operation of the digestive track

Instructions for teachers:

The work is suitable for the older students at the GCSE level (14-16 years).

Students discuss in pairs or in groups of four, what they already know about the digestive track and note down 3-7 questions they consider to be of interest.

Students read about the topic from this website
<http://digestive.niddk.nih.gov/ddiseases/pubs/yrdd/tract>.

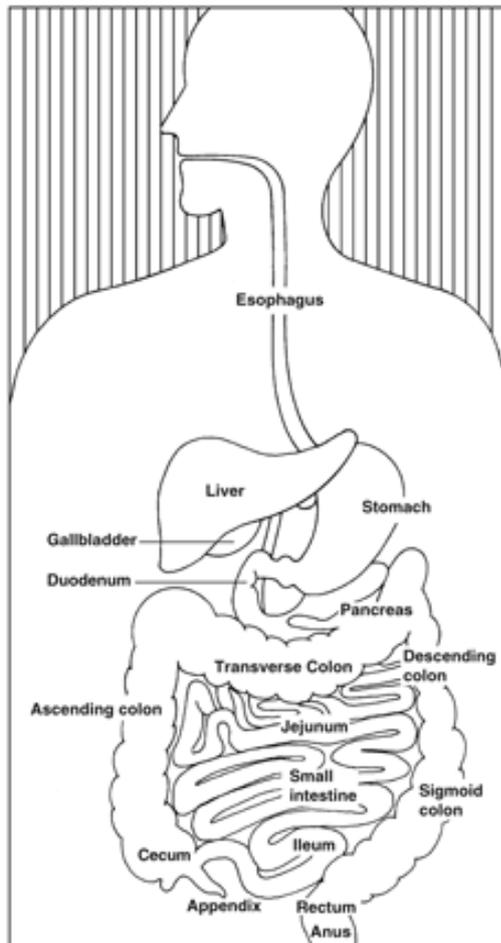
If computers are not available in the classroom, a copy of the text will be given to students (see below).

Students will make notes in the booklet about what they've read, dividing the page for notes vertically into two equal halves. The left side of a standard notebook page is used for summarizing a given reading and listing 6-10 major points. The right side is used for noting reactions to the reading and answering the questions they had.

These journal entries can then be used in group work to summarize member's reactions and to summarize the group's discussion for the class. The journalling forms the groundwork for class discussion and ensures participation of each student. (The method is adapted from http://intranet.umanitoba.ca/academic_support/uts/media/collaborative.pdf)

Your Digestive System and How It Works

<http://digestive.niddk.nih.gov/ddiseases/pubs/yrdd/>



The digestive system.

The digestive system is made up of the digestive tract—a series of hollow organs joined in a long, twisting tube from the mouth to the anus—and other organs that help the body break down and absorb food (see figure).

Organs that make up the digestive tract are the mouth, esophagus, stomach, small intestine, large intestine—also called the colon—rectum, and anus. Inside these hollow organs is a lining called the mucosa. In the mouth, stomach, and small intestine, the mucosa contains tiny glands that produce juices to help digest food. The digestive tract also contains a layer of smooth muscle that helps break down food and move it along the tract.

Two “solid” digestive organs, the liver and the pancreas, produce digestive juices that reach the intestine through small tubes called ducts. The gallbladder stores the liver's digestive juices until they are needed in the intestine. Parts of the nervous and circulatory systems also play major roles in the digestive system.

Why is digestion important?

When you eat foods—such as bread, meat, and vegetables—they are not in a form that the body can use as nourishment. Food and drink must be changed into smaller molecules of nutrients before they can be absorbed into the blood and carried to cells throughout the body. Digestion is the process by which food and drink are broken down into their smallest parts so the body can use them to build and nourish cells and to provide energy.

How is food digested?

Digestion involves mixing food with digestive juices, moving it through the digestive tract, and breaking down large molecules of food into smaller molecules. Digestion begins in the mouth, when you chew and swallow, and is completed in the small intestine.

Movement of Food Through the System

The large, hollow organs of the digestive tract contain a layer of muscle that enables their walls to move. The movement of organ walls can propel food and liquid through the system and also can mix the contents within each organ. Food moves from one organ to the next through muscle action called peristalsis. Peristalsis looks like an ocean wave traveling through the muscle. The muscle of the organ contracts to create a narrowing and then propels the narrowed portion slowly down the length of the organ. These waves of narrowing push the food and fluid in front of them through each hollow organ.

The first major muscle movement occurs when food or liquid is swallowed. Although you are able to start swallowing by choice, once the swallow begins, it becomes involuntary and proceeds under the control of the nerves.

Swallowed food is pushed into the esophagus, which connects the throat above with the stomach below. At the junction of the esophagus and stomach, there is a ringlike muscle, called the lower esophageal sphincter, closing the passage between the two organs. As food approaches the closed sphincter, the sphincter relaxes and allows the food to pass through to the stomach.

The stomach has three mechanical tasks. First, it stores the swallowed food and liquid. To do this, the muscle of the upper part of the stomach relaxes to accept large volumes of swallowed material. The second job is to mix up the food, liquid, and digestive juice produced by the stomach. The lower part of the stomach mixes these materials by its muscle action. The third task of the stomach is to empty its contents slowly into the small intestine.

Several factors affect emptying of the stomach, including the kind of food and the degree of muscle action of the emptying stomach and the small intestine. Carbohydrates, for example, spend the least amount of time in the stomach, while protein stays in the stomach longer, and fats the longest. As the food dissolves into the juices from the pancreas, liver, and intestine, the contents of the intestine are mixed and pushed forward to allow further digestion.

Finally, the digested nutrients are absorbed through the intestinal walls and transported throughout the body. The waste products of this process include undigested parts of the food, known as fiber, and older cells that have been shed from the mucosa. These materials are pushed into the colon, where they remain until the feces are expelled by a bowel movement.

Production of Digestive Juices

The digestive glands that act first are in the mouth—the salivary glands. Saliva produced by these glands contains an enzyme that begins to digest the starch from food into smaller molecules. An enzyme is a substance that speeds up chemical reactions in the body.

The next set of digestive glands is in the stomach lining. They produce stomach acid and an enzyme that digests protein. A thick mucus layer coats the mucosa and helps keep the acidic digestive juice from dissolving the tissue of the stomach itself. In most people, the stomach mucosa is able to resist the juice, although food and other tissues of the body cannot.

After the stomach empties the food and juice mixture into the small intestine, the juices of two other digestive organs mix with the food. One of these organs, the pancreas, produces a juice that contains a wide array of enzymes to break down the carbohydrate, fat, and protein in food. Other enzymes that are active in the process come from glands in the wall of the intestine.

The second organ, the liver, produces yet another digestive juice—bile. Bile is stored between meals in the gallbladder. At mealtime, it is squeezed out of the gallbladder, through

the bile ducts, and into the intestine to mix with the fat in food. The bile acids dissolve fat into the watery contents of the intestine, much like detergents that dissolve grease from a frying pan. After fat is dissolved, it is digested by enzymes from the pancreas and the lining of the intestine.

Absorption and Transport of Nutrients

Most digested molecules of food, as well as water and minerals, are absorbed through the small intestine. The mucosa of the small intestine contains many folds that are covered with tiny fingerlike projections called villi. In turn, the villi are covered with microscopic projections called microvilli. These structures create a vast surface area through which nutrients can be absorbed. Specialized cells allow absorbed materials to cross the mucosa into the blood, where they are carried off in the bloodstream to other parts of the body for storage or further chemical change. This part of the process varies with different types of nutrients.

Carbohydrates. The *Dietary Guidelines for Americans 2005* recommend that 45 to 65 percent of total daily calories be from carbohydrates. Foods rich in carbohydrates include bread, potatoes, dried peas and beans, rice, pasta, fruits, and vegetables. Many of these foods contain both starch and fiber.

The digestible carbohydrates—starch and sugar—are broken into simpler molecules by enzymes in the saliva, in juice produced by the pancreas, and in the lining of the small intestine. Starch is digested in two steps. First, an enzyme in the saliva and pancreatic juice breaks the starch into molecules called maltose. Then an enzyme in the lining of the small intestine splits the maltose into glucose molecules that can be absorbed into the blood. Glucose is carried through the bloodstream to the liver, where it is stored or used to provide energy for the work of the body.

Sugars are digested in one step. An enzyme in the lining of the small intestine digests sucrose, also known as table sugar, into glucose and fructose, which are absorbed through the intestine into the blood. Milk contains another type of sugar, lactose, which is changed into absorbable molecules by another enzyme in the intestinal lining.

Fiber is undigestible and moves through the digestive tract without being broken down by enzymes. Many foods contain both soluble and insoluble fiber. Soluble fiber dissolves easily in water and takes on a soft, gel-like texture in the intestines. Insoluble fiber, on the other hand, passes essentially unchanged through the intestines.

Protein. Foods such as meat, eggs, and beans consist of giant molecules of protein that must be digested by enzymes before they can be used to build and repair body tissues. An enzyme in the juice of the stomach starts the digestion of swallowed protein. Then in the small intestine, several enzymes from the pancreatic juice and the lining of the intestine complete the breakdown of huge protein molecules into small molecules called amino acids. These small molecules can be absorbed through the small intestine into the blood and then be carried to all parts of the body to build the walls and other parts of cells.

Fats. Fat molecules are a rich source of energy for the body. The first step in digestion of a fat such as butter is to dissolve it into the watery content of the intestine. The bile acids produced by the liver dissolve fat into tiny droplets and allow pancreatic and intestinal enzymes to break the large fat molecules into smaller ones. Some of these small molecules are fatty acids and cholesterol. The bile acids combine with the fatty acids and cholesterol and help these molecules move into the cells of the mucosa. In these cells the small molecules are formed back into large ones, most of which pass into vessels called lymphatics near the intestine. These small vessels carry the reformed fat to the veins of the chest, and the blood carries the fat to storage depots in different parts of the body.

Vitamins. Another vital part of food that is absorbed through the small intestine are vitamins. The two types of vitamins are classified by the fluid in which they can be dissolved: water-soluble vitamins (all the B vitamins and vitamin C) and fat-soluble vitamins (vitamins A, D, E, and K). Fat-soluble vitamins are stored in the liver and fatty tissue of the body, whereas water-soluble vitamins are not easily stored and excess amounts are flushed out in the urine.

Water and salt. Most of the material absorbed through the small intestine is water in which salt is dissolved. The salt and water come from the food and liquid you swallow and the juices secreted by the many digestive glands.

How is the digestive process controlled?

Hormone Regulators

The major hormones that control the functions of the digestive system are produced and released by cells in the mucosa of the stomach and small intestine. These hormones are released into the blood of the digestive tract, travel back to the heart and through the arteries, and return to the digestive system where they stimulate digestive juices and cause organ movement. The main hormones that control digestion are gastrin, secretin, and cholecystokinin (CCK):

1. **Gastrin** causes the stomach to produce an acid for dissolving and digesting some foods. Gastrin is also necessary for normal cell growth in the lining of the stomach, small intestine, and colon.
2. **Secretin** causes the pancreas to send out a digestive juice that is rich in bicarbonate. The bicarbonate helps neutralize the acidic stomach contents as they enter the small intestine. Secretin also stimulates the stomach to produce pepsin, an enzyme that digests protein, and stimulates the liver to produce bile.
3. **CCK** causes the pancreas to produce the enzymes of pancreatic juice, and causes the gallbladder to empty. It also promotes normal cell growth of the pancreas.

Additional hormones in the digestive system regulate appetite:

- **Ghrelin** is produced in the stomach and upper intestine in the absence of food in the digestive system and stimulates appetite.
- **Peptide YY** is produced in the digestive tract in response to a meal in the system and inhibits appetite.

Both of these hormones work on the brain to help regulate the intake of food for energy.

Nerve Regulators

Two types of nerves help control the action of the digestive system.

Extrinsic, or outside, nerves come to the digestive organs from the brain or the spinal cord. They release two chemicals, acetylcholine and adrenaline. Acetylcholine causes the muscle layer of the digestive organs to squeeze with more force and increase the “push” of food and juice through the digestive tract. It also causes the stomach and pancreas to produce more digestive juice. Adrenaline has the opposite effect. It relaxes the muscle of the stomach and intestine and decreases the flow of blood to these organs, slowing or stopping digestion.

The intrinsic, or inside, nerves make up a very dense network embedded in the walls of the esophagus, stomach, small intestine, and colon. The intrinsic nerves are triggered to act when the walls of the hollow organs are stretched by food. They release many different substances that speed up or delay the movement of food and the production of juices by the digestive organs. Together, nerves, hormones, the blood, and the organs of the digestive system conduct the complex tasks of digesting and absorbing nutrients from the foods and liquids you consume each day.

Food art – ethical or not?

Instructions for teachers:

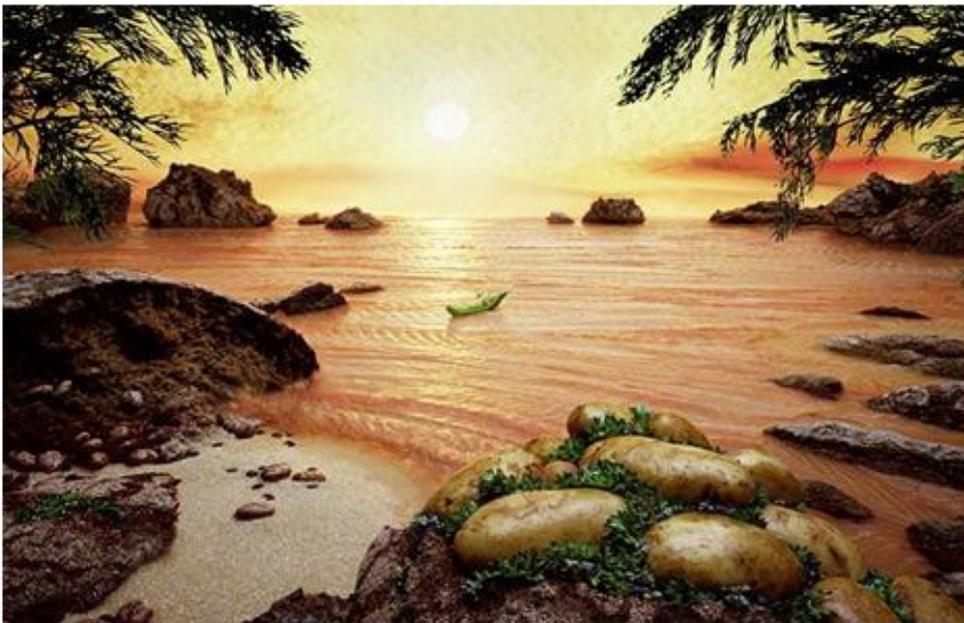
The work is suitable for the students at the GCSE level (12-16 years).

In the first phase, work will first be conducted individually, then in pairs and later in groups of four. The activity will end with a joint discussion.

The students will be shown the following image downloaded from this website <http://www.telegraph.co.uk/news/picturegalleries/howaboutthat/3519419/Foodscapes-amazing-food-art-by-Carl-Warner.html> on the classroom wall with a data projector. It could also be another picture that would warrant a different reaction from the students.

News

Foodscapes: amazing food art by Carl Warner



Carl Warner is a London-based photographer who makes foodscapes: landscapes made of food. In the picture above, a pea pod boat sails away from a land made of bread and potatoes, over a sea of salmon

Picture: CARL WARNER

Each student, individually, spends 5 minutes writing their answer to a given problem/question:

1. What is portrayed in the image? (One should only see the image on the wall without the text underneath. Otherwise one should skip the first question.)
2. What are your thoughts and reactions to this image?
3. Do you find this type of art ethical? Explain your point of view.

Pairs of students then compare and discuss their responses. Two pairs then compare their responses and try to reach a consensus on their responses.

Groups number/name: _____

No./name	Reasons for why it is not ethical	Reasons for why it is ethical
....

The decision representing the consensus formed in the group:

Then every group will present their decisions and arguments leading up to the decision to the class which will be followed by a discussion. It is not necessary that the entire class would reach consensus.

Then the class will watch the video on food and the art of presentation of Japan's amazing lunchboxes <http://www.bbc.co.uk/news/magazine-16069217>

Discussion on the topic: How do the two „food art“ cases differ from each other?

Composing a concept map on food and nutrition

Instructions for teachers:

The work is suitable for the older students at the GCSE level (13-16 years).

This work introduces the subject of food and nutrition. Presentation of the results requires a larger space, such as a wall in the school hallway.

Phase I (may be conducted in classroom or assigned as homework). Students are divided into pairs or groups of three. Each team will research one topic with the help of online information and publications. Some topics may be examined by several groups.

In classes with good collective learning skills, teachers should not present research questions or topics, but students should choose them on their own through joint discussion after they have had an opportunity to do a background search.

Topics

1. The principles of a healthy and balanced diet.
2. Eating disorders and associated health risks.
3. Food and dining folklore (proverbs, sayings, customs, etc.)
4. Representation of food and eating in fine art and music.
5. Representation of food production and manufacturing in fine art and music.
6. Change of dining customs through history.
7. The movement and absorption of food in the digestive track.
8. The importance of nutrients for the body (including water). Nutrient content of food products and meals.
9. Changes in energy and nutrition absorption by age and physical activity levels.
10. Vitamins and microelements in food.
11. Additives in food.
12. Nutritional supplements, their risks and benefits.

Pairs or groups search for information in literature and on the internet. Information found will be gathered into a written overview accompanied by illustrative material such as pictures and diagrams.

Phase II: The group presents it's overview to another group or class. The other group asks detailed questions and proposes constructive criticism for improving the work which will also be noted down in written form. Each group will have an opportunity to improve their presentation based on the feedback they received.

Phase III: Starting to draw up the concept map. The whole class will discuss the structure of the concept map and will draw the result on the discussion board.

“Food and Nutrition” will be the central terms presented on the concept map wall. Each group will attach they're own overview of the topic underneath these words according to the structure they had agreed upon earlier. The names of the students who composed the overview will be added to every topic.

Phase IV: Getting to know the concept card content. Presentations of the groups.

Joint discussion based on watching videos

Instructions for teachers:

The work is suitable for the older students at the GCSE level (14-16 years).

This activity suits best for improving language skills and argumentation. Please notice – the talks in videos present presenter's views only and can be questioned!

Students and teachers can watch a series of videos about food and discuss the in class. Before the discussion teachers are advised to go over the speeches and look into concepts and definitions that might be unclear both concept wise and language wise.

Topics mentioned in the talks:

- ⊙ relations to nature
- ⊙ urban and rural living
- ⊙ gardening and growing your own food projects
- ⊙ cooking food, family and relations between people
- ⊙ feeding the world and managing food resources
- ⊙ pesticides in food
- ⊙ healthy eating

http://www.ted.com/talks/lang/en/carolyn_steel_how_food_shapes_our_cities.html

Every day, in a city the size of London, 30 million meals are served. But where does all the food come from? Architect Carolyn Steel discusses the daily miracle of feeding a city, and shows how ancient food routes shaped the modern world.

http://www.ted.com/talks/mark_bittman_on_what_s_wrong_with_what_we_eat.html

In this fiery and funny talk, New York Times food writer Mark Bittman weighs in on what's wrong with the way we eat now (too much meat, too few plants; too much fast food, too little home cooking), and why it's putting the entire planet at risk.

http://www.ted.com/talks/ann_cooper_talks_school_lunches.html

Speaking at the 2007 EG conference, "renegade lunch lady" Ann Cooper talks about the coming revolution in the way kids eat at school -- local, sustainable, seasonal and even educational food.

http://www.ted.com/talks/michael_pollan_gives_a_plant_s_eye_view.html

What if human consciousness isn't the end-all and be-all of Darwinism? What if we are all just pawns in corn's clever strategy game to rule the Earth? Author Michael Pollan asks us to see the world from a plant's-eye view.

Fairytales and food

Instructions for teachers:

The work is suitable for younger pupils (9-11 years old)

Phase I: The teacher tells a fairytale which is related to food, for example Tormie de Paola's "Strega Nona."

After hearing the tale, the pupils will draw pictures about the fairytale in groups of 4-5. Groups agree on the contents of the picture, and each pupil will draw only a part of it. The drawings are presented to the other pupils.

Variation: the teacher will place a large sheet of paper on the wall of the classroom for each group, with a drawing started (For example Strega Nona's house). Each pupil in a group will have to continue the drawing until it's the turn of the next pupil. The group members may not discuss the work, and have to draw in silence.

The teacher will announce the time to finish drawing. Each group will receive 10-15 minutes to agree on the contents of their presentation of the drawing.

This method is suitable for a class with a good environment for work, this is not recommended for conflict-prone pupils.

Phase II: Individual work in groups.

Pupils will go to the library in pairs and will search at least 5 fairytales or thin children's books for references to food.

Phase III: Summarizing the results of individual work. The pupils will introduce the fairytales/books they used to the other pupils.

Pupil work sheet

Date: _____

Names of group members:

Before you read the books or fairytales, write in the table what you think will be the answers to the questions, then read the stories and write down the real answers in the other column.

Question	Guessed answer	Real answer	Books/fairytales that included the answer
How many stories referred to food?			
How many foods were named?			
How many stories referred to growing or preparing food?			
How many times was eating mentioned?			
How many times was a feast mentioned?			

Which foods were mentioned?

Which food related activities were mentioned?

How did your guesses differ from the real numbers?

Do you think fairytales often refer to food?

Briefly explain your last answer.

Connect Four Game

This activity suits children from grades 7- 9 (14-16 years). Its purpose is to both develop knowledge about food and language skills, especially oracy. It is designed to help children learn through talking and active learning in small groups and provides teachers opportunities for assessment of talk.²

You may want to print out for each group information about the digestive system and food from <http://digestive.niddk.nih.gov/ddiseases/pubs/yrdd/>.

You need to enlarge the board to A3. There are two sets of cards with different coloured writing which can be printed on a colour printer and then laminated and/or you may prefer to print them on a coloured card.

HOW TO PLAY CONNECT FOUR

You need 4 people, one gameboard and two sets of cards(different colours.)

Work with your partners to make two teams of two.

Each pair takes a set of cards

Teams shuffle their cards and place them in a pile facing down.

They take it in turn to turn over their top card and decide where to put it on the board.

The winning team gets four in row diagonally, vertically or horizontally.

Decide whether to have challenges or a checking system.

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Decide whether to have challenges or a checking system.

² Idea adapted from <http://www.collaborativelearning.org/cellsc4.pdf>

Connect Four Game Board

These are needed to build up body tissues	Body system which is made up of a series of hollow organs joined in a long, twisting tube from the mouth to the anus	Process by which food and drink are broken down into their smallest parts to build and nourish cells and to provide energy	Organs of digestive tract contain a layer of _____ that enables their walls to move	Food moves from one organ to the next through muscle action called _____	Swallowed food is pushed into the _____, which connects the throat above with the stomach below.
It stores the swallowed food and liquid, and mixes it up with digestive juice	These are absorbed through the intestinal walls and transported throughout the body.	Digestive glands in the mouth	Substance that speeds up chemical reactions	They produce stomach acid and an enzyme that digests protein	Helps to keep the acidic digestive juice from dissolving the tissue of the stomach itself
Produces enzymes to break down the carbohydrate, fat, and protein in food.	Digestive juice produced by liver to dissolve fat	Through this organ most digested molecules of food, water and minerals are absorbed	Foods rich in _____ include bread, potatoes, dried peas and beans, rice, pasta, fruits, and vegetables	Nutrient carried through the bloodstream to the liver, where it is stored or used to provide energy for the work of the body	Rich source of energy for the _____, which blood carries to storage depots in different parts of the body
Hormone which causes the stomach to produce an acid for dissolving and digesting some foods	Hormone which stimulates the stomach to produce pepsin, an enzyme that digests protein, and stimulates the liver to produce bile	These are water-soluble vitamins All the B vitamins and vitamin C	These are fat-soluble vitamins Vitamins A, D, E, and K	These are linings, involved in absorption and secretion	Organ where bile is stored between meals Gallbladder

Cards for Connect Four Game

Proteins	Digestive tract	Digestion	Muscle	Peristalsis	Esophagus
Stomach	Digested nutrients	Salivary glands	Enzyme	Stomach lining	Mucus
Pancreas and glands in the wall of the intestine	Bile	Small intestine	Carbohydrates	Glucose	Fat
Gastrin	Secretine	All the B vitamins and vitamin C	Vitamins A, D, E, and K	Mucosa	Gallbladder

Cards for Connect Four Game

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Using „Idea Board“

ERDF Central Baltic programme Interreg IVA project „Safe and Active Schoolday - SAS“ www.safeandactiveschoolday.ee designed a tool for analysing problems and proposing solutions in everyday schoolwork, which can be easily used both in learning subject issues and solving schoolday problems.

The main purpose of using this tool is to encourage an active lifestyle and participation in children and young people. Adults should not decide everything for children, but rather provide an environment where children and young people get a positive experience from participating in the first stages of a decision process.

A decision process begins with the realization that some particular problem or “thing” requires a decision. Then, one should discuss the status quo – both its positive and negative aspects. After this, one should list activities that improve the status quo to decide between them to agree on some activities to put into action. Once the activities are enacted, one should not forget to evaluate the results.

Problems are solved either in the order in which they are observed or according to a priority ordering. It is also possible to take a preemptive approach where one tries to find problems to solve or opportunities to improve. One should be active and act before a problem arises or an opportunity is opened.

Necessary tools: an idea board (mõttetahvel) divided into four, notes that can be attached to the board and writing tools.



The wording of the topic is agreed together, written down and attached to the board. Then one discussed the positive and negative aspects of the status quo together or in groups, where different instances are written down on pieces of paper and attached to the board in either + or – sections. Sections labeled = are for summaries and activities that would improve/enhance/mitigate or avoid. In the end the group must decide which activities can be enacted by the group themselves and also what could be done through assistance from others. Then, the group drafts an action plan and enacts the activities

Examples of topics:

1. Many pupils do not want to eat warm food in the canteen and prefer pastries from the school shop and drinking lemonade.
2. What do we know about hepatitis A and how can we protect ourselves from it?
3. Maria/Martin is rarely ill. What in their behaviour helps them stay healthy? / Maria/Martin often catches viruses. What in their behaviour makes it probable to catch viruses?

The last topic requires one to note in section “+” those aspects which helps one stay healthy and in section “-“ the aspects that make it probable to catch viruses. The “=” section is for summaries and the “?” section is for noting down activities each pupil should undertake to remain healthy.

Summary

A teacher using methods of collective learning or collaborative learning gives children opportunities to increase their critical thinking skills and to be better prepared for challenges of modern career design. It is a significant shift away from the typical teacher-centric milieu in classrooms. It is clear that the classical talking/listening/note-taking process cannot disappear entirely from the classroom, this is needed in cases when children have to get a great deal of new knowledge about an issue, but it lives alongside other processes that are based on discussion and active work with facts and other information. Teachers who use collective/collaborative learning approaches provide more guidance to pupils than the teachers practicing mostly traditional, frontal teaching methods (teacher as the figure of authority, standing in front of the class and lecturing).

Collective/collaborative learning takes on a variety of forms and is practiced by teachers of different disciplinary backgrounds and teaching traditions. Though, all of them are based on different forms of teamwork and therefore in this paper different teamwork strategies are described, and eight examples of activities for basic school pupils are given. As the project „FOODWEB“ concentrates on issues of food, the examples are compiled on the same topic.

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