




In2steam Lesson Example – Problem Based Learning

1. Unit title	Calories count in 17th Century paintings
2. Target group	10-11 years old (4th grade)
3. Duration	2 lessons (approx. 40 minutes each)
4. STEAM Skills/ 21st Century Skills??	<input checked="" type="checkbox"/> Critical Thinking <input type="checkbox"/> Entrepreneurship <input type="checkbox"/> Communicating <input checked="" type="checkbox"/> Collaboration <input type="checkbox"/> Tech Literacy <input checked="" type="checkbox"/> Creative Thinking <input type="checkbox"/> Media Literacy <input checked="" type="checkbox"/> Social skills <input checked="" type="checkbox"/> Problem Solving 
5. Expected learning outcomes	<p>By the end of this unit, learners will be able to:</p> <ul style="list-style-type: none"> ● calculate a healthy ratio of calories per day ● express basic knowledge about artistic movements of the 17th Century's art movements and about the life of some famous artists ● write a short story on the topic covered <p>In addition to the above, the lesson will help pupils to:</p> <ul style="list-style-type: none"> ● organise themselves ● improve their problem solution skills ● learn about steps of group work ● increase their listening skills ● improve their self-expression skills
6. Subjects and topics covered	Subjects: History of Art, Maths, Biology Topics: Role of calories in nutrition
7. Methodologies	<input type="checkbox"/> Design Thinking <input type="checkbox"/> Inquiry Based Learning <input checked="" type="checkbox"/> Problem Based Learning
8. Integration of the Arts	Figurative Arts: observation and analysis, interpretation of images and representations of allegories; the role of food in artistic expression
9. Learning Environment	Classroom
10. Resources required	<ul style="list-style-type: none"> ● Colour printer ● Scissors ● Printing paper ● Pen ● Pictures of fruit and meals provided (alternative pictures can be used, though this will require the calculation of the relevant calories chart) ● A plate (can be of plastic, or paper)
11. Prior knowledge a. Teacher b. students	In order to deliver this unit, the teacher will need to have a good understanding of the Problem Based Learning methodology. It would also be useful to refresh the knowledge around nutritional topics in general, and the role and importance of calories in particular.

	<p>In order to be able to participate and contribute to this lesson, the pupils will have already acquired a basic knowledge of human nutrition, incl. nutritional needs, nutrients and vitamins.</p>
<p>12. Detailed description of the step-by-step sequences of the unit, incl. specific activities to support the learning experience</p>	<p>Introduction</p> <p>Start the lesson by showing a fruit. Ask the pupils what a fruit can represent, depending on context, type of fruit, etc. Explain that you are going to explore examples of food representation in 17th Century paintings and what the painters may have wanted to express through it. In particular, you will try to work out how many calories a day some people may have eaten, based on the food shown in the paintings. Give a basic recap on why calories count matters.</p> <p>Step 1 – Formulate a problem statement</p> <p>Ask if the pupils have ever seen 17th Century paintings. Briefly describe what sets them apart from earlier Renaissance paintings. Provide some additional background information, e.g. “As you know, when art experts look at a painting, they can tell which era it belongs to or which artist created it. While every art movement follows peculiar ideas, guidelines, structures etc, every painter has an individual style. By examining their works of art, experts are able to tell who the artist was and estimate in which year the painting was completed, even before a chemical analysis has been carried out on the painting.”</p> <p>The pupils are then given a text about the painters, containing further information about their life and work, including some in-depth information about the painter’s personality, the art movements of the era and how those movements affected the painter. This will help to set the scene for the remainder of the activity.</p> <p>Check for understanding by asking probing questions and by inviting pupils to ask questions and to share any existing knowledge. Fill any relevant knowledge gap that may arise.</p> <p>Step 2 - Identify key facts</p> <p>Split your pupils into groups of 4 or 5; each group receives the same set of pictures of 17th Century paintings. Explain that the pictures handed out are of 17th Century paintings created by a variety of artists. The pupils will play the role of art experts who have been tasked to categorise the paintings by artists. Each group will brainstorm their ideas and reach a group decision (Annex 1). With the help of the teacher, pupils will start creating a list of characteristics which will help them categorise the paintings (e.g. style, subject, lightness, brush strokes, perspectives, dimensions, proportions, allegories, etc.). The pupils will decide within their groups how to categorise the paintings, but can ask the teacher to help them with their understanding. After the allocated time, the groups present their findings to each other, explaining how they created their categories and how the paintings made them feel. The exchange is meant to be an interactive session, where pupils can ask questions and share their insights with each other; the teacher will play the role of the moderator. The pupils will record their categories on the board, for all to see for the remainder of the activity.</p> <p>Step 3 - Brainstorm</p> <p>The teacher will provide information about 17th Century art movements and a short biography of the authors of the paintings. The teacher then chooses one painting containing food and explains: “This is a plate containing the snack of a</p>

	<p>Count.” Based on the picture, pupils are asked to imagine a Count and to give a brief oral description of what they think a Count was, what he may have looked like, etc. The teacher will give them a narrative about a day in the life of a Count (Annex 2). In this story, a Count wanders within his estate grounds on a horse and goes on evening walks along a nearby river.</p> <p>Ask the pupils to work out what the daily diet for the Count may have looked like, based on the information provided so far (e.g. healthy vs unhealthy food, raw vs cooked meals, local produce vs imported ingredients, fresh vs stale food, vegetarian vs carnivore, etc.). A particular focus should be on whether the Count was likely to take on enough calories and nutrients.</p> <p>Step 4 – Analysis of potential solutions</p> <p>As the brainstorm work progresses, the teacher visits each group to help them analyse their potential solution. This allows for the pupils’ work to continue, while checking for understanding and making sure the pupils remain on task and on the right track.</p> <p>Step 5 – Acquisition and assimilation of new knowledge</p> <p>Afterwards, the pupils are handed a chart showing the calories burnt through daily activities (Annex 3). Working within their groups, the pupils then calculate the estimated numbers or calories burnt by the Count based on the activities narrated in the story. Then they will attempt to calculate how many calories the Count assumes by eating the servings of food shown in the painting. The teacher will add some information about the recommended daily allowance (RDA) of calories intake, so that the pupils will be able to work out the ratio in percentage, using up to two decimals, of the Count’s calories intake against the suggested RDA.</p> <p>If time allows for it, the same step can be repeated or carried out in parallel for some nutrients (e.g. proteins, minerals, vitamins, carbohydrates, etc.).</p> <p>Step 6 - Apply the knowledge gained</p> <p>Each group is assigned a painter and asked to evaluate the work of art in the manner of brightness, light, neatness or disorder of the content and if it is related to the artist's personality; then the group spokesman expresses the judgment of the group. After this, each group picks a painting of their assigned painter and they write a story about how and why that piece of art was created. Each items of food shown in the pictures are listed according to their calories content for one serving; they are also categorised into meal groups (Annex 4). Working with that list, the pupils will then create suggestions for meals and snacks to be served to the Count, aiming to provide him with a healthy diet.</p> <p>Step 7 - Present and reflect</p> <p>Finally, these suggestions are visually represented in a presentation by the pupils working in groups, with the health reasons added in an explanatory text. The presentation will include a peer evaluation rubric pre-prepared by the teacher (e.g. 3 questions about the quality of visualisation, the level of scientific knowledge conveyed, etc. – Annex 5).</p>
<p>13. Gender-inclusive strategies and activities planned</p>	<p>Although this activity is meant to be very gender neutral, there are a few potential pitfalls to avoid. Especially with teenage girls, food and calories may trigger some adverse reaction. Look out for this kind of reaction as in some cases, they may be symptoms of an underlying problem. When explaining the recommended daily allowance (RDA) for calories intake, tread carefully when explaining the difference between male and female. Strictly avoid gender stereotypes (e.g. men tend to work physical jobs). You may want to give</p>

	<p>some background information on the role of metabolism across age and gender.</p> <p>Ensure you include female painters of the 17th Century in your activities. This painting by Louise Moillon (The fruit and vegetable seller) is ideally suited, as it depicts food but also a traditional female role of the period, which may open up interesting conversation topics. You can read more about Louise Moillon on WikiArt: https://www.wikiart.org/en/louise-moillon</p>  <p>Ensure that boys and girls are evenly distributed across the groups, so that the final results are not categorised into 'boys' and 'girls' views. When observing the group work, make sure every group member contributes equally (this is also a personality aspect, gender may or may not play a role).</p>
<p>14. Feedback and reflection</p>	<p>For Step 1, ask probing questions to check for understanding. At the end of Step 2, each group will have provided a written explanation of how they categorised the food. This can be formally assessed against a variety of standards (e.g. language skills, understanding of topic, etc.). In Step 3 pupils will provide calculations in written format, which can also be formally assessed against a variety of standards (e.g. calculating percentages, understanding of topic, etc.). As part of Step 7, pupils will provide a presentation which will further provide insights into the understanding of the topics, as well as the ability to connect the various findings across topics and subjects. Step 7 will also provide the opportunity to assess the work against presentation and communication skills, as well as against specific ICT skills. When pupils present their findings and categories to each other, acting as a moderator you can facilitate a conversation which will provide you with a good opportunity to observe who may still need additional information or help, etc.</p> <p>Overall, observation will play an important part throughout the unit. In particular, it will be important to ensure pupils remain on task and are engaged; offer support whenever you feel they are stuck. If there are specific problematic aspects of a topic that keep arising, make a note to review them in a follow-up lesson.</p>
<p>15. Intellectual property rights (IPR) / Origin of the activity</p>	 <p>CC BY-NC-ND: This license allows reusers to copy and distribute the material in any medium or format in unadapted form only, for noncommercial purposes only, and only so long as attribution is given to the creator.</p>

ANNEXES

ANNEX 1: Participants' activities

1. Please visit the following link: <https://share.nearpod.com/DFBz1EhhR9> ;
2. You can add the activity into your NEARPOD Library .

ANNEX 2: A day in the life of a Count



The Count wakes up in the morning having had 8 hours sleeping. After a 15 minutes shower, he proceeds to the grand hall on the 2nd floor. After breakfast, he travels along the borders of his estate on his horse and controls that his workers are doing their jobs. This is part of his daily routine, a ride of 120 km (a horse can run at 65 km/h, pupils should remember to calculate the way back, groups that remember it should be congratulated), other tasks are completed by his servants. When he returns to the castle, he takes the stairs to go up to the 3rd floor; each flight of stairs has 21 steps (every day, he spends 25 minutes climbing stairs; pupils who calculated the energy burnt by the Count when going down the stairs in the morning should be congratulated too). The Count changes his clothes. He skips lunch and with his friends takes a walk of 8 km along the riverside. His friends warn him about that skipping lunch is unhealthy. He tells them that he had a full platter of snacks. When they are about to have dinner, they realise a spy has entered the castle: they spot the spy and run after him, but after 1 km they give up as they are unable to catch him. They walk their way back to the castle, where the Counts hosts his friends. After checking the security system, everyone goes to bed.

ANNEX 3 - Calories burnt through daily activities (assumption: adults weighing ~80 kg)

Activities	Duration	Calories
Standing	1 hour	129.6
Running (~10 km/h)	1 hour	782.4
Climb upstairs	10 minutes	81.84
Lie on a mat	1 hour	105.6
Sleeping	1 hour	81.6
Walking on slopes	1 hour	393.6
Sitting	1hour	80
Riding a horse	1 hour	250
Taking shower	15 minutes	84
Changing clothes	10 minutes	26,89

Web sites for Calorie Calculating

<https://www.calculator.net/calorie-calculator.html>

The 3 Best Calorie Counter Websites and Apps

Web site or App	Information	Link	More
MyFitnessPal	It tracks your weight and calculates a recommended daily calorie intake . It also contains a well-designed food diary and an exercise log.	https://www.myfitnesspal.com	iPhone app Android app Instructional video
Lose It!	It is a health tracker that includes an easy-to-use food diary and exercise log. You can also connect a pedometer or other fitness device.	https://loseit.com	iPhone app Android app Instructional video
FatSecret	FatSecret is a free calorie counter. It includes a food diary, nutrition database, healthy recipes, exercise log, weight chart and journal.	https://www.fatsecret.com	iPhone app Android app

ANNEX 4: One portion of food calories

FOOD SUBSTITUTIONS <https://bit.ly/3gtGgQA>

FOOD	Explanation	Substitutions
<u>BREADS</u>	<i>One serving of bread is equal to approximately 80 calories.</i>	<ul style="list-style-type: none"> ½ bagel (approximately 1 oz) 2 slices of reduced calorie bread ½ English muffin 1 slice of raisin bread 1 slice of white bread 1 waffle, reduced-fat (4.5 in square) ½ cup of cooked oatmeal ½ cup of cream of wheat ½ cup of cooked grits ½ cup of sugar-frosted cereal ¾ cup of unsweetened cereal 8 animal crackers 3 graham crackers ½ cup of rice (cooked) ½ cup of pasta (cooked) 8 reduced-fat classic golden crackers
<u>VEGETABLES</u>		Vegetables are relatively low in calories. In fact one serving of vegetables contains just 25 calories. One serving of vegetables is equal to ½ cup cooked vegetables or 1 cup of raw vegetables.
<u>FREE FOODS</u>	<i>Free foods are those foods that contain 20 calories or less.</i>	<ul style="list-style-type: none"> coffee, black, sweetened with sugar substitute green, herbal or regular tea sweetened with sugar substitute diet soft drinks 1 tbsp fat-free cream cheese 1 tbsp non-dairy creamer 1 tbsp fat-free mayonnaise 1 tsp reduced-fat mayonnaise 4 tbsp fat-free margarine 1 tsp reduced-fat margarine cooking spray 1 tbsp fat-free dressing ¼ cup salsa 1 tbsp fat-free sour cream 1 tsp "light" jam or jelly 2 tbsp sugar-free syrup low-calorie sweeteners (sugar substitutes such as Equal®, NatraTaste®, Sweet 'N Low®, Sweet One®) mustard sugar-free gum and candies (watch portions) salt, pepper, herbs and spices
<u>"NO-FUSS LEFT-OVERS"</u>		Many of the meal plans contain "No-Fuss Left-Overs." Left-overs are a great way to ensure that food is not wasted - giving you the most bang for your buck. Left-overs can also be nutritious and they are "no-fuss" - meaning you don't have to cook anything extra for tomorrow's lunch. You can just put the extra helpings

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		<p>in a plastic container. The next morning - just grab and go! If you want to substitute a different food for the "No-Fuss Leftovers" listed in the meal plan, go to the original recipe to determine the amount of calories per serving and then choose another food with a similar calorie content using the Food Calorie Calculator.</p>
<p><u>SANDWICHES</u></p>	<p><i>Sandwiches make a great meal. But beware, not all sandwiches are created equal. If you would prefer to eat a different sandwich than what is listed on your Meal Plan, you can use the Food Calorie Calculator to determine the fat and calories in various sandwiches. If making your own, choose low-calorie and low-fat condiments such as low-fat mayonnaise and mustard. Add lean meats (and low-fat cheese, if desired) and go heavy on the veggies to give your sandwich an added boost (without all the fat and calories). If you are eating at the local deli, be sure to keep an eye on the portion sizes. If necessary, save the other half for later.</i></p>	<p>Chicken Salad Pita Sandwich 195 calories Italian Grilled Cheese and Tomato Sandwich 241 calories Roast Beef and Horseradish Sandwich 334 calories Ham Sandwich 245 calories Tuna Salad Pita Sandwich 222 calories Tuna Salad Sandwich 295 calories Grilled Ham and Cheese Sandwich 216 calories</p>
<p><u>Fruit</u></p>	<p><i>One serving of fruit is equal to approximately 60 calories.</i></p>	<p>1 (4 oz) apple ½ cup applesauce ½ cup canned apricots 4 whole apricots 1 small banana (4 oz) ¾ cup of blueberries ¾ cup of blackberries 1 cup cubed cantaloupe 12 fresh cherries ½ cup fruit cocktail (choose fruit cocktail packed in "light syrup" to save calories) ½ large grapefruit 17 grapes (3 oz) 1 slice honeydew melon 1 cup cubed honeydew melon 1 (3.5 oz) kiwi ½ small mango 1 small orange ½ papaya 1 cup cubed papaya 1 medium peach ½ cup canned peaches ½ large pear ½ cup canned pears ¾ cup fresh pineapple ½ cup canned pineapple 2 small plums</p>

		<p>1 cup raspberries 1 ¼ cup whole strawberries 2 small tangerines 1 slice watermelon 1 ¼ cup cubed watermelon</p> <p>100% "fruit juice" (not to be confused with a "fruit drink") also counts towards a fruit serving:</p> <p>½ cup apple juice 1/3 cup cranberry juice cocktail 1 cup reduced-calorie cranberry juice cocktail ½ cup grapefruit juice ½ cup orange juice ½ cup grape juice ½ cup white grape juice</p>
<u>Milk</u>		<p>1 cup of whole milk 150 calories 1 cup of low-fat (2%) milk 120 calories 1 cup skim milk 90 calories 1 cup non-fat yogurt (or low-fat 90 calories yogurt sweetened with a low-calorie sweetener) 1 cup low-fat yogurt 120 calories</p>
<u>Beverages</u>	<p>Many beverages contain calories including soda, fruit drinks and fruit juices. However, some drinks are reduced in calories such as diet sodas (zero calories) and low-calorie fruit juices/drinks.</p>	<p>Tea and coffee can be low in calories, depending on the way they are prepared. Tea and coffee can be sweetened with sugar substitutes and non-dairy creamer without adding excess calories. On the other hand, adding sugar and creamers such as half and half significantly increase the calories. If you include sugar and/or creamers in your coffee, tea or other food or beverage, you should include these calories when figuring your overall caloric intake total.</p>

ANNEX 5: Peer evaluation rubric

Points awarded for each presentation will be collected in a table similar to the one shown below. The table can be filled in by pupils, either individually or by groups.

One pupil or group must express no more than one vote per category by adding an 'X' against the chosen mark.

CATEGORIES	1	2	3	4	5
a) Each meal and snack servings are prepared to be enough for the requirements of a full adult					
b) Each meal or snack serving presentation is interesting / appetizing					
c) Reason of each serving's content is expressed well.					

*Scale from 1 (not good) to 5 (very good)

Alternatively, each pupil or group can be handed a set number of Post-It notes. Pupils can then decide to award one or more marks for each presentation, simply by sticking one or more Post-It notes against the chosen category. The only conditions are the following:

- they must use up all of their marks;
- they must spread their marks so that each group gets at least one mark and each category gets at least one mark;
- they are not allowed to assign a mark to themselves.

Example: There are 4 groups in your class. Each group is given 7 votes (i.e. 7 Post-It notes). Group 4 decides to give Group 1 one vote for category a), 2 votes to Group 2 for category b, 3 votes for Group 3 for category a, 1 vote to Group 3 for category c.

CATEGORIES	Post your mark!
a) Each meal and snack servings are prepared to be enough for the requirements of a full adult	
b) Each meal or snack serving presentation is interesting / appetizing	
c) Reason of each serving's content is expressed well.	