

4.4 Case study 4 (CS4 Portugal)

Concept focus	Nutritional composition of food Making food choices
Activities implemented	Activity B: Food cards
Inquiry skills	Working collaboratively
Scientific reasoning and literacy	Scientific reasoning (problem-solving)
Assessment methods	Classroom dialogue Teacher observation Self-assessment Student devised materials (reports) Presentations
Student group	Grade: upper second level; vocational (professional) equivalent to 10 th grade Age: 14-19 years Group Composition: mixed ability and gender; 12 boys, 16 girls Prior experience with inquiry: No prior experience with inquiry

Students were asked to address a real-world problem – how might their school prepare “healthy snack kits,” as there was no cafeteria available. The teacher focused on the inquiry skill of *working collaboratively*, which was assessed through observation using an observation grid and students were assigned a performance using a four-level rubric. The teacher discussed the criteria with the students in advance. In addition, summative assessment was carried out, which included a contribution from *working collaboratively*.

(i) How was the learning sequence adapted?

The **Food and food labels** SAILS unit was adapted to the school context and the students’ age and it started with a real problem that needed to be solved. The teacher wanted to motivate the students by asking them to solve concrete problems related to the curriculum content. Since the school does not have a working cafeteria, the students started with the following problem: “How can we maintain healthy food habits if we do not have a cafeteria? How can we have proper snacks between main meals at a low cost and without compromising the nutritive and hygienic quality of food?”

The goal was to select the proposal that best answered the question. The problem solving was subdivided in two phases. In the first phase, a snack was developed from the nutritional analysis of food and teenagers’ energy needs. This can be related to Activity B: Food cards in the original unit, but adapted for implementation at a higher level. In a second phase, packing and conservation of meals in good conditions of food hygiene was considered. For the case study, the results of the first phase of the work were considered. The students were provided with a worksheet, which featured the research question and some guidelines for formatting their reports and resources for searching for information (Figure 1).

The unit was implemented over five 60-minute lessons, which were scheduled as follows:

- Lesson 1: Definition of the problem/strategy, discussion of the assessment criteria or rubric, and group’s organisation
- Lesson 2-4: Development of the proposals of appropriate snack
- Lesson 5: Presentation and discussion of proposals

“Healthy School Snacks” kit

Food is one of the most important aspects of individuals’ health. In addition to providing pleasure, it is essential to life. Food provides several nutritive substances that the organism needs. At our school, we are debating a problem:

How can we maintain healthy food habits if we do not have a cafeteria? How can we have proper snacks between main meals at a low cost and without compromising the nutritive and hygienic quality of food?

Assignment

The written work should include:

- Theoretical framework, where the objective must be specified, as well as the theoretical concepts considered (rational nutrition, nutrient, nutritional needs, and energetic needs) and the main Food Rules;
- The first phase of the snack proposal should present a brief characterisation of the proposal (food comprised in it, nutritional composition, nutritive value and type of confection/packaging). The second phase should detail good practices of food hygiene/HACCP;
- Discussion should feature critical analysis of the proposed snack and statement of the difficulties experienced during the development of the work;
- Conclusion should provide a summary of the learned information and contents.

Other specifications: the paper must be written using a word processor programme (for example, Microsoft Word) with an A4 page format, vertical, normal margins, Arial 12 font for body text and 14 for headings (for subheadings use 12 bold font). The paper should have a maximum of 15 pages. Terms and concepts used during classes should be employed. “Brazilian Portuguese” terminology should be avoided.

To build the “healthy school snacks” kit (i.e. for food choices) you may visit the following websites:

- Portuguese nutritionists association: www.apn.org.pt (e-books: *School snacks* and *Eat well outside your home*);
- Food composition chart:

<http://www.insa.pt/sites/INSA/Portugues/AreasCientificas/AlimentNutricao/AplicacoesOnline/TabelaAlimentos/Paginas/TabelaAlimentos.aspx>

Figure 1: Student worksheet for CS4 Portugal

(ii) Which skills were to be assessed?

The assessment focused on the skill of *working collaboratively*, in particular teamwork and debating with peers. For assessment of teamwork, students were expected to be able to work within diverse teams and to produce ideas based on views from team members. They should be able to take into account and deal with disagreements, manage time and workload and agree procedures. Assessment of this skill can include self-assessment. Students’ skill in debating with peers is developed through student dialogue. Students should have the ability to talk, listen, take on other peoples’ viewpoints, empathise with different views and show respect. The skills were assessed using a rubric that was discussed with the students after the problem formulation and work organisation during the first lesson (Table 1). In addition, this skill can be assessed through teacher

observation, using a registration grid, in which the teacher notes the number of times that certain behaviour is observed (Table 2).

Table 1: Rubric for assessment of working collaboratively

Skills	Emerging	Developing	Consolidating	Extending
Teamwork Interpersonal relationships and group functioning (emotional literacy)	Observes and accepts the colleagues' proposals in the organisation of the group work, but gives no suggestions; merely accepts what the colleagues are doing (due to difficulties in interpersonal relationships).	Participates in the organisation of the group work, but only makes one or two suggestions that add little value to what was already done (due to difficulties in interpersonal relationships).	Participates in the organisation of the group work and gives positive suggestions contributing to a productive group dynamic.	Participates in the organisation of the group work and significantly contributes to a productive group dynamic, creating positive personal interactions (allowing the improvement of others and raising the work level).
Debating with peers (discussion)	Presents the obtained results without explaining how they were achieved.	Presents the results and describes how they were obtained.	Presents the results and explains the reasoning for obtaining them.	Presents the results, explains the reasoning for obtaining them and discusses those results.

Table 2: Registration grid for assessment of working collaboratively

Behaviour	Student x	Student y	...
Does not interrupt when others speak			
Questions the colleague regarding what he is saying			
Defends his points of view			
Talks with kindness			
Challenges a quieter colleague to speak			
Congratulates the colleagues when they present a positive idea			
Assumes an active role in order to solve conflicts between colleagues			
Defines /clarifies the work's objectives			
Defines/distributes/negotiates tasks among colleagues			
Draws attention to time			
Faced with distractions draws the group's attention to the work			

The work was carried out in student-selected groups of three to five students. All the groups were mixed-sex groups. At the end of the activity the students individually completed an opinion questionnaire regarding teamwork. The questionnaire analysis revealed that some students did not say everything they wanted, either by lacking the necessary knowledge or because they lacked confidence. Students seem to have some problems regarding interpersonal relations and some difficulties in structuring tasks, however, almost all students said they have defended their ideas. It was also verified that students did not answer the questionnaire by self-assessing their performance

within the group, but instead they expressed their opinion considering only the final presentation by the group to the whole class; this kind of answers prevent the drawing of more informative conclusions on students' perceptions about their individual performance within the group.

The teacher used formative and summative assessment, giving written and/or oral feedback throughout the activity development (namely, in the final written work, in the group's presentations, and taking observation notes regarding the development of the teamwork).

(iii) Criteria for judging assessment data

The teacher discussed the expectations for developing their skills in *working collaboratively* with the students in the first lesson. During the lessons, the teacher observed the students and groups, and noted when certain behaviours were evident. The themes and indicators for performance in this skill were identified by the teacher in advance of the class, as shown in Table 3.

Table 3: Teacher's assessment guide for evaluation of working collaboratively

Dimensions	Themes	Indicators
Performance in a team (interpersonal skills observed and recorded in the observation grid)	Empathic listening	Does not interrupt when others speak
		Seeks to understand others points of view
	Assertiveness (exhibits and keeps his point of view)	Defends his point of view
		Talks with kindness
	Interpersonal support	Helps the colleagues with difficulties
		Gives positive feedback to colleagues
		Encourages the colleagues that are less involved
	Conflicts management	Uses strategies to solve negative conflicts
		Tries to include the colleagues' points of view in a coherent whole
Tries to listen to all points of view		
Teamwork performance	Teamwork structure	Defines the work's objectives
		Distributes tasks among all group members
	Teamwork dynamics	Tracks the development of the group work
		Considers and tracks the time
Debating with peer (discussion) (Qualitative observation notes recorded by the teacher during the discussion in large group)	Substantive knowledge	Shows scientific knowledge about the subject
		Appropriate scientific language
	Reasoning	Shows cognitive skills that allow the analysis of information
		Relates different information, knowing how to retrieve and work with that information

The teacher expected the students to be able to develop a proposal for a well-adjusted snack, suited to the energy needs of teenagers, and according to the taught contents. She also expected the students to be able to reveal capacity of analysis and interpretation of the data contained in the food composition table, being able to support their snack proposal in class.

Table 4: Rubric for assessment of student reports

Criterion	Level 1 Undeveloped	Level 2 Under development	Level 3 Fully developed	Rating
Introduction	Presents the work and its objectives in an incomplete and/or poorly understandable way.	Presents the work and its objectives in a poorly complete way or in a way that is hard to understand.	Presents the work and its objectives in a complete and understandable way, interesting to read.	Level 1 – 0 Level 2 – 10 Level 3 – 20
Healthy school snack kit	The kit does not comply with the rules of rational nutrition and food hygiene in the majority of the presented proposals.	The kit does not comply with the rules of rational nutrition and food hygiene only with regard to the amount of each food and/or the Good Practices of Food Hygiene.	The kit complies in an original and creative way with the rules of rational nutrition and food hygiene.	Level 1 – 0 Level 2 – 30 Level 3 – 60
Discussion	The critical analysis is poorly reflective or it is even inexistent. The exploration of the experienced difficulties throughout the work development reveals little ability to self-criticism and reflection.	The critical analysis is poorly reflective or even inexistent or the exploration of the experienced difficulties throughout the work development reveals little ability to self-criticism and reflection.	The critical analysis is reflective and enriches the work. The exploration of the experienced difficulties throughout the work reveals ability to self-criticism and reflection.	Level 1 – 0 Level 2 – 10 Level 3 – 20
Conclusion	Presents vague and/or poorly understandable conclusions.	Presents incomplete and/or poorly understandable conclusions.	Presents a good synthesis of the work as well as the application of the main laws of rational nutrition and accomplished learning.	Level 1 – 0 Level 2 – 10 Level 3 – 20
Group Work <i>Teacher's observation notes from classes</i>	Observes and accepts the colleagues' proposals for the work's structure, but gives no suggestions, just accepts what the colleagues are doing (due to difficulties with interpersonal relationships).	Participates in the development of the work's structure, but gives only one or two suggestions that add little value to what was already made (due to difficulties with interpersonal relationships).	Participates in the development of the group work's structure and contributes with positive suggestions to create a productive group dynamic.	Level 1 – 0 Level 2 – 15 Level 3 – 30
Communication/ discuss with others	Presents the results without explaining how they were attained.	Presents the results and describes how they were attained.	Presents the results, explains the reasoning involved in their attainment and discusses those results.	Level 1 – 0 Level 2 – 25 Level 3 – 50
Total				200 points

The table for discussion and analysis of nutritional values and the menu proposal preparation was achieved based on an internal teamwork discussion, which led to the debate. Afterwards, each group presented their own proposal to the class, which became another debate opportunity with the large group/class.

As detailed in the worksheet (Figure 1), students were asked to prepare a comprehensive report of their work. The teacher prepared a three-level rubric for summative assessment of the various aspects of this report (Table 4).

(iv) Evidence collected

Teacher's opinion

Mostly students responded positively because they were involved in solving a real problem that affects their everyday lives and is directly related with their future professional situation. Students were motivated and involved in the tasks although they have revealed little autonomy.

The discussion with the students in the first lesson, in which the rubric was introduced, allowed a more accurate comprehension of what was expected to be the final product. In teamwork, students searched and discussed internally until they reached a consensual snack proposal. In their class presentation, students used valid arguments justifying why their snack should be selected to solve the problem. It is relevant that students recognise the importance of their roles, which are performed within teamwork where everyone should cooperate for the development of the final product. It would be important to create discussion moments in class so that every group has the opportunity to receive feedback. The teacher's feedback in class is very important to support the task development and decisions taken within the group.

A positive aspect of discussing the assessment rubric in advance of the activity was the fact that the students understood what was expected as the final product. The most significant difficulty for the teacher was assessment of teamwork during the task development. The teacher chose to assess two groups more thoroughly. It is hard to write notes and simultaneously give feedback to the students regarding the work that they are doing. For an observer the grid is good and complete, but for the teacher that has to manage behaviours and help less autonomous students solving tasks it becomes more complex.

Sample student artefacts

In the proposed snack shown in Figure 2a, the students present a suggestion that meets the three rules for a healthy diet – complete, balanced, and varied. The food is varied and representative of the several sectors of the Mediterranean diet food pyramid. In addition to the selection of the food that comprises the snack, students presented the amount of each one that should be used in the snack's preparation, as well as their nutritional characterisation and the calculation of the energy values per portion. One less positive feature was the choice of pork ham, which could be replaced by another bread complement less rich in saturated fat, such as cream cheese, or avoiding the duplication of dairy, poultry ham. The amounts are imprecise (the weight of the ham slice and the peach).

Kit de lanche escolar



O objectivo deste trabalho é dar a reconhecer a importância de uma alimentação saudável. Uma alimentação equilibrada é essencial para o crescimento e desenvolvimento do organismo humano, como por exemplo:

- 1 Iogurte líquido 185g
- 1 Pão de centeio 70g
- 1 Fatia de fiambre de porco "regular" – 25g
- 1 Pêssego 160g

Cálculo nutricional:

Nome: Iogurte Aromatizado açucarado líquido meio gordo

Grupo: Leites e Produtos Lácteos

Subgrupo: Iogurte

Macroconstituintes

Componentes	por 100 g*	Por Iogurte servido – 185g
Água, g	83,3	154,105
Proteína, g	3,0	5,55
Gordura total, g	1,3	2,405
Total de Hidratos de Carbono disponíveis, g	11,5	21,275
Total de Hidratos de Carbono expresso em monossacarídeos, g	12,1	22,385

(a)

KIT Lanche Escolar

- 1-Fruta (maça cortada - 160g)
- 1- Iogurte de comer natural
- 1/2 -Pão de Integral com manteiga e fiambre

Valor Calórico:

Nome: Maça com casca

Grupo: Frutos e Derivados

Subgrupo: Frutos frescos e derivados

Parte Edível: 90 %

Porção Unitária Recomendada: 160 g

Distribuição Energética (%)

Energia

Componentes	Por 100 g*	Por porção recomendada
Energia, kcal	57	91
Energia, kJ	238	381

Componentes	por 100 g*	por porção recomendada
Água, g	82,9	132,6
Proteína, g	0,2	0,3
Gordura total, g	0,5	0,8
Total de Hidratos de Carbono disponíveis, g	13,4	21,4
Total de Hidratos de Carbono expresso em monossacarídeos, g	13,6	21,8
Monossacarídeos, g	13,4	21,4
Ácidos orgânicos, g	0,20	0,32
Álcool, g	0	0
Amido, g	0	0
Oligossacarídeos, g	0	0
Fibra alimentar, g	2,1	3,4
Ácidos Gordos		

(b)

School Snack Kit

The aim of this proposal is to recognise the importance of a healthy diet. A balanced diet is essential for the growth and development of the human organism, for example:

- 1 Liquid yoghurt 185g
- 1 Rye bread 70g
- 1 Slice of pork ham "regular" - 25g
- 1 Peach 160g

Nutritional calculation:

Name: Flavoured yogurt sweetened liquid medium fat

Group: Milk and dairy products

Subgroup: Yogurt

Macro constituents

Components	Per 100g	Per yoghurt – 185g
Water, g	83.3	154.105
Protein, g	3.0	5.55
Total fat, g	1.3	2.405
Total available carbohydrate, g	11.5	21.275
Total carbohydrates expressed as monosaccharides, g	12.1	22.385

School Snack Kit

1 Fruit (sliced apple - 160g)

1 Natural yoghurt (solid)

1/2 Brown bread with butter and ham

Caloric value:

Name: Apple unpeeled

Group: Fruits and Derivatives

Subgroup: Fresh fruits and derivatives

Edible part: 90%

Recommended unit serving: 160g

Energy Distribution (%)

Energy

Components	Per 100g	Per recommended portion
Energy, kcal	57	91
Energy, kJ	238	381
Components	Per 100g	Per recommended portion
Water, g	82.9	132.6
Protein, g	0.2	0.3
Total fat, g	0.5	0.8
Total available carbohydrate, g	13.4	21.4
Total carbohydrates expressed as monosaccharides, g	13.6	21.8
Mono + disaccharides, g	13.4	21.4
Organic acids, g	0.20	0.32
Alcohol, g	0	0
Starch, g	0	0
Oligosaccharides, g	0	0
Dietary fibre, g	2.1	3.4
Fat acids		

Figure 2: Proposed snacks.

The snack suggested in example 2 (Figure 2b) does not completely characterise the food to be used in its preparation or the amounts of each one. The students consulted the table of food composition, but they did not know how to adapt the data they found to the nutritional characterisation of the food that comprises the suggested snack or to the calculation of its nutritional value.

(v) Use of assessment data

The teacher will continue to implement inquiry activities, because she considers these activities foster the students' involvement and allow content knowledge application in a way that is associated with reality. The inquiry activity prepares students to solve the same kind of problems throughout their lives, allowing them to develop and increase professional skills. The work groups should be changed so that all students can share their ways of working with each other.

(vi) Advice for teachers implementing the unit

The teacher should consider the students' background and the task's requirements, both regarding knowledge and classroom working practices, as well as the search for information and the ability to work in groups.