INQUIRY AND ASSESSMENT UNIT

WOODLICE

What are the living preferences of woodlice (or other commonplace small creatures)?

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WHAT ARE THE LIVING PREFERENCES OF WOODLICE (OR OTHER COMMONPLACE SMALL CREATURES)?

Overview

KEY CONTENT/CONCEPTS

- Introduction to working with living animals
- Living conditions
- Animal behaviour

LEVEL

- Lower second level

INQUIRY SKILLS ASSESSED

- Developing hypotheses
- Planning investigations
- Forming coherent arguments
- Working collaboratively

ASSESSMENT OF SCIENTIFIC REASONING AND SCIENTIFIC LITERACY

- Scientific reasoning (recording data and observations; drawing conclusions)
- Scientific literacy (data analysis and presentation of results; critiquing experimental design)

ASSESSMENT METHODS

- Classroom dialogue
- Teacher observation
- Self-assessment
- Worksheets
- Student devised materials (investigation report)
- Presentations
- Other assessment items (post-activity test)

Classroom materials for this Inquiry and Assessment Unit are available at WWW.SAILS-PROJECT.EU

1. INQUIRY AND ASSESSMENT UNIT OUTLINE – WOODLICE

The **Woodlice** SAILS inquiry and assessment unit outlines an activity that is intended to aid students in learning about the environment, ecology, and animal behaviour. Students investigate the living conditions of woodlice, which are common in large parts of Europe and are easy to handle. Other small animals with similar habitats may also be used. The expected learning outcomes are: (1) learn to plan, perform and evaluate an experimental study, and (2) identify and explain ecological relationships using scientific concepts, models, and theories. These learning outcomes are part of the science curriculum at lower second level across Europe.

Skills emphasised for development and assessment include *developing hypotheses* and *planning investigations* (designing and conducting an experiment). Throughout the activities students will have opportunities to practice a range of other inquiry skills, such as collecting and interpreting data (*planning investigations*), drawing appropriate conclusions (*forming coherent arguments*), and reporting and discussing results (*scientific reasoning*). Suggested assessment tools are provided in the unit, but it is the teachers' choice to select what inquiry skills to develop and assess. This unit can be implemented over two lessons (45 minutes each).

The unit was trialled by teachers in Sweden, Poland, Ireland, Slovakia and Portugal, with students aged 12-16 years (8 classes in total, mixed ability and gender). Teaching approaches varied, for example in Ireland the teacher formed a *guided inquiry*, while in Poland the students engaged in *open inquiry*. In all case studies *developing hypotheses* was assessed, while the assessment of other skills varied between case studies.

2. IMPLEMENTING THE INQUIRY AND ASSESSMENT UNIT

2.1 Activities for inquiry teaching & learning and their rationale

The **Woodlice** SAILS inquiry and assessment unit was developed by the team at Malmö University as a part of the SAILS project. This is proposed as an *open inquiry* activity, in which students are asked to investigate the living conditions of woodlice, which are common across Europe and easy to handle. This activity aids students in learning about the environment, ecology, and animal behaviour. The biology content in this unit is connected to carrying out investigations using living animals. Both ethical and practical issues can be considered. The expected learning outcomes are: (1) learn to plan, perform and evaluate an experimental study, and (2) identify and explain ecological relationships using scientific concepts, models, and theories.

Concept focus	Investigating the living conditions of woodlice
Inquiry skill focus	Developing hypotheses Planning investigations Forming coherent arguments Working collaboratively
Scientific reasoning and literacy	Scientific reasoning (recording data and observations; drawing conclusions) Scientific literacy (data analysis and presentation of results; critiquing experimental design)
Assessment methods	Classroom dialogue Teacher observation Worksheets Student devised materials Presentations

Rationale

Students are asked to obtain woodlice, or other creatures with similar habitats, and to investigate their preferred living conditions. The investigation can be entirely open, allowing the students an opportunity to develop hypotheses, plan investigations to test them, implement their investigations and analyse and interpret their results. Teachers can choose the skills to assess, and alter the implementation to suit their classrooms.

Suggested learning sequence

1. The teacher asks the students to "Investigate the living conditions of woodlice."
2. Some guidance may be provided, such as suggesting variables like intensity of light, amount of moisture in the environment and food preferences.
3. Students then have freedom to form hypotheses, plan investigations to these their predictions and implement the experiments to generate results.

As this is a very open research question, opportunities have been identified for development of many inquiry skills and key competencies. Through this investigation, students can

- Formulate hypotheses about the preferred living conditions,
- Plan an investigation (or a series of investigations) in order to test the predictions,
- Design and conduct the investigation(s),
- Collect, document, and analyse data,
- Draw conclusions supported by the evidence,
- Explain any unexpected results,
- Report, compare, and discuss own results with the results from other students, and
- Suggest how to improve own (or other's) investigation.

2.2 Assessment of activities for inquiry teaching & learning

This unit is particularly suitable for assessing *developing hypotheses*, *planning investigations* (planning and designing scientific experiments), drawing conclusions, explaining unexpected results, reporting, comparing and discussing results, and providing suggestions about how to improve investigations. Use of a 3-level rubric is proposed for assessing investigative skills.

Developing hypotheses – formulate hypotheses about preferred living conditions

There are two aspects for assessment as part of this activity, asking inquiry questions and *developing hypotheses*.

The skill of asking inquiry questions addresses the students' ability to ask questions that can be investigated systematically (Table 1). Questions to guide the students in this skill include:

- Which questions would you like to pose about this?
- What would you like to know about this?
- How could you pose this question, so that you may find an answer to the question?

Table 1: Asking inquiry questions

Level 1	Level 2	Level 3
The student poses a number of questions, but does not make a distinction between questions possible to investigate and questions not possible to investigate.	The student, with the support of others, revises questions so that they become possible to investigate.	The student revises own or others' questions, so that they become possible to investigate systematically.

To develop a hypothesis, students need to collect information and ideas about a question, so that a hypothesis can be formulated (Table 2). Some teacher questions can guide the students:

- What do you think will happen?
- Why do you think this will happen?
- Can you explain by using your scientific knowledge?

Table 2: Formulating hypotheses

Level 1	Level 2	Level 3
The student formulates a prediction about what will happen, but does not explain why.	The student formulates a prediction about what will happen and explains why. The explanation builds on own (or others') experiences.	The student formulates a hypothesis, that is makes a prediction that is scientifically well-founded.

Planning investigations

The skill of *planning investigations* can build on the hypothesis developed, as students should plan how to test their hypothesis (Table 3). Planning involves both identifying appropriate equipment and suggesting a functional design. The teacher can pose the following questions to guide the students:

- How could you investigate this?
- What kind of equipment would you need?
- What would you look for?
- What can you do in order to get as trustworthy results as possible?

Table 3: Planning investigations

Level 1	Level 2	Level 3
The student suggests how an investigation might be designed, but not in detail.	The student suggests how an investigation might be designed, but the design is incomplete in some respect. The design can, with some revisions, be used for systematic investigations.	The student plans an investigation where the design includes... ...identification of variables to change and to be held constant ...the order to perform different parts of the investigation ... equipment to be used.

Carrying out an investigation, including documentation of data

When carrying out an investigation, students should plan how they will collect data. In this aspect, the appropriate use of equipment is also included (Table 4). Questions to guide the students:

- What do you have to keep in mind when using this equipment?
- What could you do in order to make the results as accurate as possible?
- How can you document your results so that your classmates could make sense of them?

Table 4: Carrying out an investigation

Level 1	Level 2	Level 3
The student carries out an investigation from beginning to end, but needs constant support by the teacher/ peers or detailed instructions. The student uses equipment, but handles it in a way that is not always safe. The student sporadically documents the investigation in writing and with pictures.	The student carries out an investigation from beginning to end, but sometimes needs support by the teacher/ peers or detailed instructions. The student uses equipment safely. The student documents the investigation in writing and with pictures, but the documentation is incomplete or lacking in accuracy.	The student carries out an investigation from beginning to end, either alone or as an active participant in a group The student uses equipment safely and appropriately. The student accurately documents the investigation in writing and with pictures.

Forming coherent arguments – interpreting results and drawing conclusions

This aspect is about identifying patterns, making interpretations, and drawing conclusions from the results (Table 5). Students should be able to interpret their results appropriately, form conclusions based on scientific evidence and compare their results to their initial hypothesis. They should develop their *scientific reasoning* capabilities and use reasoning to form coherent arguments. Suggested questions to guide the students in their inquiry include:

- Which patterns do you see?
- How do these results agree with your predictions?
- Can these results be interpreted differently?

Table 5: Interpreting results and drawing conclusions

Level 1	Level 2	Level 3
The student draws conclusions, but only uses a limited amount of the results from the investigation. The student compares the results from the investigation with the hypothesis.	The student draws conclusions, based on the results from the investigation. The student compares the results from the investigation with the hypothesis.	The student draws conclusions, based on the results from the investigation. The student relates the conclusions to scientific concepts (or possible models and theories). The student compares the results from the investigation with the hypothesis. The student reasons about different interpretations of the results.

Forming coherent arguments and scientific literacy – evaluating an investigation

This unit can be used for the assessment of *forming coherent arguments*, and developing students' *scientific literacy*. Students should be able to identify possible sources of error in their investigations and decide if the results and the conclusions are reasonable (Table 6). There are three aspects to consider when evaluating an investigation:

- Explain unexpected results,
- Make comparisons with others' results, and
- Suggest how to improve own (or others') investigations

The teacher can pose questions to guide the students during the evaluation process, for example:

- Do your results agree with the results of others?
- How could your investigation be made more accurate?
- Is this reasonable?
- What sources of error are there in your investigation?
- Are these conclusions reasonable?

Table 6: Evaluating an investigation

Level 1	Level 2	Level 3
The student compares their own results with the results and conclusions of others. The student reasons about how reasonable the results are. The student suggests how to improve the investigation.	The student compares their own results with the results and conclusions of others. The student identifies possible sources of error and reasons about how reasonable the results are. The student suggests how to improve the investigation. The student revises the investigations based on suggestions (their own or from others).	The student compares their own results with the results and conclusions of others. The student identifies and evaluates possible sources of error and reasons about how reasonable the results are in relation to the sources of error identified. The student suggests how to improve the investigation based on a comparison of the planning and actual execution. The student revises the investigations based on suggestions (their own or from others). The student reasons about how reasonable the conclusions are.

The task may also be used to assess students' skills in collecting, documenting, and analysing data, but since this part of the investigation is quite simple, it may be difficult to identify weaknesses in student performance. When documenting the investigation in text and with pictures, students should also use graphs, tables and symbols in their documentation. They should decide how the documentation is used in discussions about results and conclusions (Table 7). Questions to guide the students:

- How can you save your results, so that you may show them to others?
- How can you present your investigation and your results, so that someone else would understand how you have done (or be able to carry out a similar investigation)?

Table 7: Documenting and discussing

Level 1	Level 2	Level 3
The student documents the investigation with everyday language and contextual pictures, drawings, etc. The student uses the documentation in discussions around how the investigation was carried out. The student discusses the investigation in an everyday language.	The student documents the investigation with text and pictures, but also supports the documentation with graphs and tables. The student uses the documentation in discussions around how the investigation was carried out and the results obtained. The student discusses the investigation and results obtained, but combines scientific concepts with everyday language.	The student documents the investigation with text and pictures, but also supports the documentation with graphs, tables, and appropriate scientific symbols and representations. The student uses the documentation in discussions around all parts of the investigation, including the conclusions drawn and how the investigation might be improved. The student discusses the investigation and results obtained with the use of scientific terminology.

Teachers implementing the **Woodlice** SAILS inquiry and assessment unit may also assess students' observation skills. Through the use of observations, students can identify properties, find similarities and differences, and describe objects in words and drawings (Table 8). Questions to guide the students:

- Which properties do these objects have?
- Are there any other properties that may not be as easily discovered?
- Are there any similarities (or differences)?
- How would you describe your observation?

Table 8: Observations

Level 1	Level 2	Level 3
The student identifies easily observable properties among the objects studied.	The student identifies easily observable properties among the objects studied as well as less obvious properties. The student uses several different properties to describe an object.	The student identifies easily observable properties among the objects studied as well as less obvious properties. The student uses several different and relevant properties to describe an object. The student makes use of more than one of the senses, and also makes use of appropriate technological aids, when observing objects.

This activity may also be used to assess students' understanding of basic ecological concepts, such as species, habitat, physical and biotic environment (Table 9). In particular, student understanding of these concepts may be assessed when *developing hypotheses* (if the hypotheses are grounded in scientific knowledge) and when explaining and discussing the results. To guide the students, the teacher can ask, "How would you classify these into different categories?"

Table 9: Classifications

Level 1	Level 2	Level 3
The student classifies organisms, objects, and substances according to easily observable properties (such as the number of legs, colour, or physical state).	The student classifies organisms, objects, and substances according to their properties, including properties not directly observable (such as weight and conductivity).	The student classifies organisms, objects, and substances according to scientific principles (such as biological taxonomies).

3. SYNTHESIS OF CASE STUDIES

This unit was trialled in five countries, producing five case studies of its implementation – **CS1 Sweden**, **CS2 Poland**, **CS3 Ireland**, **CS4 Slovakia** and **CS5 Portugal** – as summarised in Table 10. The ages of the students involved were 12-16 years. Generally, the case studies describe 2-3 lesson periods of approximately 45 minutes. The most common method of implementation was to work in pairs or small groups, mixed with class discussions. A written report from the students was the most common student artefact to assess, even if performance-based assessment was possible.

3.1 Teaching approach

Inquiry approach used

This unit was developed as an *open inquiry* activity and allowed variation in its implementation depending on the class group. In **CS1 Sweden**, unit was implemented as a *bounded inquiry*. Students discussed in groups, and the teacher collected questions. After discussions there was an evaluation from the teacher. The students decided on questions to investigate and engaged in a follow up discussion at the end. **CS4 Slovakia** also used a *bounded inquiry* approach, in which students started by raising questions, before carrying out their investigation in small groups.

In **CS2 Poland** the unit was implemented as an entirely *open inquiry*. In the first lesson they discussed planning their investigations. Students selected investigation to study. Students planned, carried out and analysed results of the experiments entirely on their own, i.e. which animals, factors to investigate, how to collect evidence. Little direction was given by the teacher.

In both **CS3 Ireland** and **CS5 Portugal**, the teachers chose to use a *guided inquiry* approach. In **CS3 Ireland**, the students first engaged in an open discussion, then the teacher picked three options for students to investigate. In **CS5 Portugal**, a theoretical framework for the inquiry was established using images of ecosystems and an interactive discussion.

Implementation

Working with living animals gave an interesting context for this inquiry, although some students needed to be introduced to particular terminology. For example, the students in **CS4 Slovakia** did not know woodlice prior to this investigation. In some cases, such as **CS2 Poland** and **CS5 Portugal**, other animals were used, e.g. crickets, earworms, beetles, centipedes, meal beetle larvae and earthworms. The starting point of the investigation differed between the case studies.

In **CS1 Sweden**, the activity started with students looking at woodlice with magnifying glasses, to give students a chance to examine how to work with living animals. The teacher started with a general discussion and formulating questions took place in the first lesson. The second lesson was used to carry out investigations, write a report and develop conclusions. In a third lesson, the teacher gave feedback on the reports and students discussed how the investigations could be improved.

A *guided inquiry* approach was implemented in **CS3 Ireland**, where after an initial group discussion to collect students' questions, the teacher evaluated the questions and selected the three particular variables to be investigated (the effect of light, amount of moisture and food preferences on the behaviour of woodlice). Students then developed and noted their hypothesis and used a worksheet to guide students' work/collection of information.

An *open inquiry* was used in **CS2 Poland**, and the teachers did not provide suggestions of which variables could be considered in their investigations. They felt this gave students the possibility to work actively and use their imagination. In **CS2 Poland** and **CS4 Slovakia** the students first looked for a picture of woodlice on the internet, noted the environment in which they live, and then collected some of the creatures. The teacher facilitated rich discussions with the students before they started their investigations. Implementation in **CS4 Slovakia** was also organised over three lessons; the first lesson was used

Table 10: Summary of case studies

Case Study	Duration	Group composition
CS1 Sweden	Three lessons (45 min each)	• Groups of 2 students • Mixed ability and gender
CS2 Poland	Three lessons (45 min each)	• 6 groups of 4-5 students (student selected) • Used with four class groups
CS3 Ireland	Two lessons (1x 40 min, 1 x 80 min)	• 8 groups of 2-3 students • Mixed ability and gender
CS4 Slovakia	Two lessons (45 min each)	• 5 groups of 4 students • Mixed ability and gender
CS5 Portugal	Three lessons (50 min each)	• Small groups (3-4 or 4-5) • Teacher assigned groups alphabetically

for engaging the students, the second lesson for developing and testing a hypothesis and the final lesson for completing worksheets and self-assessment.

The teachers in **CS3 Ireland** and **CS5 Portugal** supported the students by giving them sub-questions, which helped them to formulate a testable hypothesis:

1. Inquiry question to be answered:
2. What do you think will happen?
3. Why do you think this will happen?

Inquiry skills addressed

The teachers trialling this unit mainly focused on the inquiry skills of *developing hypotheses, planning investigations* and carrying out the planned investigations. The inquiry skills identified by the teachers in each case study are detailed in Table 11.

3.2 Assessment strategies

Within the five case studies, the inquiry skills of *planning investigations* and *developing hypotheses* were chosen for assessment in most cases (Table 11). The teachers also assessed students' skills in *forming coherent arguments* and *working collaboratively* and opportunities to develop and evaluate *scientific reasoning* and *scientific literacy* were identified. The assessment methods described in the case studies include teacher observation and classroom dialogue, as well as self-assessment of *working collaboratively* in **CS5 Portugal** and a post-implementation test in **CS2 Poland**. Student artefacts, such as worksheets, presentations or other student devised materials were evaluated in most case studies. The teachers used the rubrics provided in the assessment of activities for teaching and learning section of the unit, with some modifications.

In **CS1 Sweden**, the assessment was based on the knowledge requirement for this year group. The teacher adapted the rubrics to suit the local curriculum for biology. A 3-level rubric was used to assess the students' abilities based on their lab reports, which included both text and drawings (Table 12).

Table 11: Inquiry skills identified by teachers in the case studies

CS1 Sweden	• Developing hypotheses • Planning investigations • Scientific reasoning (recording data and observations) • Scientific literacy (critiquing experimental design)
CS2 Poland	• Planning investigations • Forming coherent arguments • Scientific reasoning (data entry, drawing conclusions) • Scientific literacy (data analysis and presentation of results)
CS3 Ireland	• Developing hypotheses
CS4 Slovakia	• Developing hypotheses • Planning investigations • Working collaboratively
CS5 Portugal	• Developing hypotheses • Working collaboratively

Table 12: Assessment scale used in CS1 Sweden

E	C	A
1. The student contributes to formulating simple questions and planning which can be systematically developed.	The student formulates simple questions and plans which after some reworking can be systematically developed.	The student formulates simple questions and planning which can be systematically developed.
2. The student uses equipment in a safe and basically functional way.	The student uses equipment in a safe and appropriate way.	The student uses equipment in a safe and effective way.
3. The student contributes to making proposals that can improve the study.	The student makes proposals that after some reworking can improve the study.	The student makes proposals that can improve the study.
4. The student draws up simple documentation of their studies using texts and pictures.	The student draws up developed documentation of their studies using texts and pictures.	The student draws up well-developed documentation of their studies using text and pictures.

In **CS2 Poland**, the teacher assessed a particular skill per student group: one group were assessed on *planning investigations*, one group on carrying out an investigation and one group on analysing results (*forming coherent arguments*). The teacher used several rubrics from the unit, and adapted to a 6-point scale, which is more commonly used in the Polish school system (Table 13). The assessment was based on teacher observation and evaluation of written reports. The teacher developed a test afterwards for deriving conclusions from the last lesson. The students were disappointed by the grades they received. The teacher commented that group work could be deemed unfair for individuals.

Table 13: Rubric for the assessment of data analysis and presentation of results in CS2 Poland

Assessed skill	2 points level	4 points level	6 points level
Data analysis and presentation of results	The student interprets the data correctly (categorising the measured variables as lesser or greater), but is not able to create a proper graph based on the data	The student presents the data on a graph, but the graph lacks or has poorly developed elements such as axis titles, scale, legend, etc.	The student presents the data on an appropriate graph(s) including all necessary elements such as axis titles, scale, legend, etc. prepared correctly
	The student points out basic/selected sources of biased/incorrect results of the experiment	The student enumerates the main sources of biased/incorrect results of the experiment	The student analyses all main sources of biased/incorrect results of the experiment and indicates the ways to avoid such results in the future
	The student proposes the elements of the method serving to improve the experiment	The student proposes ways to improve the course of the entire experiment step by step	The student compares their results with other groups, discusses data interpretation and proposes methods to improve both their own and the other groups' experiments

In **CS3 Ireland**, the assessment of the skill of *developing hypotheses* was carried out both in-class (as students are discussing the questions or by examining what they have written in-class) or after the lesson (evaluation of student artefacts). The teacher identified several key considerations for the assessment of this skill, and used a 4-level rubric for the assessment of students' worksheets (Table 14):

1. Is the question clear and qualified (e.g. do students mention levels)? Is the question testable and specific enough?
2. Is the prediction linked to the question? Does it suggest an outcome to the investigation?
3. Is the hypothesis justified, for example based on personal experience, students' own observations, or trials?

In **CS4 Slovakia**, the skills of *forming coherent arguments* during peer discussion, *developing hypotheses* and forming conclusions and *planning investigations* were assessed during the discussion, using adapted 4-level rubrics (emerging/developing/consolidating/extending) to assess the inquiry skills (Table 15).

Table 14: Rubric used to assess developing hypotheses in CS3 Ireland

Assessed skill	Emerging	Developing	Consolidating	Extending
1. Generating questions	A question was formulated e.g. "Do woodlice swim?"	A clear investigable question was formulated, such as distinguishing between moisture, humidity, liquid water	A clear investigable question was formulated mentioning specific levels of food/light/moisture	A clear investigable question was formulated mentioning specific levels of food/light/moisture and how it affects the woodlice
2. Making predictions	A prediction is made	A testable prediction is made linked to the question	A testable prediction to the question is made that suggests a clear outcome	A testable prediction to the question is made that suggests a clear outcome based on scientific reasoning
3. Formulating hypotheses	Hypothesis not justified	Hypothesis based on personal experience or inference	Hypothesis based on scientific knowledge or scientific observation	Hypothesis based on scientific knowledge or scientific observation with clear explanation

Table 15: Rubric used for the assessment of inquiry skills in CS4 Slovakia

Assessed skill	Emerging	Developing	Consolidating	Extending
1. Peer discussion and forming coherent arguments	The student describes the course of their own search (information or animals).	The student argues for the search approach and achieves a result (brought woodlice, found out the facts about them).	The student argues logically for the search approach, achieves the result, listens to the experiences of others and responds to them.	The student argues logically for the search approach, achieves the result, responds to the experiences of others, and following discussions, concludes and formulates a hypothesis
2. Formulating hypotheses and conclusions of investigation	A prediction is made.	A testable prediction is made linked to the question.	A testable prediction to the question is made that suggests a clear outcome.	A testable prediction to the question is made that suggests a clear outcome based on scientific reasoning.
3. Planning investigations	The student has a plan to verify the hypothesis.	The student has a plan to verify the hypothesis, consults with others and is willing to compromise.	The student has a plan to verify the hypothesis, consults with the others and is inclined towards a solution that allows them to obtain an accurate result.	The student has a plan to verify the hypothesis, consults with others, and is inclined towards a solution based on scientific thinking.

In **CS5 Portugal**, the teacher decided to evaluate teamwork (*working collaboratively*), paying attention to gender issues and the skill of *developing hypotheses*. Students had to develop a hypothesis, provide a justification for that hypothesis and show the link to the research question. The teacher gave feedback throughout the inquiry process, and assessed the final products. The teacher used a 4-level rubric, adapted from the rubrics provided in the assessment of teaching and learning section of the unit, to assess these skills (Table 16).

Table 16: Assessment criteria from CS5 Portugal

Skill	Emerging	Developing	Consolidating	Extending
1. Working collaboratively (teamwork, interpersonal relationships and group functioning; emotional literacy)	Observes and accepts the colleagues' proposals in the group work, but gives no suggestions; merely accepts what the colleagues are doing (due to difficulties in interpersonal relationships).	Participates in 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 group work and gives positive suggestions contributing to a productive group dynamic.	Participates in 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).
2. Formulating a hypothesis	Formulates hypotheses that are not consistent with the planning or that are not eligible for investigation.	Formulates hypotheses that are consistent with the planning of the experiment.	Formulates hypotheses that are consistent with the planned experiment and are based on the research questions.	Formulates hypotheses that are consistent with the planned experiment. Those hypotheses are based on the research questions and identified variables.

When assessing teamwork, the teacher focused on selected groups, and completed an observation grid based on the behaviours observed during peer discussions (Table 17). The teacher found that students were able to work within diverse teams. They could produce ideas based on views from team members. They could take into account and deal with disagreements. They managed time and their workload and could agree procedures. Students also self-assessed their performance during group work using a flow chart.

Table 17: Registration grid for the assessment of working collaboratively in CS5 Portugal

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 quieter colleagues to speak			
Congratulates 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			