

## 4.1 Case study 1 (CS1 Sweden)

<b>Concept focus</b>	Investigating the living conditions of woodlice
<b>Inquiry skills</b>	Developing hypotheses Planning investigations
<b>Scientific reasoning and literacy</b>	Scientific reasoning (recording data and observations) Scientific literacy (critiquing experimental design)
<b>Assessment methods</b>	Classroom dialogue Teacher observation Student devised materials (investigation report)
<b>Student group</b>	<b>Grade:</b> Year 6 (lower second level) <b>Age:</b> 13 years <b>Group composition:</b> co-ed <b>Prior experience with inquiry:</b> No prior experience

This case study details implementation during three lesson periods. Students' skill in *developing hypotheses* was assessed through classroom dialogue, while skill in *planning investigations* was assessed by teacher observation of students' use of equipment. In the final lesson, students critiqued their experimental design and prepared a lab report, thus developing their *scientific reasoning* and *scientific literacy*. The teacher used a three-level assessment scale to evaluate student performance.

### (i) How was the learning sequence adapted?

The **Woodlice** SAILS inquiry and assessment unit was tried during three lessons. The students worked together in pairs. In the first lesson the students looked at the woodlice with the help of loupes. The teacher provided a general overview of how a systematic investigation can be carried out. During the end of the first lesson the students were asked to formulate a research question concerning the living conditions for woodlice and a list of what material they needed for their investigation. During the second lesson the students made their investigations. They documented their experiments, results and conclusions. In the beginning of the third lesson the students got a response on their lab reports and were asked to formulate how their investigations could be improved.



Figure 1: Selected images of the students' experiments

## (ii) Which skills were to be assessed?

The skills identified for assessment were *developing hypotheses* and *carrying out an investigation*, as well as developing *scientific reasoning* capabilities through documentation of results and *scientific literacy* through critiquing experimental design:

1. The student's ability to formulate a research question that can be investigated systematically.
2. How the student used the equipment.
3. The student's suggestions on how to improve the investigation.
4. The student's documentation from the investigation.

The assessment was based on the knowledge requirements at the end of year 6 in the Swedish compulsory school and an assessment tool was prepared for use in the case study (Table 1).

**Table 1: 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, which after some reworking can improve the study.	The student makes proposals, which 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.

## (iii) Criteria for judging assessment data

1. During the first lesson the students formulated their research question individually. In the first step they then discussed their question in pairs and chose one of their questions, which was shown to the class. The different questions were discussed with the class and the teacher. Finally, the students picked up one of the discussed questions. The teacher assessed the whole process.
2. Students' skill in using equipment was assessed by teacher observation during the first and second lessons. The teacher also discussed with the students how to handle the woodlice.
3. During the third lesson the students got the opportunity to write down improvements of their initial investigation. The teacher felt it was easier to make this without any disturbance, for instance other students working with the woodlice. The teacher assessed the lab report.
4. During the whole process the students used both text and drawings in their documentation, which was assessed by the teacher in the lab report.

## (iv) Evidence Collected

### Teacher opinion

The teacher thought it was a strength to carry out the investigations in several steps, during three lessons. Since it was the first time for the class and teacher working together with systematic investigations the teacher needed some time to explain what a systematic investigation is. The teacher considered the unit as suitable for an introduction to systematic investigation, especially *developing hypotheses* and questions. The teacher found that it is important to let the students

share ideas with each other. In this way all students in the end had a research question that was possible to work with. The unit was suitable when assessing how students handle living creatures.

### **Sample student artefacts**

The most common question proposed was to investigate was if the woodlice preferred light or darkness. It was also common to investigate conditions about temperature, moisture and food. It was sometimes hard for the students to really differentiate light from darkness and so on. Some of the students did not wait enough time to get a reliable result.