

## 4.2 Case study 2 (CS2 Denmark)

<b>Concept focus</b>	Introduction to IBSE
<b>Inquiry skills</b>	Developing hypotheses Planning investigations (carrying out investigations)
<b>Scientific reasoning and literacy</b>	Not assessed
<b>Assessment methods</b>	Classroom dialogue
<b>Student group</b>	<b>Grade:</b> grade 7 (lower second level) <b>Age:</b> 13 years <b>Group composition:</b> co-ed (9 girls, 12 boys) <b>Prior experience with inquiry:</b> No prior experience

This case study describes implementation with a group of lower second level students aged 13 years, with no prior experience in inquiry. Skills assessed were *developing hypotheses* and *planning investigations*, which were evaluated through provision of formative feedback during classroom dialogue. The teacher found that these students were too young to effectively implement this unit, as they were not capable of both understanding the scientific concepts underlying mechanics and at the same time trying to understand how to do inquiry.

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

The **Collision of an egg** SAILS unit was implemented in full in this case study. This topic was chosen because it seemed like a good introduction to doing inquiry, with a theme that was exciting for the students at the same time. The thrill of letting go of an egg and the excitement of saving the egg from crashing was thought to be a good introduction.

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

The following skills were assessed in this case study: *developing hypotheses*, *planning investigations* and carrying out an investigation.

To assess these skills, the teacher studied rubric assessment tools from another inquiry activity, specifically looking at the chosen inquiry skills. This was done so that the teachers could use the progression in the rubrics as foundation for a constructive and scaffolding talk with the students during their inquiry work. Teacher did not use specific rubrics for assessment in this class.

### (iii) Criteria for judging assessment data

The teacher had the expectation that the students while following the instructions in the lesson plan would reflect on and learn about how to carry out investigations. The focus was on students to identify different variables influencing the collision of the eggs and on creating a proper hypothesis to investigate. When actually carrying out the teaching the teacher came to the conclusion that the criteria from the rubrics were not appropriate for practice when trying to use them on a whole class at the same time. It therefore turned in the direction of formative assessment based on what the teacher remembered from the rubrics and prior experience of the teacher.

### (iv) Evidence collected

#### Teacher opinion

The learners were very positive towards the assignment and started out with trying to solve the inquiry practically, but ended up with smashing eggs from the tallest height. The teacher noted during the lesson that the students were not capable of both understanding the scientific concepts and interdependencies in mechanics and at the same time trying to understand how to do inquiry.

At the start of the lesson, students tried to follow the work sheet. But quickly questions came up in the different groups, showing the teacher that the students were not prepared for such an open inquiry yet. These were questions such as “what is a variable?” or “what is a hypothesis?”

Afterwards the teacher did not think that she had used the rubrics very well for assessment most of all because there was a severe lack of inquiry and a lot of just smashing eggs. The teachers answered afterwards that she would not do this exercise again with students at this age and thereby confirming that the age group of this unit should not be lowered from the 15 years that was first intended.

### **Observer notes**

As an observer I tried to be the fly on the wall during the two hours of teaching. It was my impression that the students wanted to do the assignment well. Many groups started out with a small-scale inquiry of dropping eggs in buckets of flour from half a meter. But no groups had a control of variables in their exercise planning. There were for example no groups that considered the amount of flour in the buckets. They started their investigation without such considerations beforehand and thereby came to conclusions that were not very valid. As an observer it was my impression that the students were disappointed in their own competence to carry out an investigation and that this disappointment was the main reason for not continuing with inquiry but instead starting smashing eggs.

At first the teacher tried to use what she remembered from the rubrics intended for assessment but soon the teacher also discovered that the lesson did not work with the students and from there it was more “fire-fighting” than assessment from the teacher. As an observer I would suggest three reasons for the lesson going that bad, namely: i) the students did not have enough scientific knowledge about mechanics to actually being able to identify different factors influencing if the egg crashed or not in a collision; ii) the students were not trained enough in doing inquiry and the task was therefore too open for them to get a grip on; and iii) the students was not aware of the goal with the investigation which appeared as some students were focusing on gaining knowledge of mechanics while others were focused on gaining inquiry skills. In this way the students were put between two chairs.

### **(v) Use of assessment data**

As the end of the lesson, the teacher summed up the experiences of the day and presented the students with the intended learning goals. She then took the blame for letting the students come in a position where they were not able to handle the challenges put up in the lesson. The teacher intended to step back and to introduce inquiry in a more structured way the next time she would do inquiry with the class.

### **(vi) Advice for teachers implementing the unit**

An advice for new teachers doing this unit could be to do it in two separate lessons where the first lesson is focusing on clarifying variables and planning experiments and the second part would be to actually carry out the experiments. This would give the teachers a better chance to judge and scaffold the students’ plans for their experiments and the teacher would not have to take care of helping some with the planning while others were already smashing the eggs.