

## 4.6 Case study 6 (CS6 United Kingdom)

<b>Concept focus</b>	What makes oranges float?
<b>Inquiry skills</b>	Developing hypotheses Planning investigations Working collaboratively
<b>Scientific reasoning and literacy</b>	Not assessed
<b>Assessment methods</b>	Classroom dialogue Teacher observation
<b>Student group</b>	<b>Grade:</b> Year 8, lower second level <b>Age:</b> 12-13 years <b>Group composition:</b> mixed gender; higher attaining, “top-set” students, seven groups of 3-4 (31 students in total) <b>Prior experience with inquiry:</b> No prior experience in inquiry based skills approach.

The emphasis in this inquiry session was placed on the students asking inquiry questions and then testing them out and observing what happened, rather than on them getting the “right” answer. Skills assessed were *developing hypotheses*, *planning investigations* and *working collaboratively*. Assessment was formative, and provided through teacher observation and in-class questioning. No formal rubric was used, but the teacher did identify five general criteria for success during the lesson.

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

The **Oranges** SAILS inquiry and assessment unit was implemented as suggested in the original unit, in a single 40-minute lesson. The class worked in seven groups of four students and one group of three members. Mixed gender groups were formed where possible, aiming for pairs of each gender in each small group. The class had done a lot of practical work/experiments previously, but not with the focus on planning an inquiry. Practical lessons typically consist of a teacher giving the students a question and a method which the students then follow it, with little thought to variables and reasoning of process. An emphasis in this inquiry session was placed on the students asking inquiry questions and then testing them out and observing what happened, rather than on them getting the “right” answer or being right or wrong. This class was selected to trial this inquiry activity as they are a well-behaved and able group. They are a high achieving “top-set” group.

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

To begin, the students were asked to predict whether an orange would float or sink, and the teacher then tested this at the front of the class. Next a problem was posed to the class group “What makes oranges float?” The students explored this question in small groups, through asking and testing their own inquiry questions.

There was little direction from the teacher and also minimal equipment was initially provided. This was to avoid limiting students’ creative thoughts and inquiry questions, as seeing certain equipment might have influenced their approaches. Students were allowed to ask for any additional equipment that they needed and this was provided as long as the school had it and it was safe to use.

Students had 40 minutes to plan and carry out their inquiry. Students were not expected to write down their plan, but had to verbally explain their method – this encouraged more trial and error as no time was wasted writing things down. At the end of the lesson students were given the opportunity to discuss as a class group what went well, what could have been improved, as well as what other questions would they like answered.

While each of the small groups worked on developing their inquiry questions and method, there was time for the teacher to move around the various groups and listen to the discussions and conversations taking place as the students worked. The teacher asked questions on the group's rationale but was very careful not to lead or steer the groups in any one direction. Assessment was done through teacher observations and questioning during the lesson (although no notes were written down at the time). However, a follow up lesson where students could individually write a report on their inquiry would allow for more formal summative assessment and teacher feedback if this were felt necessary.

### **(iii) Criteria for judging assessment data**

When assessing groups the following criteria became apparent as the lesson progressed.

1. Did the groups develop a logical order to test their questions?
2. Did their testing actually answer their questions?
3. Was there an even contribution of ideas and partaking of roles (i.e. no dominant or passive members of the group)
4. Could students articulate their ideas to one and another?
5. Did the groups successfully negotiate a resolution to any conflict of ideas?

### **(iv) Evidence collected**

#### **Teacher's opinion**

It was evident from teacher observations that the students were slightly scared and inhibited at first, because of the freedom the task gave them. The initial apprehension seemed to decline after testing the first inquiry question and students quickly became engaged and confident at developing their own inquiry based questions. Within groups, there was a degree of disagreement over which question to test first. Most groups could resolve this themselves, however in some it was the dominant member who got their way. The groups were rigid in their approaches at first, but when their early ideas failed them then began to scientifically "play" and became more creative and independent in their thinking. Students initially wanted to write down their ideas before trying them, however as the lesson went on students became more confident to trial their ideas without written instructions.

It was evident from the lesson that most students were able to generate questions and test them out in an organised way. In addition, while initially there were problems within the groups, most groups were able to resolve these differences swiftly and then work effectively.

Students seemed to gain confidence in their inquiry skills and working without the lead of a teacher as the session progressed. The anxiety students felt at the beginning seemed to dissipate and they became more comfortable working without knowing if their answer was right or wrong. This genuine inquiry seemed to engage them all.

In future, the students could be formally assessed against a criteria like in the rubric provided in the unit. This would need to be done over a series of lessons and with a mixture of teacher observations and written work to get a clear picture. No rubric was used in this session. Assessment was all informal and the teacher just noticed things as they arose. No written notes were made by the teacher at the time or after.