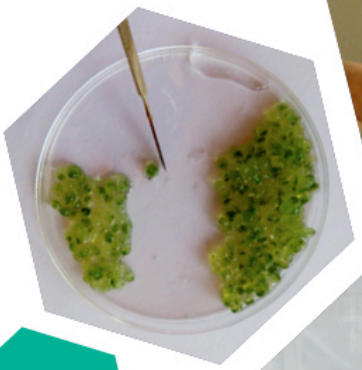
Teacher Education Programme

Strategies for Assessment of Inquiry Learning in Science



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SAILS
Strategies for Assessment of Inquiry Learning in Science

Session 4: Strengthening the Inquiry Approach

Objectives of Session

- to share reflections on recent inquiry activities
- to reflect on what inquiry and IBSE means in science classrooms
- to audit inquiries completed on the TEP
- to consider how to plan effectively for inquiry activities
- to trial one inquiry
- to look at the use of rubrics for assessment

Feedback

1) Which inquiry skills have you focussed on since the last session? Why did you select these skills?
2) What feedback have you had from your students about how inquiry activities are different from their other science lessons?
3) How did you gather evidence of student learning during the inquiry activities?
4) How did you group the students to make the most of collaborative learning opportunities? How is this different from previous groupings?

Findings from the SAILS project

- Teachers can develop assessment strategies relevant to specific inquiries
- Teachers can assess during an inquiry and provide feedback opportunities to allow students to make changes in their work
- Choice of inquiry tends to be content-driven, in most cases, and choice of what to focus assessment on is affected by this
- Some aspects of inquiry lend themselves to mapping progression and self- and peer-assessment

Changing View of Inquiry

- How has you view about inquiry changed since session 1?
- What is your current definition of inquiry?
- How do you believe inquiry learning helps students in science?

Does your definition fit with the Wellcome 2013 ideas?

"Inquiry-based science learning sees students learning *through* inquiry, using skills employed by scientists such as raising questions, collecting data, reasoning, reviewing evidence, drawing conclusions and discussing results. When students learn through inquiry they can develop scientific knowledge and they can also learn *about* inquiry, including the processes of science and how to construct reliable, valid and accurate investigations." (Wellcome 2013 p2)

Inquiry types

1. **Learning about inquiry skills**
   This is where pupils develop specific inquiry skills through an inquiry approach. (eg. Floating Orange)
2. **Learning through inquiry**
   This is where inquiry is used to help the students develop their conceptual knowledge. (eg. Food labels)
3. **Learning through doing an inquiry**
   The focus is on understanding aspects of inquiry through completing a whole inquiry (eg. Rates of Reaction)

Auditing the Inquiry Purposes

- List the inquiry activities you have done on the TEP
- Thinking about the different inquiries you have tried, which category would each activity fit into:

  Learning about inquiry skills

  Learning through inquiry

  Learning through doing an inquiry
- Did you change anything when you tried an inquiry with your students? Why was this?
- Do you tend to focus on one, two or all three inquiry purposes with your students?

Planning an Inquiry Lesson

Lesson planning is different for inquiry lessons because:

- students take a more active role in decision making
- teachers need to think about how to set-up a collaborative learning environment
- opportunities need to be planned for assessment and feedback during the inquiry

Inquiry Lesson Plans

For the Cooked Spaghetti inquiry:

- Which purpose would you allocate this inquiry to?
- Which decisions do students take in this inquiry?
- How would you organise the students to ensure collaborative learning works well?
- Where and how would you assess students in this inquiry?
- Where and how would you provide feedback in this inquiry?

Inquiry Lesson Plan

- Use Resource Sheet 4.1 to write a lesson plan for the last inquiry you did with your students.
- Compare your lesson plan with a colleague's. What similarities can you see between the two plans? Are there specific parts of the lesson when its possible to assess a particular aspect of inquiry or a specific inquiry skill?

Formative Assessment

- How and where might you use a Placemat or Learning Landscape in the Cooked Spaghetti inquiry?
- What feedback might you give in this inquiry?
- How might your students use a Placemat or Learning Landscape for peer assessment?

Rubrics

- These support the teacher making judgements and are a means of recording assessment data
- Decide what a successful performance would look like for the skill you are assessing in the Cooked Spaghetti inquiry
- How might a student who is still developing that skill perform? What would early development look like?
- What might an exceptional performance look like?

Rubrics

	Emerging	Developing	Crafting	Extending

- Successful performance is described in the third column (Crafting)
- Column 2 describe students working towards success (Developing)
- Column 1 is a basic attempt (Emerging)
- Column 4 is an enhanced performance (Emerging)

Rubric Development

	Emerging	Developing	Crafting	Extending
Ask inquiry questions			Raises a testable question that forms a hypothesis	

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Rubric Development

	Emerging	Developing	Crafting	Extending
Ask inquiry questions	Discusses a number of testable questions and agrees one they feel is testable	Raises a testable question with reasoning from previous science ideas they have encountered	Raises a testable question that forms a hypothesis	Raises a testable question that forms a hypothesis and are able to explain what results to look for to prove or disprove the hypothesis

Rubric Development

	Emerging	Developing	Crafting	Extending
Ask inquiry questions	Discusses a number of testable questions and agrees one they feel is testable (eg Does the skin/shape/ amount of air in the fruit make it float/sink?)	Raises a testable question with reasoning from previous science ideas they have encountered(eg Is it the amount of air that makes the fruit float because this lowers its overall density?)	Raises a testable question that forms a hypothesis (eg How does the amount of air in the fruit alter its ability to float?)	Raises a testable question that forms a hypothesis and are able to explain what results to look for to prove or disprove the hypothesis (eg If the waxy skin helps the fruit float then removing it will cause it to sink)

Writing an inquiry lesson: Floating Garden

- The next slide shows an inquiry devised by Practical Action
- Which type of inquiry does Floating Garden inquiry seem to be?
  - open, guided or bounded?
  - learning *through* / learning *about* or *doing* an inquiry

Practical Action:
www.practicalaction.org/floatinggardenchallenge

Floating Garden Inquiry

The problem:

The land where crops grow often gets regularly flooded

The challenge:

Design and build a **model** of a structure that farmers could grow their crops on even when it floods

Writing an inquiry lesson plan: Floating Garden

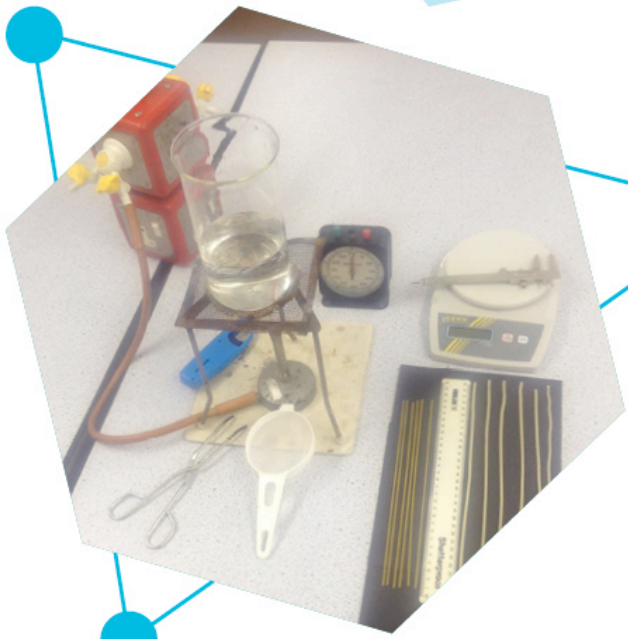
- How would you engineer opportunities for students to demonstrate their learning?
- What evidence of student learning would you be looking for? Where in the lesson would you create the assessment opportunities for this? Use Resource Sheet 4.1 to indicate how you would do this
- Which questions would you use to tap into student understanding?
- How might you use a Place mat or Learning Landscape in this activity to encourage peer assessment?
- What assessment data would you record? When and how might students receive feedback?

Floating Garden Inquiry

- Agree on one lesson plan for each group.
- Carry out the Floating Garden Inquiry according to the lesson plan
- What changes did you make as you tried out the inquiry? Why did you need to make these changes?
- How might you strengthen peer and self-assessment in this inquiry?

PMI

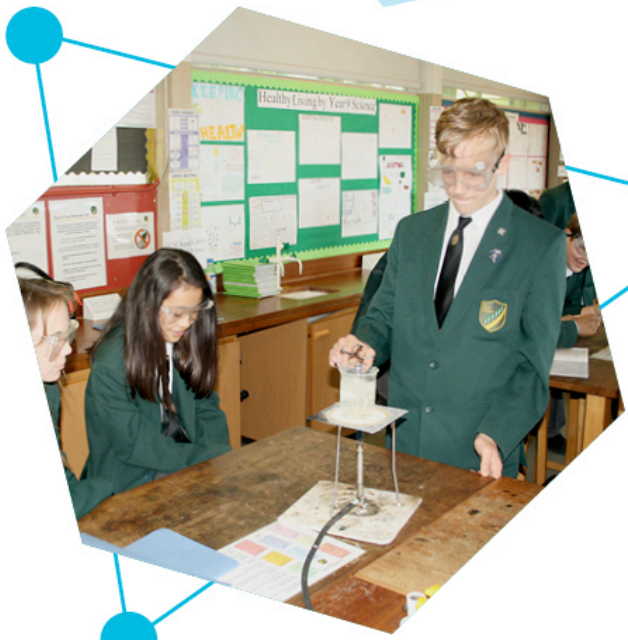
- Plus (+)
  what went well,
  what am I happy with
- Minus (-)
  what did not go well
  or as expected
- Interesting (?)
  what caught their attention
  as interesting or surprising



de Bono, E . (2015) Lateral Thinking: Creativity step by step. Harper Perennial

PMI on Inquiry

- Use the PMI technique to reflect on how inquiry learning has worked in your classroom
- What was positive, negative and interesting?
- Discuss your reflections with a colleague



Thinking about Inquiry TEP

- How have your ideas about inquiry changed through doing this TEP?
- Which events influenced this?
- How has your practice changed as you have included more inquiry in your classroom?
- What effect have these changes had on your students?
- How has inquiry-based learning changed the way students think about science?

Planning Ahead

Think about what you want to achieve with inquiry learning;

- in the next few months
- over the rest of this year
- next year
- in the future

References

- Yeomans, E. (2011). *Perspectives on Education: Inquiry-based learning.* London: Wellcome Trust
- Practical Science *http://www.gettingpractical.org.uk/*
- de Bono, E. (2015) *Lateral Thinking: Creativity step by step.* Harper Perennial
- Practical Action, The Schumacher Centre, Bourton on Dunsmore, Rugby CV23 9QZ, United Kingdom *http://practicalaction.org/floatinggardenchallenge*