

Assessment in the Pedagogy of Inquiry

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King's Assessment Projects

- King's-Medway-Oxfordshire- Formative-Assessment- Project (KMOFAP) 1999-2001
- Consultancy on CAPITAL, AifL, JAFa plus several local authority projects in UK
- TLRP project with University of Cambridge 2002-2005
- King's-Researching-Expert-Science-Teachers (KREST) 2005- 2009
- Projects with schools and local authorities
- King's-Oxfordshire-Summative-Assessment Project (KOSAP) 2009-2012
- SAILS
- ASSIST-ME

The Aims Hargreaves: the Knowledge Creating School

. schools must prepare students to increasingly higher levels of knowledge and skill, not just in the conventional curriculum or even in ICT, important as these are, but also in the personal qualities that matter in the transformed work place – how to be autonomous, self-organising, networking, entrepreneurial, innovative, with ‘the capability constantly to redefine the necessary skills for a given task, and to access the sources for learning these skills’

The Aims of Inquiry Based Learning in Science

- **Aim A** For the learner to understand and be able to use some of the methods that scientists use?
- **Aim B** So that learners know about the main concepts of science, and about how scientists discovered these?
- **Aim C** To help the learner to become effective, independent yet collaborative, and responsible in present and future learning tasks?

Are these three in conflict? And what has assessment got to do with it?

How can pupils learn to inquire?

I Tell them how to do it e.g. describe some examples to illustrate the rules.

What's wrong with that?

OR

II Give them a problem and leave them to 'discover' how to tackle it

What's wrong with that ?

How can pupils learn to inquire?

I Tell them . . Teach rules

- **Not engaging**
- **There are no rules –problems can be very different from one another**
- **So need initiative, creativity : the whole point of inquiry is to develop these qualities**

How can pupils learn to inquire?

II Leave them to 'discover' how to tackle a problem

- **Different ideas will arise: how to choose which to spend time on?**
- **Need to plan what to do.**
- **Some ideas will turn out to be too difficult or will fail: can one learn from difficulty and failure?**
- **One learns by reflection : what did I get wrong, what did I get right?**

Assessment has a role in All aspects of pedagogy

- A Decide learning aims
- B Select and plan activities
- C Implement in the classroom
- D Review: informal summative assessment
- E Formal summative assessment

The roles of assessment.

- Stage C Implement in the classroom

Formative assessment should

Providing feedback that helps learners improve their ideas through dialogue

Encourage learners to discuss one another's ideas – they are resources for one another

Peer assessment

Help learners to reflect on their own ideas

Self Assessment

The Methods Dialogic Teaching

Children, we now know, need to talk, and to experience a rich diet of spoken language, in order to think and to learn. Reading, writing and number may be acknowledged curriculum 'basics', but talk is arguably the true foundation of learning.

The roles of assessment?

- **D Informal summative assessment**
- Feedback on written work
 - – dialogue in writing
- Feedback on informal tests
 - – dialogue in writing
- Learners discuss one another's written work
 - – **peer assessment**
- Learners use feedback from teachers and from peers to reflect on and improve their work
 - – **self assessment**

SAILS

**Strategies for Assessment of
Inquiry Learning in Science**



SAILS

**Strategies for Assessment of
Inquiry Learning in Science**





**Strategies for Assessment of
Inquiry Learning in Science**

SAILS aims to prepare science teachers, not only to be able to teach science through inquiry, but also to be confident and competent in the assessment of their students' learning through inquiry.

SAILS partners



MALMÖ UNIVERSITY



Change of Emphasis

- Formative assessment as regular practice to provide:
 - evidence for planning
 - feedback for the the pupil
- Summative assessment at key points to provide accountability

Think what you need to share with children to help them in their learning while keeping track of their progress for reporting to others.

Criteria (Starch-amylase)

Oral expression

- You use the terminology accurately and confidently.
- You know the terminology, but sometimes fail to use it.
- You do not know the terminology.

- You can communicate in accordance to the situation.
- You do not communicate in accordance to the situation.

Designing & Implementing an Experiment

- You can carry out the experiment, you make accurate observations, you understand the connections and you record your observations in writing or depiction.
- With help, You can carry out the experiment, you make accurate observations, you understand the connections and you record your observations in writing or depiction.
- You are unable to carry out the experiment, make accurate observations, you don't understand the connections and you don't record your observations in writing or depiction.

SAILS PILOT STUDY

- Partners reported in the evaluation questionnaire that teachers found the following skills easy to assess:

Planning

Developing hypotheses

Asking questions

Data Analysis

Evaluating

SAILS PILOT STUDY

Partners reported in the evaluation questionnaire that teachers found the following skills difficult to assess:

Creativity

Searching for scientific information

Intepretation of data, graphical representation

Verbal expression of results

Formulating arguments

Discussion with peers

Teamwork

Cookie Mining





Cookie Mining Inquiry

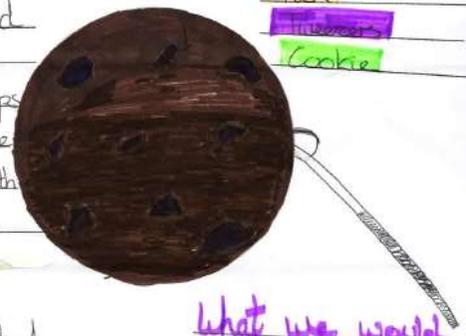
Cookie

Mining

What we did

We got the pick and started to make a hole around one of the chips. Then we tried to get the chip out of the cookie with the tweezers.

- Cookie Equipments
- Pick
 - Tweezers
 - Cookie

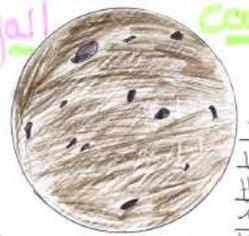


Overall our method went well but when we made the hole with the pick it was very hard because the cookie was rock hard. When we tried to prize the chocolate chip out of the cookie with the tweezers, the chip crumbled.

What we would do differently!

I think that our method took too much time, so a better method would of been to crush the cookie up in a beaker, and then you remove the chocolate chips. Or we could of soaked the cookie in water to soften it and then it could be easier to remove the chips.

By Abigail
Pettyfer
SQ



The back of the cookie was much harder to remove the chips because they were small. The other methods would of worked better.

	Emerging	Developing	Consolidating	Extending
Observing with a view to identifying again	Only looked at top side of cookie. Relying on visual memory only. Might have counted the number of chocolate chips	Drew a diagram of the front only OR had linking observation where they had observed the proximity of distinctive features.	Looked at front and back. Drew a detailed diagram of both. Were able to explain why they knew this was their biscuit.	Looked at front and back. Drew a detailed diagram of both. Were able to describe for someone else as well as identify it themselves
Selecting appropriate equipment and separation techniques	Attempt the task, able to explain how their method works.	Able to specify which technique they were going to use & explain why they thought it would work (even if they were wrong)	Were able to specify which technique they were going to use and explain why they were going to use it. Were able to use sound science to justify why some equipment/technique	Able to discuss the pros and cons of different techniques and see how some would be more appropriate in particular circumstances (if

Food and food labels

Emerging	Developing	Consolidating	Extending
Recognise if a food is high, medium or low level for specific food group	Categorise common foods into high, medium or low level for specific food group	Compare two foods on the amount of a specific food group per 100g or portion size	Compare the amount of a specific food group in a range of foods
Offer ideas	Listen to ideas from group members and consider alongside their own ideas	Sensitively discuss ways in which a group members meal plans could change and offer advice	Consider a range of ideas and be willing to explain why they feel some advice might be more effective than others

Peer assessment

Emerging

Pupils were able to look at other group's work and see how it performed.

They gave a brief feedback to the other group on aspects they liked and/or gave an overall judgement of the group's solution/answer.

Developing

Pupils looked at another group's solution/answer. They were able to give constructive feedback on what was good about it and how it could improved.

Consolidating

Pupils could comment on the quality; if each person had contributed; and how well the explanation/presentation (verbal or written) were done. Pupil treated boys/girls/ethnic with equal respect.

Extending

Pupils could consider how well a group's solution/answer worked, how it could be improved and say why developments would lead to a positive change. They approached the other group with consideration and gave feedback, oral and written, with sensitivity.

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Assessment has a role in All aspects of pedagogy

- A Decide learning aims : the aims of inquiry
- B Select and plan activities : a topic for inquiry should
- C Implement in the classroom : formative assessment
- D Review: informal summative assessment
- E Formal summative assessment : a guide for decisions

An example – how to promote dialogue

- B Select and plan activities : a topic for inquiry should
 - engage learners, give scope for active involvement,
 - develop both skills and concepts

My example

The aim : to start study of photosynthesis

Planning : two initially identical plants one in light, one in shade

Class asked why these two had grown differently and give four minutes to discuss with one another

Conducting a dialogue: Part 1

T: Monica - your group? Pair?

Monica: That one's grown bigger because it was on the window.

T: On the window? Mmm. What do you think Jamie ?

Jamie: We thought that . . .

T: You thought?

Jamie: That the big' un had eaten up more light.

T: I think I know what Monica and Jamie are getting at, but can anyone put the ideas together? Window - Light - Plants?

Many hands go up. T. chooses a child who has not put up his hand. (continued).

Conducting a dialogue : part 2

- **T:** Richard.
- **Richard:** Err yes. We thought, me and Dean, that it had grown bigger because it was getting more food. *Some students stretch their hand up higher. T points to Susan and nods.*
- **Susan:** No it grows where there's a lot of light and that's near the window.
- **T:** Mmmm. Richard and Dean think the plant's getting more food. Susan ... and Stacey as well? Yes. Susan thinks its because this plant is getting more light.
- What do others think? Tariq
- ©Paul Black et al. 2003

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Rules for Effective Group Work

- All students must contribute:
 - no one student says too much or too little
- Every contribution treated with respect:
 - listen thoughtfully
- Group must achieve consensus:
 - work at resolving differences
- Every suggestion/assertion has to be justified:
 - arguments must include reasons

Dialogue with written work

Do we need to have marks on everything ?

Students are not good at knowing how much they are learning, often because we as teachers do not tell them in an appropriate way

.....
When asked by a visitor how well she was doing in science, the student clearly stated that the comments in her exercise book and those given verbally provide her with the information she needs.

Teacher in King's project

Pupils' Perspective

After each end of term test, the class is grouped now to learn from each other. [The researcher] has interviewed them on this experience and they are very positive about the effects. Some of their comments show that they are starting to value the learning process more highly and they appreciate the fact that misunderstandings are given time to be resolved, either in groups or by me. They feel that the pressure to succeed in tests is being replaced by the need to understand the work that has been covered and the test is just an assessment along the way of what needs more work and what seems to be fine

Why teachers' summative assessments are important

Decisions about teaching sets

Information for the next teacher

Reporting to Senior Management Team

Reporting to Parents

Guiding the pupil

Key Steps in Developing Teachers' Summative Assessments

1 **Validity**

What does it mean to be good at science?

To remember the results **OR** to be able to inquire ?

2 **Evidence**

A collection of each pupil's work

3 **Dependability and comparability**

Moderation – in and between schools

Requires some uniformity in the collections

And agreement about the criteria

Moderation: teaching and learning conversations

I think its quite a healthy thing for a department to be doing because I think it will encourage people to have conversations and it's about teaching and learning. . . . it really provides a discussion hopefully as well to talk about quality and you know what you think of was a success in English. Still really fundamental conversations.

Teacher in King's project

Teachers' Summative Assessment Confidence

But I think if all the teachers had more, possibly more ownership of what we are actually doing in terms of summative assessment then you would have more confidence in saying to parents, which I think is one of the biggest things I find with lower school.

Mathematics teacher

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