

Evaluation of inquiry-based science education pedagogy and programs

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Evaluation...

- Serves a particular purpose
 - At the stage of small scale implementation once the program has been developed (formative - to identify how to improve the program and its implementation)
 - At the stage of large scale implementation (summative - to identify the effects of the implementation of the program)
- Involves the collection, analysis interpretation and reporting of data useful for the purpose

Deciding the evaluation focus

- Focus here is on the formative questions:
 - Are teachers using IBSE pedagogy?
 - Are students learning through inquiry?
- Only when there is evidence that the intended pedagogy and experiences for students are in operation is it appropriate to ask summative questions
 - make sure the independent variable is in operation before measuring the dependent variable

Formative evaluation: what information about students?

Are they

- gathering evidence by observing real events or using other sources?
- pursuing questions which they have identified as their own even if introduced by the teacher?
- making predictions based on what they think or find out?
- talking to each other and the teacher about what they are observing or investigating?
- expressing themselves using appropriate scientific terms and representations with understanding both in writing and talk?
- suggesting ways of testing their own or others' ideas to see if there is evidence to support these ideas?

Formative evaluation: what information about teachers?

Are they

- providing opportunity for students to encounter materials and phenomena to explore or investigate at first hand?
- arranging for discussion in small groups and in the whole class?
- encouraging tolerance, mutual respect and objectivity in class discussion?
- providing access to alternative procedures and ideas through discussion, reference to books, the Internet?
- setting challenging tasks, offering alternative ideas, providing support (scaffolding) to give students experience of operating at a more advanced level?
- encouraging students to check that their ideas are consistent with the evidence available?

Finding reasons

- Find out about teachers'
 - understanding of inquiry
 - understanding of how children learn
 - background knowledge of the science content
 - confidence in using different pedagogical skills
 - confidence in dealing with students' questions
- Talk to school principals, administrators
- Analyse written materials
- Review the training and professional development of the teachers in IBSE

Sources of information

- Ask the teachers
- Ask the children
- Look at teachers' plans
- Review children's notebooks
- Observe the class in action
- Talk to the children about observed events
- Talk to the teacher about observed events, their planning, their judgments of success, etc
- Talk to parents, principals, administrators.

Ways and means

- Questionnaires to and/or interviews of teachers, children and others involved (head teachers, teaching assistants, parent helpers)
- Focusing questions for reviewing documents (eg nature of the written feedback on children's work; details of teachers' lesson plans)
- Observation procedures and schedules for observing teacher, children and classroom
- Photographs of events

Interpreting the data

Awkward questions:

- What is to be taken as satisfactory?
- Use of a comparison (control) group avoids some problems, but
- Value judgements are always involved and need to be made explicit

Using criteria for evaluating classroom practice

- Agree the standards/criteria to apply
(value judgments)
- Collect relevant evidence
(more value judgments)
- Scan the evidence in relation to each standard statement and decide how good is the fit
(more value judgments)
- Use the result to identify where there is need for further help

Some examples of standards

Teachers should be:

- Using a range of methods suited to the achievement of various goals of learning science
- Providing simple materials and equipment for children's first-hand exploration and inquiry
- Providing activities that are interesting, enjoyable and relevant to children
- Providing opportunities for inquiry relating to the *scientific phenomena* in their environment
- Regularly asking questions which invite children to express their ideas
- Knowing where children are in the development of ideas and inquiry skills

etc

**INTERACADEMY PANEL
ON INTERNATIONAL ISSUES**



**REPORT OF THE WORKING
GROUP ON INTERNATIONAL
COLLABORATION IN THE
EVALUATION OF
INQUIRY-BASED SCIENCE
EDUCATION (IBSE) PROGRAMS**

Example – the ECBI evaluation (Chile)

- International expert group worked with local evaluation team
- 57 schools involved in the evaluation: 8 taking part as case studies, involving classroom observations; 49 taking part in the survey
- 2 field workers visited each school for one week to observe classes, planning and conduct interviews with teachers and parents
- A field worker visited the schools to supervise the completion of questionnaires by teachers and pupils, principals and curriculum coordinators.