

Exploring the Use of Formative Assessment for Nature of Science Teaching in Practical Science

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Practical science

can develop scientific literacy

Two issues persist:

Washback effect

Accountability pressure

Cookbook problem

Recipe-like practical tasks

While the **Nature of Science (NOS)** has the potential to mitigate these issues, effective explicit-reflective NOS instruction remains a pedagogical challenge.

Formative assessments can support NOS teaching

Theoretical Frameworks

Formative Assessment



Formative Assessment Strategies (William & Leahy, 2015)

Nature of Science (NOS)

The Family Resemblance Approach (FRA) to NOS: science learning encompasses

- cognitive-epistemic dimensions
- social-institutional dimensions



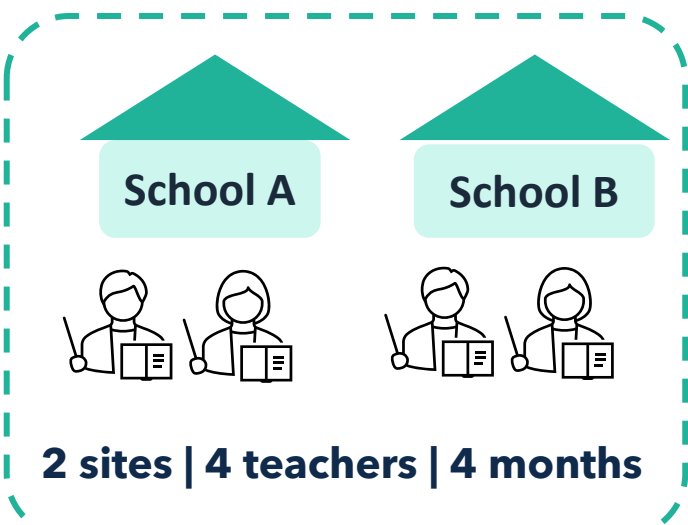
Family Resemblance Approach to NOS (Erduran & Dagher, 2014)

Research Questions

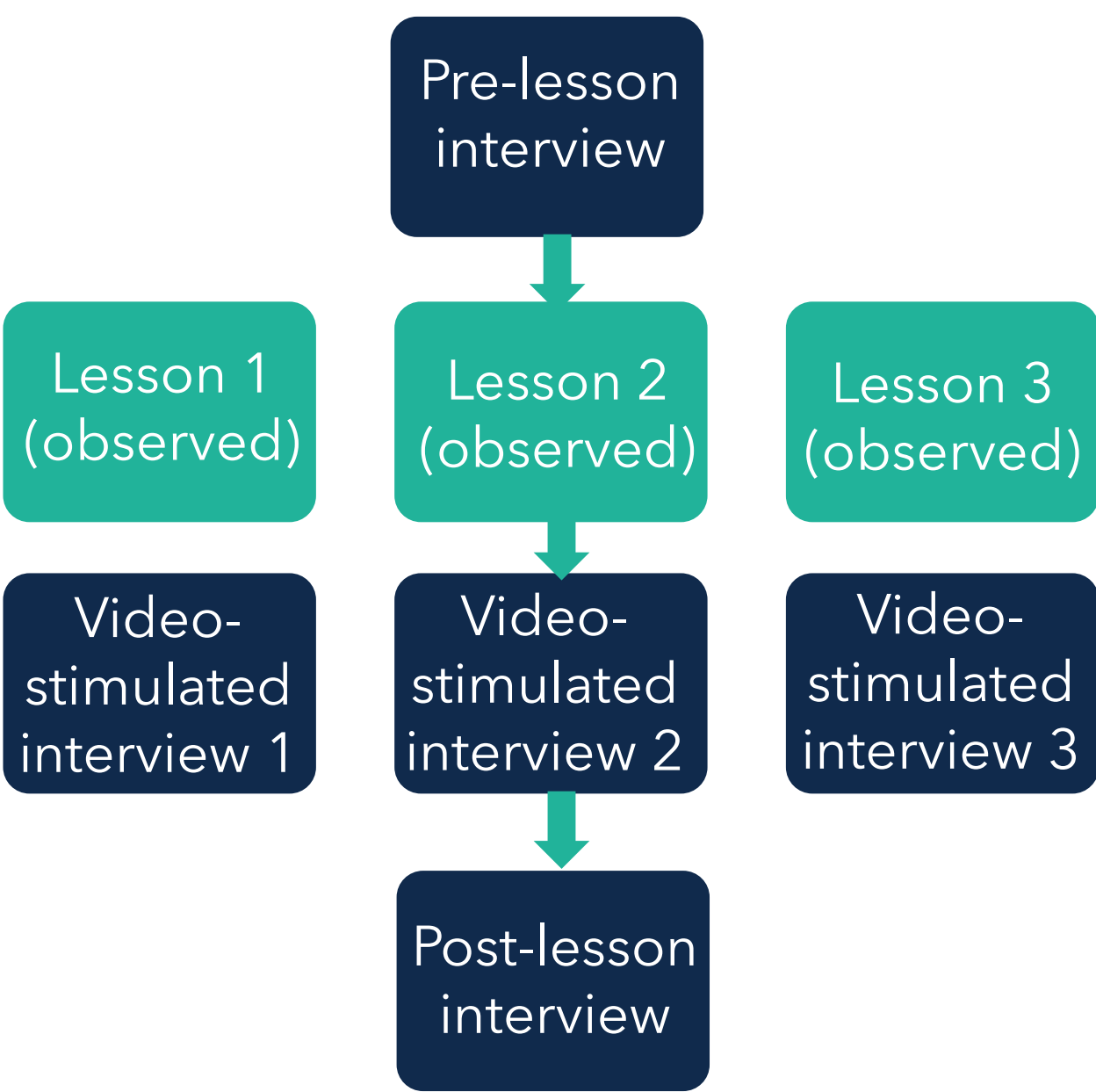
- 1 How do high school physics teachers in Singapore use formative assessment to support Nature of Science (NOS) instruction in practical science?
- 2 What are teachers' views on the use of formative assessment to support NOS instruction in practical science?

Criteria for participation

- Teach high school physics in Singapore
- Are open to being filmed in classrooms
- Are willing to engage in deep interviews



Research Design



Observations

Observations aim to **capture behaviour**, offering rich perspectives that "illuminate meanings" (Merriam, 2009, p. 32).

Interviews

Interviews provide a space **for extended conversations**

Preliminary Findings

Formative strategies sharpen or make NOS instruction explicit

(FA)

Eliciting Understanding:

Asks students questions to guide justification

(NOS)

Experiment-theory nexus: Explores agreement between scientific experiment and theory

“Okay, I want all of you, at your tables, to walk around and check everybody's A and B values... If you don't like what you see, go to the next table. [You] don't always have to go to your best friend.”

(FA)

Peer Assessment:

Gets students to evaluate each others' work

(NOS)

Social institutional aspect of science:

Peer scrutiny parallel to scientists' peer review

Potential Contributions

Pedagogy

Demonstrates pedagogical approaches in which NOS instruction in practical science can be supported through formative assessments

Assessment

Offers models of formative assessment practice in NOS teaching for systems facing gaps in teacher assessment literacy and performance-driven accountability pressures (Baird et al., 2026)



Reference

Baird, J.-A., Correia, C., Cowie, B., Masri, Y., Hayward, L., Kanjee, A., Ng, D., Flórez Petour, M., Popov, M., & Yan, Z. (2026). Formative assessment - a global phenomenon. *Assessment in Education: Principles, Policy & Practice*, 1-13.
Erduran, S., & Dagher, Z. (2014). *Reconceptualizing the nature of science for science education*. Springer.
Merriam, S. B. (2009). *Qualitative research: A guide to design and implementation*. Jossey-Bass.
William, D., & Leahy, S. (2015). *Embedding formative assessment: Practical techniques for K-12 classrooms*. Learning Sciences International.