

The *Science* of Engagement

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Fizzing investigation

- Be safe, be responsible!
 - Any allergies?
 - Minimise spills; clean up with paper towels
- Collaborative teams of 4
 - Director: Make sure everyone understands the procedure and is involved in the investigation
 - Manager: Collect and return the equipment
 - Speaker: Approach the teacher, other speakers if necessary
 - Auditor: Monitor and record learning

Fizzing investigation

Reflection:

- Was the activity enjoyable and interesting?
- Were you emotionally invested in the task?
- Were you working effectively with your team?
- What's missing? What did we leave out?

Levels of Engagement

Intellectual Engagement

- a serious emotional and cognitive investment in learning, using higher order thinking skills (such as analysis and evaluation) to increase understanding, solve complex problems, or construct new knowledge

Behavioural Engagement

- participation in the formal requirements of schooling (time on task, attendance, completion of work, rule compliance)

Social Engagement

- a sense of belonging and participation in school life, relationships

(Willms, Friesman & Milton, 2009)

Intellectual engagement

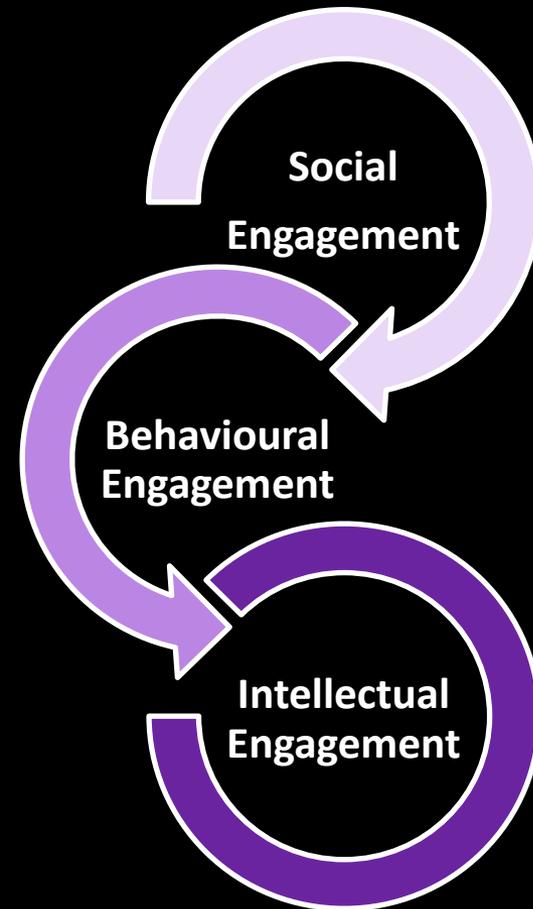
What is it?

Can we see it?

Is it about getting the
“right” answer?

Are all children equally
curious?

Will some children be
easily engaged but others
need direction?



Making learning visible

1. Auditors to share their observations with their groups.
2. Groups to discuss how a teacher could increase or improve intellectual engagement with this task.
3. Report! How can a teacher could increase or improve the intellectual engagement with this task?

Strategies for intellectual engagement

Stimulating introduction to the activity

Opportunities to make predictions

- P-O-E

Explaining

- Reasoning from evidence

Questioning

- Procedural, methodological
- Conceptual, theoretical
- Hypothetical

5Es: Engage

(Australian Academy of Science, 2012)

- Create interest and stimulate curiosity
 - Begin with a motivating or discrepant experience
- Set learning within a meaningful context
 - Use an activity or text to set context and establish relevance
- Raise questions for inquiry
- Uncover ideas, beliefs, conceptions
 - Open discussion, individual student writing, drawing, acting or simulating, questions to reveal students' ideas

Predicting

- What do you think will happen?
 - Increases intellectual engagement and investment in the task at the outset
- Why do you think this will happen?
 - Discussing a prediction with others requires articulation of understanding
 - Negotiating a prediction with others reveals and improves reasoning, as feedback is inherent to negotiation*

Questioning

- Procedural, methodological questions
 - Why do we label the bottles? the balloons?
 - Why do we put the powder in the balloons?
 - Why do we wipe the funnel each time? Why do we discard the paper towel?
 - How can we ensure safe behaviour while handling chemicals?

Questioning

- Conceptual, theoretical questions
 - What are the bubbles?
 - Do the bubbles come from the sodium bicarbonate?
 - Why do you think that?
 - Do the bubbles come from the tartaric acid?
 - Why do you think that?
 - When do the bubbles appear?
 - Why do you think they only appear then?
- Hypothetical questions

Explaining

- Claims are supported by evidence and reasoning (C-E-R framework)
 - Claim: statement of relationship, or event
 - Evidence: observations made that support claim
 - Data in context of procedure are *results*
 - Results are used as *evidence* to support a claim
 - Reasoning: the logic that connects the evidence with the claim
 - Uses scientific principles, concepts

Articulating

- Science journaling
 - Observations, ideas, thoughts about scientific activities
 - Articulating ideas requires students to consider what they “know” and why and how they know it
 - Self-assessment tool for students to reflect on conceptual change and development
 - Useful diagnostic tool for teacher, informs future planning

Role of the teacher

- Ask questions that promote critical and reflective thinking
- Draw out students' questions and facilitate inquiries
- Involve students in productive argumentation
- Monitor learning and give timely feedback
- Communicate high expectations
- Set appropriate challenges
- Be passionate, interested, enthusiastic!

References & Readings

Australian Academy of Science (2012). Change detectives. *Primary Connections*. ACT: Author.

Chin, C. (2007). Teacher questioning in science classrooms: Approaches that stimulate productive thinking. *Journal of research in Science Teaching*, 44(6), 815-843.

McNeill, K. L., Lizotte, D. J., Krajcik, J., & Marx, R. W. (2006). Supporting students' construction of scientific explanations by fading scaffolds in instructional materials. *The Journal of the Learning Sciences*, 15(2), 153-191.

Willms, J. D., Friesen, S. & Milton, P. (2009). What did you do in school today? Transforming classrooms through social, academic and intellectual engagement. *First National Report*. Toronto: Canadian Education Association.