Module Title: **SCIENCE LEARNING AND TEACHING 2**

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Module Description:

The module introduces role plays that help to identify teaching behaviours that promote and support good student talk. There is evidence that students, including girls from a number of non-western cultures, are prepared to invest energy and effort in appropriately structured interpretive discussions. The nature of good student talk and supporting teacher beliefs are clarified. Then some of the skills in conducting extended discussions are examined. This leads to the important idea of sharing intellectual control, and ways to facilitate this. The module finishes by exposing participants to other aspects of learning and teaching that are relevant to sharing control and enhancing engagement.

Summary of Activities:

	Title	***Min***
1.	Between Session Activity	30
2.	Promoting Student Talk – role plays	60
3.	Work Out the Missing Bits - if …. then …	30
4.	Other Sources of Student Engagement	30
5.	Extension to Other Aspects of Learning	20
Total		170

Module Outcomes:

- Develop a list of both teacher behaviours that support good classroom discussions, and teacher actions that can be used in typical, tricky situations.
- Acquire more detailed descriptions of good student discussion behaviours, and the importance of these for learning in science.
- Develop understandings of transmissive and interpretative views of teaching, the relationship between such beliefs and behaviours, and the consequences of the need for changes in belief on the rate of behavioural change.
- Be able to decide when and how to use either or both of Sweller Questions and Writing On the Reading.
- Have a range of ways of sharing intellectual control.
- Understand how the lists of good learning behaviours and poor learning tendencies may be used to further stimulate improvements in classroom learning.

Resources and Materials:

- OHTs: 2.5, 2.6, 2.7, 2.9, 3.2b, 3.4b, 3.5b, 4.4, 5.1, 5.2.
- Copies of Attachments: 2.3, 2.4, 3.2a, 3.2b, 3.4a, 3.4b, 3.5a, 3.5b, 4.1, 4.2, 4.4, 5.1, 5.2.

Activity 1: Revisit Last Session and Share Participants' Experiences

Purpose: To discuss with participants their experiences with the between session tasks.

Teaching Procedures: Interpretative Discussion (features of which will emerge during the module).

Time allocation: 30 minutes

What to do

FACILITATOR	PARTICIPANT
1.1 This is an opportunity for participants to share their experiences of trying the between session activities. 1.2 Ask, "Who wants to share something they have tried?" **It does not have be something that necessarily worked successfully.** • Stress that there is value in hearing about both the activities people designed, and the positive and negative aspects of how these played out in the classroom 1.3 With experiences ask, "Are there modifications you would consider and why?" 1.4 Closing the session – Remind participants, "If there are any handouts from the things they did in class drop them in the box now or on their way out. If individuals have concerns but do not wish to make them public, drop those into the box also."	1.1 Share with the group experiences of the between session activities. 1.2 People are often diffident, try to overcome diffidence by making a contribution early. 1.3 Be prepared to share successes and failures: -don't feel threatened by sharing failures. - don't feel boastful by sharing successes.

Tips and Tricks:

- The first comment from a new group is often hard to get so be prepared to increase wait time. Considerable wait time is important here to set the scene.
- Remind participants of the importance of both successes and failures in the discussion.
- As facilitator, do not set yourself up as the "expert". Be prepared to throw things back to the group; eg. ask, "How would others handle that?" It can be helpful to share an experience of your own in which you would like some advice from the group.
- Create opportunities to share ideas, experiences and resources.
- Build on participants' ideas, call for and offer extensions and different perspectives. Don't evaluate them (personally or their ideas) individually – throw it out to the group and let the group do the evaluation.
- In closing, (if possible), build a sense of group progress. Be encouraging of the things the participants have tried, and highlight the importance of reflecting on their experiences. Comments such as, "It is good to see things are happening, people are trying things and suggesting changes they would make next time" may help to encourage participants to try other activities.
- The focus of this module is on extending the level of student engagement and this should be established from the discussion in this first activity which will hopefully set the scene for what follows.

Activity 2: Promoting Student Talk

Purpose: To explore teacher behaviours that promote and support good student talk.

Teaching Procedures: Interpretive Discussion

Time allocation: 60 minutes

What to do

FACILITATOR	PARTICIPANT
2.1 Introduce this activity as one which focuses on promoting student talk that is relatively tentative, hypothetical, and exploratory.	
2.2 Invite participants to jot down teacher behaviours that promote (any of) student talk, student engagement, and student self esteem; ie does the teacher avoid GWITM and if so how? Bring together as a consolidated list.	2.1 List behaviours and consolidate as group response. (GWITM – Guess What is In the Teacher's Mind)
2.3 Give out role play 1 sheets, Attachment 2.3, to (six) participants. Briefly discuss the context. Seek participants to enact role play. Facilitate subsequent (interpretive) discussion.	2.2 Six participants act out the role play. All participants then discuss, and compare the teacher talk and the subsequent student responses with those listed previously. Participants focus on the teacher and student talk within the role play.
2.4 Repeat 2.3 with role play 2 – Attachment 2.4. Facilitate subsequent (interpretive) discussion that compares the two role plays.	2.3 As above. Compare/contrast student talk in the two role plays, and seek reasons for this in the nature of teacher talk. Discuss and elaborate.
2.5 Using the questions on OHT 2.5, conduct a discussion (perhaps in groups) that aims to bring out some of the ideas about transmissive and interpretive teaching as shown on OHT 2.6.	2.4 Work in groups, and respond to the questions on OHT 2.5. Provide one response at a time on each question

FACILITATOR	PARTICIPANT
2.6 Use OHT 2.6 to draw the discussion together and to emphasize that teachers' behaviours tend to be based on their beliefs about teaching and learning.	2.5 Contribute to discussion and link to OHT 2.7.
2.7 Call for any other useful teacher behaviours, and add these to the list from 2.2. Refer to OHT 2.7 as basis.	2.6 Use the ideas on OHTs 2.5 and 2.6 to extend the list of teacher behaviours.
2.8 Call for some features of good student talk during interpretive discussions. Hopefully participants will come up with statements that are similar to those on OHT 2.8 - use as required.	2.7 Offer good student discussion behaviours.

Discuss/Consider:

- Developing or changing teachers' practice involves more than just extending the repertoire of teaching procedures (such as probes, POE etc). Using these successfully involves changes in teachers' behaviours – such as how they interact with students and run lessons. Changes in this area will be incremental.
- How does a teacher's confidence with content influence whether, and how, interpretive discussions are held.
- As part of their normal teaching, many primary teachers conduct such discussions, but generally less often in science. A low level of confidence in science content, and a belief that science is about correct answers, can both act as constraints to initiating discussions. It is important to discuss how to conduct discussions that will raise content issues that the teacher, at that moment, does not know how to explain.
- Having a list of specific fruitful student behaviours helps a teacher both to support them and to build student awareness of the value the teacher attaches to them. Refer to OHT 2.8
- The purpose of this module is to argue that promoting good student talk enhances learning, and hence that science classrooms can and should incorporate interactive dialogue as needed. However, it is not being suggested, nor would it be appropriate to conduct every science lesson as an interpretive discussion. Rather an interpretive discussion should be viewed as a teaching procedure to be used regularly as appropriate – refer to OHT 2.9.

Tips and Tricks:

- The three critical teacher behaviours to be identified from the activities described above are:
  - Delay judgement.
  - Increased wait time.
  - Affirming the value of the students' ideas.

- From the role play, the type of behaviours to avoid are associated with:
  - Fishing for one particular answer.
  - Guess what's in the teacher's mind. (GWITM)
  - Immediately evaluating learner responses.
  - Listening only for whether comments are right or wrong, not for what meanings and ideas lie behind them.

  See OHT 2.7 for these points.

Activity 3: Work Out the Missing Bits

Purpose: To develop some appropriate responses to common situations in an interpretive discussion in science.

Teaching Procedures: Incomplete Notes

Time allocation: 30 minutes

What to do

FACILITATOR	PARTICIPANT
3.1 What you saw in role play 2 was a discussion progressing well, but tricky situations can arise. The statements examined in this activity arose from a discussion 3 teachers were having in the staff room one lunchtime. As such, the responses presented are not meant as the definitive answers to these situations, but rather as a starting point to begin a group discussion.	
3.2 Divide participants into small groups and give each group Attachment 3.2a to fill in the missing sections.	3.1 Discuss and fill in/suggest responses to the blank 'Then' statements.
3.3 Give out Attachment 3.2b (OHT 3.2b), and stress that the responses are no more than what some teachers, experienced in these discussions, said they usually did. Call for and discuss any differences.	3.2 Compare responses with those on Attachment 3.2b and decide if there are any differences worthy of discussion.
3.4 Repeat 3.2 and 3.3 above with Attachments 3.4a and 3.4b (OHT 3.4b).	3.3 Repeat 3.2 above.
3.5 Repeat 3.4 with Attachments 3.5a and 3.5b (OHT 3.5b)	3.4 Repeat 3.3.

Discuss/Consider:

- In a class discussion, it is important to be prepared to close tactfully, particularly if the discussion is not going well. Lesson plans therefore need some flexibility.
- It is important to maintain a sense of progress, particularly for weaker students and if there has been no final closure, draw together the main issues of the discussion and then outline the issues still to be resolved.
- You cannot predict when a very useful or insightful student comment will suddenly cause a discussion, which may have been meandering, to make a lot of progress. Being prepared to invest a bit of time to let students get into the issue is a big shift for some teachers.
- There is a strong temptation for teachers to fill in gaps, avoid silence after a question and correct all wrong answers. Is this always appropriate?

Tips and Tricks:

- Try not to praise comments as being correct (good science) but rather value them for being useful. A 'wrong' idea can be very useful in promoting good thinking.
- Participants generally do a good job on this task hence it can provide affirmation and reassurance.

Activity 4: Other Sources of Student Engagement

Purpose: To explore a different way of increasing the level of student engagement in science classrooms.

Teaching Procedures: Sweller Questions and Writing On the Reading

Time allocation: 30 minutes

- Perhaps the most important reason why using student ideas and promoting good student talk generate high levels of student engagement is that they are important ways of building a sense of shared intellectual control. Students feel that their ideas, questions, arguments and suggestions are important and may regularly (not invariably) influence any or all of what is done, how it is done, and for how long. There are other ways of sharing intellectual control (see Attachment 4.4, OHT 4.4). The next two procedures are ways of promoting and using student questions and having students work out part of the content as well as what else they need to know.

What to do

FACILITATOR	PARTICIPANT
4.1 The context is the bubonic plague and participants are asked to react. Split participants into two groups. Group 1, working in pairs asks sweller questions of the map in Attachment 4.1	4.1 Sweller question group – using only the map of the spread of bubonic plague (Att 4.1), work out in pairs as much as you can of what happened, what you think may have happened, and what more you need to know to establish what happened.
4.2 Group 2, working individually does a writing on the reading of the text in Attachment 4.2.	4.2 Writing on the reading – working individually, write extensively on the text margins (Att 4.2). Engage in a written dialogue with the author, include personal reactions, and comments, links to or differences from your life/current events, things you do not understand, and questions you would like answered.
4.3 Form groups of 4: one sweller question pair and two writing on reading individuals. Aim to answer each others' questions.	4.3 Try and answer each others' questions. List the questions that still need answers as well as any new questions that arise
4.4 Discuss other ways of sharing intellectual control (Attachment 4.4, OHT 4.4). Call on participants' experiences.	4.4 Offer instances from own practice or ideas for future practice

Discuss/Consider:

- Students typically work out much of what you wanted to teach and a list of questions that will cover most or all of the rest of what you wanted to teach.
- How this fits with the idea of sharing intellectual control.
- The similarities and differences between the two procedures of writing on the reading and sweller questions.
- It is not necessary in the classroom to do both as we did here.

Tips and Tricks:

- The stimulus for sweller questions are commonly forms of maps, diagrams or pictures that have quite a lot of information on them.
- For a writing on the reading, supply the text with wide margins with room for students to write their comments.
- It is a good idea to show students an example of a writing on the reading (using a different writing) to give them a sense of what they are required to do.
- Activity 4.4 is another opportunity for participants to validate their existing practice.

Activity 5: Extensions to Other Aspects of Learning

Purpose: To provide options for participants to focus on other aspects of learning.

Teaching Procedures: Group Discussion

Time allocation: 20 minutes

- The information provided in the attachments has been distilled from years of shared reflective practice, and is meant as a resource for ongoing use. It is anticipated that participants will be able to use this information as a framework to identify and tackle a wide range of problems associated with passive learning, (not necessarily restricted to science). It is not the intention of this activity to engage with all the tendencies and behaviours identified in the attachments, but to briefly explore the utility of the information therein.
- Transmissive teaching assumes students currently know little of value about the topic and are there to receive the teacher's wisdom. Commonly, this creates passive learning and low levels of interest and engagement. Students may become dependent on the teacher for their learning and assume little responsibility for their own learning. Transmissive teaching may lead to students adopting many Poor Learning Tendencies (PLTs) - see Attachment 5.1.

What to do

FACILITATOR	PARTICIPANT
5.1 Give out the list of poor learning tendencies. (Attachment 5.1, OHT 5.1) Do not try and discuss all of these, rather choose one or two and call for instances from participants' practice and/or things they have done that are likely to stimulate appropriate positive learning behaviours.	5.1 Identify instances of PLTs they have seen and actions they have taken or can think of which tend to counter them.
5.2 If appropriate, discuss Attachment 5.2 (OHT 5.2), a list of Good Learning Behaviours. These are what teachers have found to be behaviours that students exhibit when they are resisting PLTs. They include and extend the types of student talk on OHT 2.8. Like PLTs, good learning behaviours can give teachers ideas for teaching procedures.	

Discuss/Consider:

- PLTs are learnt habits, and as such can be unlearnt. They offer ways of improving student performance by learning how to learn better.
- The discussion of PLTs is not intended to do more than introduce participants to other aspects of learning that may be followed up. Being aware of these helps teachers devise teaching approaches to counter them. Teachers in PEEL groups have been doing this for many years and have produced a rich range of teaching ideas that aim to promote quality learning.
- The good learning behaviours give teachers a framework by which, if they choose, they can assess students' oral contributions to class – this issue emerges in the assessment module.

Tips and Tricks:

- Both these lists are imperfect classifications of a more complex reality. Their purpose is to allow teachers to focus on different aspects of learning.
- No teacher could, or should, be overtly focussing on more than a small number of these at a time. The intention here is not to overwhelm teachers, but provide them with ideas for extension of their practice.

Between Session Tasks:

1. Conduct an interpretive discussion around a topic not previously discussed, using a suitable stimulus eg. probe of prior views
2. Try another way of sharing intellectual control.

Support Materials:

Osborne, R. & Freyberg, P. (1985). *Learning in Science: the implications of children's science.* Auckland: Heinemann.

Barnes, D (1975). *From Communication to Curriculum.* Penguin Books.

Baird, J. & Northfield, J. (1992). *Learning from the PEEL Experience.* Melbourne: Monash University

Mitchell, I & J. (1997). *Stories of Reflective Teaching.* PEEL Publications, Monash University.

Mitchell, I (Ed) (1999). *PEEL in Practice – 650 ideas for quality teaching.* This is a CD. PEEL Publications, Monash University.

PEEL Publications are available from:

The Faculty of Education, Monash University, Clayton 3168

Phone: 03 9905 2791

http://www.education.monash.edu.au/projects/peel/