University of Wollongong

Skills for Laboratory Demonstrators

Laboratory coordinators manual

To the Laboratory Coordinator

How to use this package

The Skills for Laboratory Demonstrators DVD is designed to introduce demonstrators to the skills and attitudes needed to help students develop science laboratory skills through questioning and explaining.

The DVD provides five scenarios set in the Physics laboratory followed by tips from experienced academics and demonstrators. Each scenario is a separate chapter so they may be viewed in any order.

A workbook comprising a set of questions and background notes is provided to support demonstrators in thinking through the strengths and weaknesses of the various approaches and to consider their own strengths and areas for development. The workbook is copy free so you may photocopy as many as you need.

It is recommended that you use the DVD and workbook as a training program. Under your guidance, demonstrators may view and discuss the scenarios and tips and record their observations in the sections titled Activity A and Activity B. As a conclusion to the workshop, or following the workshop, Activities C and D could be completed by the group or by individuals.

Alternatively the package may be used by demonstrators for self-study. If so, remember that demonstrators will need feedback on their reflective responses from an experienced laboratory supervisor, demonstrator and/or academic.

Before the training session

Watch the DVD and consider which scenarios and tips you will use and any further issues you would like to discuss during the session.

The material on the DVD plays for 20 minutes. It is suggested that you plan a 2 hour session in order to cover the activities. Alternatively choose two or three of the scenarios and run a shorter session.

Photocopy the required number of workbooks and provide to participants.

The workshop

ACTIVITY A – Play the first scenario you have chosen. Ask the workshop participants to write their own responses to the questions. Discuss their responses and provide feedback. Refer to the Background Notes if relevant. Repeat for other scenarios.

ACTIVITY B – Watch the Tips for Demonstrators section of the DVD. Ask the participants to write their own responses to the questions. Discuss their responses and provide feedback. Refer to the Background Notes if relevant.

ACTIVITY C – If the demonstrators are inexperienced, lead a discussion on their concerns and areas of confidence. Experienced demonstrators may be able to (privately) identify their own areas for development and perhaps consider what actions they can take to improve.

ACTIVITY D – Ask the demonstrators to develop a summary sheet for their next class. Modify this sheet according to your own needs. Ask them to share some items and provide feedback.

EVALUATION – Don't forget to gather feedback from your participants on the usefulness of the workshop and materials for next time.

Scenarios and questions

Activity A - The five scenarios

1. The dictating tutor
   Experiment – Carrier Lifetime

2. The hands-off tutor
   Experiment – Charge to Mass Ratio

3. The unprepared tutor
   Experiment – Carrier Lifetime

4. The superior tutor
   Experiment – Charge to Mass Ratio

5. The effective tutor
   Experiment – Charge to Mass Ratio

For each scenario, ask participants to respond to the following questions:

(a) How would you rate this demonstrator on a scale of 0 – 10

0 ------ 1 ------ 2 ------ 3 ------ 4 ------ 5 ----- 6 ------ 7 ------ 8 ------ 9 ------ 10
Hopeless Perfect

(b) What (if anything) should this demonstrator stop doing?

(c) What (if anything) is this demonstrator doing well?

(d) What might the students think about this demonstrator?

ACTIVITY B - Watch the tips for demonstrators and write your response below.

After watching the Tips for Demonstrators, ask participants to respond to the following questions in their workbooks:

- What are the Physics staff members saying about demonstrating?
- What is the role of the demonstrator?
- With participants, summarise the key points.

Activity C – The role of the demonstrator

Provide information and/or lead a discussion on the role of the demonstrator in your institution.

Ask participants to reflect on their own role using the table to the right, if required. If the demonstrators are inexperienced, lead a discussion on their concerns and areas of confidence. Experienced demonstrators may be able to (privately) identify their own areas for development and perhaps consider what actions they can take to improve.

Activity C - What are your own strengths as a demonstrator?

	Good	Okay	Not so good	What will you do to further develop this skill?
Preparation (background, context, interesting points)				
Trouble shooting				
Teaching through questions, explanations and analogy				
Developing a good relationship with students				
Interacting equally with all of the students during a Q/A session				

ACTIVITY D – Ask the demonstrators to develop a summary sheet for their next class. Modify this sheet according to your own needs. Ask them to share some items and provide feedback.

Summary sheet

Name of the experiment

Background, broader context of the experiment

What difficulties might you expect students to have?

How will you help students overcome these difficulties?

One analogy you can use

Questions you will ask students about their work

Something interesting about the history of the experiment

Background notes

1. Divergent – convergent thinking.
2. Relationships built on respect.
3. Confidence.
4. Characteristics of effective demonstrators.
5. The skills of questioning.
    - Closed questions.
    - Open questions.

1. Divergent – convergent thinking

Problem solving tasks are often best tackled using divergent thinking first (eg what are all the possibilities here?) followed by convergent thinking (eg, choose the theory that makes most sense).

Help students see the difference and encourage them not to seek a solution too early.

2. Relationships built on respect

Treat all students with respect regardless of your personal feelings towards them. Make sure they treat each other in the same way. Model the kind of behaviour you want. If you show them trust, respect, openness, honesty and enthusiasm you will generate the same in them.
Students will not contribute if they think they will be made to look stupid. Never put students down, even if they get the answer wrong. Listen to them carefully and check that you understand what they are saying.

3. Confidence

Most teachers are nervous when they begin teaching. Most people won't know if you don't tell them.

4. Characteristics of effective demonstrators

Students have identified nine important characteristics of good demonstrators.

Demonstrators:
Mark fairly and without bias to individual students
Mark consistently with other demonstrators
Relate the laboratory work to professional practice
Show good knowledge of techniques and skills
Give clear explanations - when asked for
Criticise constructively, with clear explanation of errors
Support students and help their self-confidence
Admit their mistakes
Are approachable.
(Source: Oxford Brooks University, http://www.brookes.ac.uk/services/ocsd/firstwords/fw111.html).

A further characteristic noted by Physics academics at the University of Wollongong is the ability to extend students' interest through providing contextual/historical information where appropriate, for example, about key scientists involved in the experiment.

5. The skills of questioning

A series of carefully phrased, non-threatening questions will surface the student's understanding or misconceptions.

Students often don't know what questions to ask you. They may realise they are facing a problem but not be able to shape the question. You can help them through careful questioning.

- Ask clear questions.
- Ask what they think might be the next step to take in solving the problem
- When a student asks a question, ask the student in return to explore possible answers - or ask the other student/s what they think?
- Ask only one question at a time.
- You want students to think about the answer – so wait, don't jump in and answer it yourself.
- If the students can't answer it may be your question that is the problem. Rephrase the question and try again.

Closed questions have a factual or yes/no answer. They can be useful if you want to encourage students to be involved or if you want to stop a student who is talking too much - when they answer yes or no you can quickly jump in and move on.

Examples of closed questions

- What are the … called?
- Is it true that ….?

Open questions offer the opportunity to probe, check, encourage deeper thinking. They encourages students to speculate, draw inferences. They are useful if you want students to think, to work out the next step – BUT - they can be intimidating for students who aren't used to them so be supportive.

Examples of open questions

- What do you think is happening here?
- Can you tell me more about that?
- What do you think the problem might be?
- Where are you getting stuck - what did you do just before that?
- What might be the next step to take?
- Suppose you did x … what might happen then.
- What might be the implications of that?
- This is looking interesting. Tell me what you are doing here?
- Is this method working?
- Is there another way you could have done this that would also have worked?
- So you seem to be using x method. What made you decide to use x?
- How could you interpret this data at this stage?
- At this stage it would be useful if you focused on the relevant issue which is ...
- That's a very good start ... now what's next?

Skills for laboratory demonstrators was filmed at the University of Wollongong, NSW, Australia
http://www.uow.edu.au

Actors: Stephen Dowdell, Heidi Nettelbeck, and Lakshal Perera

Tips from: Stephen Dowdell, Duncan Fisher, Carey Freeth, Michael Lerch, Heidi Nettelbeck, Lakshal Perera, George Takacs, Bill Zealey.

Running time: 15 minutes

Scenario 1: 1 mins 14 secs	Scenario 4: 2 mins 19 secs
Scenario 2: 1 mins 19 secs	Scenario 5: 4 mins 37 secs
Scenario 3: 1 mins 58 secs	Scenario 6: 4 mins 09 secs
Tips: 9 mins 02 secs	Total: 24 mins 38 secs

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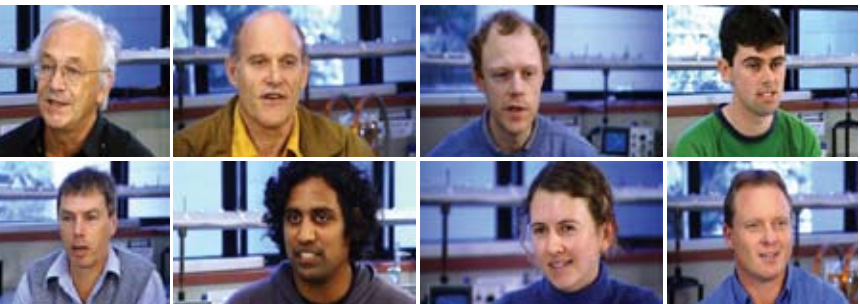
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