Learning Materials in a Problem Based Course

James Busfield and Ton Peijs

How to attract students and who will they be?

ATTRACTING STUDENTS

What do you want them to learn?

PROFESSIONAL SKILLS
MATERIALS CHEMISTRY
ENVIRONMENTAL MATERIALS
MATERIALS FOR ENGINEERS

How do you find out if your teaching is useful?

EVALUATION

How will you help them to learn this?

DISTANCE LEARNING
PBL
CASE STUDIES
LABS
TUTORIALS

How will you find out what they have learnt?

ASSESSMENT

UK Centre for
Materials Education

Students learn in PBL by solving a problem or explaining a situation they are given

INTRODUCTION

Many of our community, lecturers in the disciplines of and relating to Materials Science and Engineering, have expressed interest in simple-to-use guides to support the workshops we run on learning and teaching. As part of our 'Thematic Groups' scheme, we have established 12 themes for this special focussed support, each of which is led by a 'Thematic Group Leader'. During the first two years of the scheme, workshops have been held on these themes and this has enabled the leaders to further explore relevant issues with lecturers and feed the results into this series of booklets.

Learning and teaching is a continuous cycle represented in the diagram below:

We can start at any point around the cycle. If we are in the business of teaching it certainly helps if there is someone to teach! Not such a funny joke in the current climate with reducing numbers of students in technical disciplines. Hence one of our main concerns is how can we approach schools and work with school students to attract them into Materials areas. 'Attracting Materials Students' by Cheryl Anderson explores how we can work with schools and the wider community to ensure a diverse and inclusive group of able students on our courses. Once we have a class to teach, what would we like to teach them? The first reaction to such a question is to make a list of topics or knowledge. However, this is only a beginning, and a very limited one. Not only are there many skills and attitudes that we would
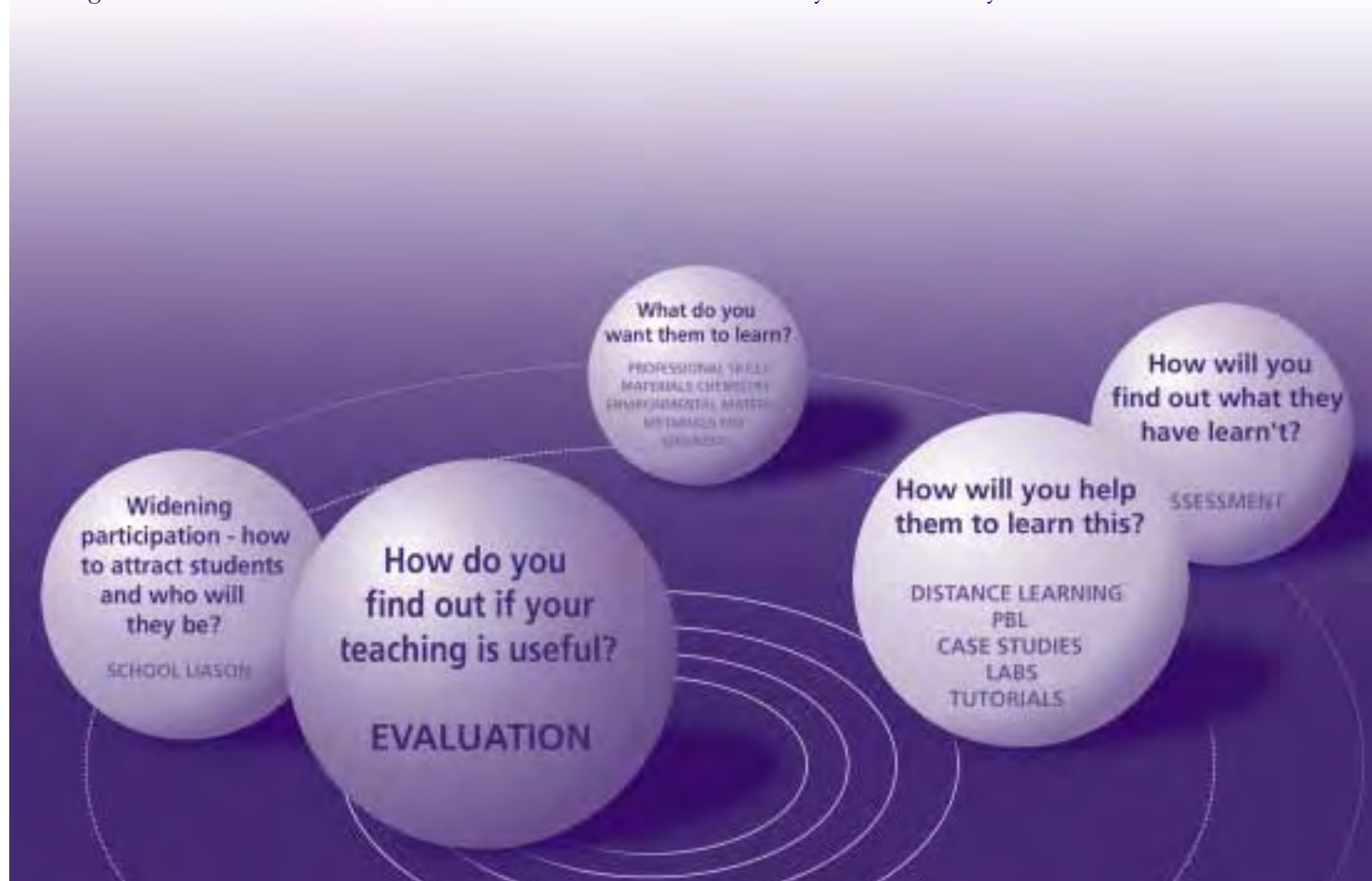
like them to develop, but learning is more complex than simply the what. It also involves the how. 'Developing Professional Skills' by John Wilcox explores the approach to empowering students to track their own skills development as they progress. 'Materials for Engineers' by Mike Bramhall, 'Materials Chemistry' by Stephen Skinner and 'Environmental Materials' by Cris Arnold, focus on what we might like to include in a specialised curriculum, for targeted students. The knowledge, skills and attitudes or learning objectives identified for each course must be assessed if we are going to give credit to students for learning what we want them to learn. 'Assessing Materials Students' by Lewis Elton gives support to the development of assessments and assignments that do in fact give marks for those things we want to acknowledge, rather than those aspects that are simply easy to assess!

Believe it or not it is only at this stage that we can really consider how we should teach the students to learn these things. We all know about lectures but will we use in addition or instead: tutorials ('Tutoring Materials' by Adam Mannis and Shanaka Katuwawala), labs ('Teaching Materials Lab Classes' by Caroline Baillie), case studies ('Teaching Materials Using Case Studies' by Claire Davis and Elizabeth Wilcock), problem based learning ('Learning Materials in a Problem Based Course' by James Busfield and Ton Peijs) or even learning at a distance ('Learning Materials at a Distance' by Mark Endean)?

The final stage before we start all over again is to see if we have done what we intended to do. We may have already found out whether, and how effectively, the students learnt what we wanted them to (i.e. if the assessment matched the learning objectives and if our teaching methods suited the students' learning approaches). If this has not proved to be as ideal a scenario as we would have wished we will need further input to analyse what has happened. 'Were the course objectives inappropriate?' 'Am I sure that the assessment did not force my students into taking a surface approach? ' Did the students take on surface approaches to learning because of my teaching?' Ivan Moore's 'Evaluating a Materials Course' will give you the tools of the trade to conduct your own thorough evaluation and enable you to develop an improved course for next year's cohort. Which brings us back to the beginning of the cycle. 'Are we attracting students with appropriate abilities for this course?' And on it goes ....

In writing these booklets, and running the workshops we have had a lot of fun and we hope that you catch the flavour of this in using them. Stay in touch and give us feedback about your ideas in implementing any of the suggestions. As a community we can learn most from each other.

Caroline Baillie and Leone Burton
Editors

Learning Materials in a Problem Based Course

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WHY THIS BOOKLET?

In 2000 the Department of Materials at Queen Mary University of London introduced Problem Based Learning (PBL) into their first year undergraduate program – being the first Materials Department in the UK to do so. A year later PBL was further expanded into their second year undergraduate program. To make space in the curriculum, the teaching load was reduced by 20% and most of the traditional practical classes were removed.

Problem Based Learning (PBL) is a concept used to enhance multidisciplinary skills using planned problem scenarios. It is an active way of learning that teaches students problem solving skills, while at the same time allowing them to acquire basic knowledge. PBL was first introduced in the late 1960s at McMaster University in North America, and has since spread around the world mainly in medical education.

The principal aims of implementing PBL are:

- To integrate knowledge and skills from a range of multidisciplinary modules
- To acquire knowledge through self-study
- To teach students how to work in groups and manage group projects
- To improve and develop transferable skills of students
- To develop problem solving skills of students
- To encourage self-motivation, curiosity and thinking
- And finally, to make learning fun!

WHAT THIS BOOKLET DOES? – A PBL GUIDE

This booklet is based on what Queen Mary University of London does and its context. It can be used as a guide to developing a PBL system that works in your context.

At Queen Mary University of London, for first year students, the PBL program consists of 6 case studies (3 per semester) and some initial sessions of key-skills training, as well as some miscellaneous lectures that are beneficial and essential to the development of students. For second year students, PBL consists of 4 case studies (2 per semester) and some key-skills sessions that prepare them with skills required in order to complete PBL tasks.

Appendix 1 provides an

EXAMPLE PBL CASE STUDY

In PBL two different roles for teaching staff can be distinguished:

- The **case group tutor** – who works with a specific PBL group
- The **case study champion** – who creates a specific case study exercise

During the case studies, PBL groups meet regularly for at least an hour each week. There are no compulsory times and locations for these meetings; it is up to the individual groups to decide when and where to meet. However, it is a requirement for all members of each group to meet up at least once a week with their case group tutor. Attendance at all these group meetings is compulsory and is registered by the case group tutor.

Learning Outcomes

PBL in the Department of Materials at Queen Mary University in London is conceived as a way of reinforcing the traditional lecture-based process of delivering academic content, and it is not designed as a substitute. It is primarily a problem-solving programme that seeks to provide students by the end of Year 2 with a checklist of transferable skills and underpinning subject-specific knowledge for more detailed project/research work and further study/application in subsequent years.

By completing PBL, students are expected to learn how:

- To solve problems in an organised manner using brainstorming and resource investigation techniques
- To build on prior knowledge and acquire new knowledge throughout the case study
- To operate basic lab equipment (microscopes & mechanical testing machines) to support the case study investigations
- To use basic computer packages (Word, Excel,

and PowerPoint) and engineering analyses packages (CAE and FEA)

- To analyse and discuss experimental data using written reports, posters and oral presentations
- To work in groups by managing group meetings and recording them using formal minutes to note all actions and decisions

The Case Study Champion

Each PBL case study has a champion who conceives the case study, puts it onto paper, gives a verbal and written explanation for tutors, and assesses how PBL student groups deal with the case study. It is important that students are able to contact the case study champion at designated times during the period in which the case study is being completed.

PERSPECTIVE ADOPTED: THE 7-STEP PROJECT PLAN OF PBL

The following stepped plan approach is essential in order to ensure a systematic method of working is used for all the case studies. Thus group meetings should be structured to conform to the following 7-Step Project Plan of PBL:

- Step 1: Explain unknown wording, statements and concepts
- Step 2: Define the problem(s)
- Step 3: Brainstorm – analyse/try to explain the problem(s)
- Step 4: Make a systematic inventory of explanations
- Step 5: Formulate self-study assignments
- Step 6: Perform self-study assignments
- Step 7: Report and evaluate on self-study. After each group meeting, the group formulates the next stage of the self-study assignments

Step 1: Explain unknown wording, statements and concepts

First, students will read the problem outline, and then they should identify any words, terms or concepts whose meaning they are unclear about. Other student members of the group may be able to provide definitions. It is important that students feel safe to be frank about what they do and do not understand.

Output: Words on which the group cannot agree a meaning should be listed as learning questions.

Step 2: Define the problem(s)

Students are encouraged to contribute their views concerning the nature of the problem. The tutor may need to encourage them all to contribute in a broad discussion. It is quite possible for different group members to have a different perspective of the problem. Comparing these views helps to define the task ahead.

Output: List of problems.

Step 3: Brainstorm

This is the most crucial step in the problem solving process. Here students test out a wide variety of possible explanations or solutions for the problem using information from memory. With brainstorming, each member of the group makes suitable suggestions, until no more ideas are forthcoming. Initially, no priority is set for the suggestions and all ideas are viewed as being equally valid no matter how strange they may appear at first.

The scribe writes down all possible ideas that contribute towards understanding, explaining and solving the problem on a white-board or a large sheet of white paper. Only after all the ideas are written down can they be discussed in more detail and priorities can be set. The tutor should discourage students from going into too much detail during the brainstorming phase. This step is essential as it encourages students to come up with different solutions to the same problem.

Output: List of possible explanations or solutions.

Step 4: Make a systematic inventory

Here the group re-examines the ideas raised in the brainstorming in more detail and compares their ideas against the problem outline to see how well they match, which solutions are linked and where further exploration is needed. This step will help define the self-study assignments of Step 5, as the group needs to organise the different explanations and solutions to form a limited number of tentative solutions.

Output: Ordering or linking of possible solutions from brainstorming.

Step 5: Formulate self-study assignments

The group agrees on a core set of learning objectives, often in the form of questions, which form the basis of students' self-study. These learning objectives should be specific and achievable within the time available between two group meetings. At the beginning of a case study (after the first meeting) it is important that all students share the self-study assignments, whereas in a later stage of the case study some students may have assignments that are not shared by the whole group.

Output: The written objectives are the main output of the group after each group meeting. These are circulated to all students and the tutor immediately after the meeting.

Step 6: Perform self-study assignments

In this step, the students will individually seek out any available learning resources to obtain the information that will contribute towards understanding, explaining and solving the problem. It should be emphasised that each student is responsible for their assignment and must be prepared to contribute to solving the problem. After each group meeting, the group will formulate the next stage of the self-study assignments.

For some PBL problems, students (as a group) will be requested to undertake experimental investigations to support their case studies. In these instances, it is essential that students liase with appropriate lab staff identified by the case study champion prior to booking a time slot to use lab facilities relavant to their case study.

Output: Students' individual notes.

Step 7: Report and evaluate on self-study

In the second meeting, the group returns to discuss the self-study assignments. Each student reports on the output of their study, shares information about sources, helps each other understand, and identifies problem areas that need further study or expert help.

Output: Students' individual notes.

Whenever a case is completed with a written group report and/or a presentation, then the draft version of the report or presentation needs to be discussed during the last group meeting of that case.

PBL GROUP ROLES

In the first year, the initial group selection for the first two case studies is determined by merging two tutor groups. For at least one of the two case studies, a student's individual tutor will also act as their case group tutor. After this, the groups will change on a random basis. This ensures that any effect of group selection is evened out over the first two academic years. Average group size is approximately five or six members.

By rotation at each meeting, students play four specific roles within the group. These are chair, minutes-secretary, scribe and general group members. Rotation ensures that students are exposed to all of these roles.

During a group meeting, the chair has the task of maintaining the agenda and steering the conversation. In order to have information available to the entire group, it is useful to keep a record as part of the work on a case
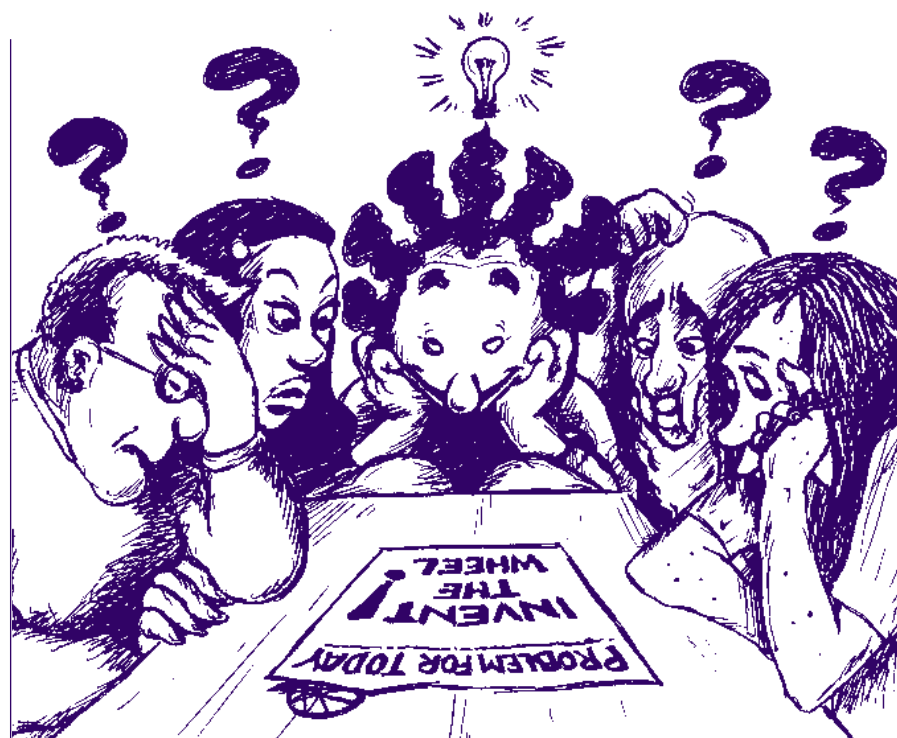
Students learn in PBL by solving a problem or explaining a situation they are given

study. The scribe does so by taking down important matters on a white board, flip chart or large sheet of paper. The information addressed in a student group must be incorporated in minutes of the group meeting. This facilitates the recording of a case study, and is part of the process of ensuring that the case study functions well. During each group meeting, one of the students therefore acts as secretary.

Role of Chair

- To lead the group through the 7 steps of PBL
- To ensure equal participation of all group members
- To maintain good group dynamics
- To keep time
- To ensure the group sticks to the task at hand
- To check if the scribe records the points raised in the discussion

Role of Minutes-Secretary

- To make minutes of meetings by structuring points written down by the scribe
- To distribute the minutes of the meeting to all group members and the tutor
- To participate in the group discussion

Role of Scribe

- To record points raised by the group
- To help the group order their thoughts
- To participate in the group discussion

Role of Group Member

- To follow the 7 steps of PBL
- To actively participate in the group discussion
- To listen to each other's contribution
- To ask open questions
- To research all the learning objectives independently
- To share information with each other

MODEL MEETING FORMAT IN PBL

Prior to each group meeting, an agenda is made. After every meeting is held, minutes are written and circulated. During the meeting the agenda should be followed systematically.

The standard agenda for the first group meeting is given below:

- Meeting commences (assign meeting roles)
- Apologies for absence (only in very exceptional circumstances)
- Step 1: Explain unknown wording, statements and concepts
- Step 2: Define the problem(s)
- Step 3: Brainstorm
- Step 4: Make a systematic inventory
- Step 5: Formulate self-study assignments
- Close the meeting

The model agenda will be changed or altered depending on the progress of the case study. The following agenda is suitable for most of the subsequent meetings; (during the meeting the agenda should be followed step by step):

- Meeting commences (assign meeting roles)
- Apologies for absence (only in very exceptional circumstances)
- Review the minutes of the last meeting to remind what should have been done
- Step 1: Report on self-study activities assigned at the last meeting
- Step 2: Review the definition of the problem(s)
- Step 3: Brainstorm for new ideas
- Step 4: Make a systematic inventory
- Step 5: Formulate further self-study assignments
- Close the meeting

Other items might have to be added at certain specific meetings. For example, the tutor should conduct a mid-project review on each of the group members' individual performance before the close of one of the meetings. Also, in the final meeting, an item should be included where the tutor can review the group's draft PBL submission, to ensure that no factual errors are contained and to give advice on presentation and style.

Writing Up Minutes of Group Meetings

After every meeting, minutes are written by the minutes-secretary (using the format given below), and then typed up and circulated before the end of the day to all participants in the group including the case group tutor.

The minutes are a record of how the PBL case study progressed, and will be submitted with the other submissions at the end of the PBL activity for assessment.

Below is a model for writing up meeting minutes for a normal meeting. The format will change depending on the progress of the case study. For example, for the first and last meeting during a case study the agenda will need special issues for those meetings.

Minutes of Meeting:

- *Context* PBL group number; Date and time of meeting; Title of case study; Number of meeting
- *Opening* List of attendees; Agreement on different roles of group members (change at each meeting)
- *Announcements of group members or tutor*
- *Minutes of previous meeting* Discuss issues arising from the minutes of the previous group meeting
- *Step 1: Report on self-study activities assigned at the last meeting* Outline the self-study report from the group members
- *Step 2: Review the definition of the problem* Write down any changes that may have been agreed since the last meeting
- *Step 3: Brainstorm for new ideas* Write out all the main ideas that came up in the meeting
- *Step 4: Make a systematic inventory* Prioritise the ideas raised during the brainstorming
- *Step 5: Formulate further self-study assignments* Assign individuals to specific study assignments for group members
- *Close the meeting* Record time of closure; Plan time and location of next meeting

ROLE OF THE CASE GROUP TUTOR IN PBL

During the case study, a tutor works with each PBL group. This person is usually an academic member of staff or a research assistant in the department. As tutor to the group, they have several tasks. They should:

- facilitate group interactions amongst students
- consider ways of improving co-operation in the student group as an instrument for attaining the case study goals
- listen carefully to what students already know and stimulate them to tackle possible new challenges
- ask questions and stimulate discussion
- explain how the material is organised
- monitor progress and performance

The overall role of the tutor is:

- to stimulate the group at appropriate moments to explore the material in more depth
- to act as facilitator of the group learning process
- to provide formal moderation of the individual students within the group

Tutors should never:

- act as the chairperson
- lecture in the traditional sense
- impose their knowledge and standards on the group, but help the students explore the problem on their own

Tutor Instructions

Prior to the start of the case study, tutors should:

- Check the scheduled PBL timetable at the start of the academic year and note when they are expected to be a tutor
- If any significant periods of planned absence overlap with their tutoring commitments, then the tutor is expected to swap their tutoring role with a colleague and inform the PBL case study champion of the change
- In the week prior to the start of the specific PBL exercise, they should read the briefing documents provided both for students and for the tutors, which will be circulated by the case study champion

During the initial case briefing session, tutors should:

- Attend so that they can confirm what the students have been told
- Introduce themselves at the end of the session to their group
- Arrange the initial group meeting at a time and location that is convenient for the whole group. Typically this will be on the day of the briefing session

During the case group meetings, tutors should:

- Ensure that a chair, minutes-secretary and scribe are selected, and that they know their respective roles
- Stimulate the conversation by asking open questions (e.g. how…?, what…?, why…?, when…?, where…?) that will enable the group when appropriate to explore the material in more depth
- Support the group learning process
- Prevent too much sidetracking
- Encourage less vocal members to participate
- Maintain good group dynamics and resolve any significant disputes
- Record the attendance of the group
- Complete the *MEETINGS REVIEW FORM* (Appendix 2) for the case group at each specific meeting
- Ensure that subsequent follow up meetings have been arranged
- Evaluate group performance
- At a subsequent follow-up meeting the tutor should perform a mid-project review, whereby the students are given feedback on their own contributions to the group
- At the final meeting the tutor should review the draft PBL submissions such as a presentation or report. Then they should point out any obvious factual errors and provide advice on style and format of the final submission

At the end of the case study, the tutor should:

- Attend the formal assessment event (presentation, trial, poster session or other evaluation)
- Produce a mark for each of the groups they observe at the formal assessment event and return the completed *ASSESSMENT OF PRESENTATIONS FORM* (Appendix 3) to the case champion
- Collect from the students in their PBL group individual *PEER ASSESSMENT FORMS* (Appendix 4) and collate the marks
- Complete the *CASE GROUP ASSESSMENT FORM* for their PBL group (Appendix 5) and return them to the case study champion at the end of the session

Please note that the tutor is also responsible for moderating the individual scaling factor generated from the peer review process. This should reflect each individual performance, with consideration given to the feedback from the Peer Assessment Forms completed by all the students at the conclusion of each project, as well as reflecting their own observations recorded on the Meetings Review Form.

ASSESSMENT OF PBL

The case study group is typically expected to submit one or a number of the following at the completion of each project: a poster, report, oral presentation, html web page, or design and build device. The specific format will be identified on the initial case study outline. The case study champion will assess the work to generate a group mark.

Each individual's performance is reviewed using the peer review process to generate an individual scaling factor for each student. This is done by each student completing a *PEER ASSESSMENT FORM* (Appendix 4) at the conclusion of each project. This is handed to the case study tutor at the formal assessment event.

The case study tutor is responsible for moderating the individual scaling factor generated from the peer review process. This should reflect each individual performance with consideration to the feedback from the students. Each tutor should then complete a *CASE GROUP ASSESSMENT FORM* (Appendix 5) for their group that should be handed over to the case study champion.

The case study champion collates all the group marks and the scaling factors to generate individual marks for the PBL case study. Tutors are encouraged to differentiate between individual performance marks, and should note that the marks should not alter the average mark obtained by the group. Therefore the average of the multipliers for the whole group must be 1.00. For example, if a tutor wants to award a higher mark to a member of the group, then one or more members' marks must be reduced by a similar amount.

Suggested scaling multipliers are:

- Non-participation – 0.0
- Poor – 0.75
- Average – 1.0
- Good – 1.1
- Excellent – 1.25

As an example for a case study that required a report and a presentation to be completed then the typical individual mark is derived from:

[(report + presentation)/2] x individual scaling factor

Each individual in the group will be assessed upon how well they demonstrate the following attributes:

- To analyse the problem
- To innovate possible solutions
- To critically evaluate group suggestions
- To demonstrate prior theoretical knowledge as well as that newly acquired throughout the case study
- To use practical skills in completing the case study

In addition, their team roles will be evaluated, including how well they performed as:

- Chairperson
- Minutes-secretary
- Scribe
- Group member

PBL SUBMISSIONS

### *Written Report*

A single submission for each group is frequently (but not always) expected for a case study. The report should be:

- structured
- include details of any experimental work undertaken
- include plots/tables of all the essential discoveries during the investigation
- include notes of all group meetings as a record of how the PBL case study progressed

PBL submission and assessment
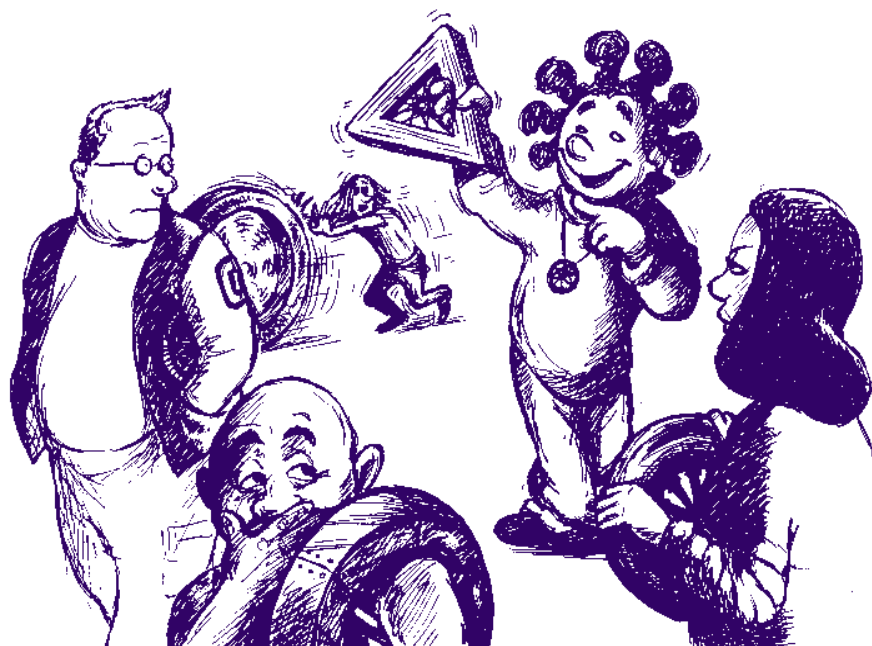
Presentation

Students may be asked to carry out a group presentation on their findings. Typically only 1 to 3 members should actually make the presentation. But throughout the year, every student is expected to have presented their findings at least once. Presentations are restricted to 10 minutes each, with 5 minutes for questions, and immediate feedback is provided on team performance.

Poster

Occasionally, the formal assessment can be based upon a poster presentation. This should be clear, concise, attractive, and easy to read.

Web Resource

Occasionally, students are asked to create a web-based report to explain their findings. This should incorporate colourful graphics and should be easy to navigate. Again, only a single web-based report per group to be submitted.

Design and Build-Based Study

Occasionally, students in their groups are asked to make a device or structure as part of a case study. This must be submitted at the end of the study period for either evaluation or testing.

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Savin-Baden, M. (2000) *Problem-based learning in higher education: untold stories,* SRHE & Open University Press, Buckingham.

For further information regarding PBL at the Department of Materials at QMUL, please visit the following website:

http://www.materials.qmul.ac.uk/pbl

Contact details as follows:

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APPENDIX 1: EXAMPLE PBL CASE STUDY: 'THE COURT CASE'

THE CROWN vs DR TON PEIJS:

Dr Ton Peijs was charged that on the first day of May 2001 he did wilfully, while taking part in an anti-capitalist demonstration in the city of London, damage a restaurant belonging to the CJD-burger chain in Oxford Street. The prosecution provided forensic evidence linking Dr Peijs to the scene of the crime. The defence team, concerned by the overwhelming force of evidence held by the prosecution, decided to hire several independent consultants (the PBL groups) to advise them and to give evidence in court. Several different pieces of evidence were provided against Dr Peijs. One for each group to examine.

For example team E were given a sample E2 of fibre from the wall of the CJD-burger restaurant which they alleged to have come from Dr Peijs' pullover. A sample of the same black fibre E1 taken from his pullover when he was arrested was also provided for comparison.

The Court met with Lord Justice Reece presiding. Prosecuting counsel was Julian Evans, and defence was conducted by James Busfield. After a brief review of the evidence from the prosecution the defence counsel called upon expert witnesses from each team and invited them to present their evidence. Each PBL group was cross-examined on their evidence by counsel for the prosecution. Exhibit E1 was identified as being a man made polymeric fibre and exhibit E2 was identified as being natural fibre. As none of the evidence presented by the prosecution was conclusive then the case against Dr Peijs was dismissed.

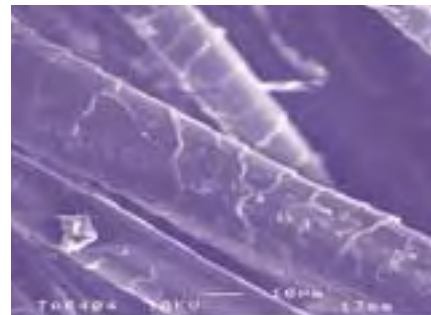

Exhibit E1: Fibre sample from suspect's clothing

Exhibit E2: Fibre sample collected from a splinter on the broken door-post of the CJD burger restaurant

APPENDIX 2: MEETINGS REVIEW FORM

Meetings Review: Tutor Assessment of Group's Activity

Case Study Number:

Title:

Group Number:

Group Tutor:

Meeting 1

Date:

Student	absent	poor	average	good	excellent	Chair	Secretary	Scribe

Comments:

Meeting 2

Date:

Student	absent	poor	average	good	excellent	Chair	Secretary	Scribe

Comments:

APPENDIX 3: ASSESSMENT OF PRESENTATIONS FORM

Assessment of Formal Presentations (completed by tutor)

Case Study Number:

Title: Date:

Group number: Mark: /10
Presenters:
Comments:

Group number: Mark: /10
Presenters:
Comments:

Group number: Mark: /10
Presenters:
Comments:

Group number: Mark: /10
Presenters:
Comments:

Group number: Mark: /10
Presenters:
Comments:

● *Return to case study champion*

APPENDIX 4: PEER ASSESSMENT FORM

Peer Assessment (Completed by the students in the group)

Case Study Number:

Title:

Group Number:

Group Tutor:

Name:

Individual performance marks:

Student	Performance mark

Notes on individual performance scaling factor

The group will submit one or a number of the following at the completion of a project: a poster, a report, an oral presentation or an html web page. Each part of the submission will be assessed to generate a group mark out of 10. This is scaled by the case tutor to reflect each individual performance with consideration to the feedback from the peer assessment forms completed by all the students at the conclusion of each project.

The individual performance marks should not alter the average mark obtained by the group. Therefore the average of the multipliers must be 1.00. Suitable suggested scaling multipliers are:

Non-participation	*0.0*
(not included in the average for the group)	
Poor	*0.75*
Average	*1.0*
Good	*1.1*
Excellent	*1.25*

Total individual mark = [(report + presentation)/2] x individual scale factor

● *Return to case group tutor*

APPENDIX 5: CASE GROUP ASSESSMENT FORM

Overall Group Assessment (completed by tutors)

Case Study Number: *Date:*

Title:

Group Number: *Group Tutor:*

Presentation   /10   *Report   /10*

Average mark   /10

Individual marks:

Student Name (tutor to complete)	Individual Scale Factor (0-1.25) (tutor to complete)	Total Individual Mark /10 (champion to complete)
Average value	Average value of this column must be 1.0	The same as above average

Notes on individual performance scaling factor

The group will submit one or a number of the following at the completion of a project: a poster, a report, an oral presentation or an html web page. Each part of the submission will be assessed to generate a group mark out of 10. This is scaled by the case tutor to reflect each individual performance with consideration to the feedback from the peer assessment forms completed by all the students at the conclusion of each project.

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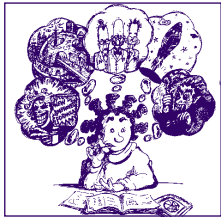
Non-participation   0.0
(not included in the average for the group)
Poor   0.75
Average   1.0
Good   1.1
Excellent   1.25

Total individual mark = [(report + presentation)/2] x individual scale factor

● *Return to case study champion*

NOTES

Other Booklets In the Series:

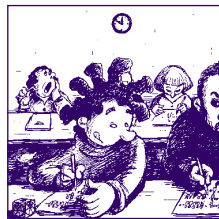Attracting Materials Students – Cheryl Anderson
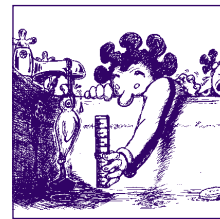

Environmental Materials – Cris Arnold

Teaching Materials Using Case Studies – Claire Davis and Elizabeth Wilcock

Developing Professional Skills – John Wilcox

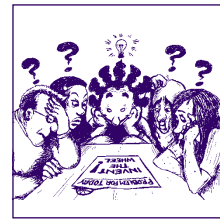Assessing Materials Students – Lewis Elton

Learning Materials at a Distance – Mark Endean

Materials for Engineers – Mike Bramhall

Tutoring Materials – Adam Mannis and Shanaka Katuwawala

Learning Materials in a Problem Based Course – James Busfield and Ton Peijs

Materials Chemistry – Stephen Skinner

Teaching Materials Lab Classes – Caroline Baillie

Evaluating a Materials Course – Ivan Moore

Learning Materials
in a Problem Based Course

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