

## **PBLE: Competition Entry**

**(Complete according to the accompanying guidelines before this document)**

Name(s) of entrant(s): Claire Davis and Elizabeth Wilcock

Institution: University of Birmingham

Faculty / School: School of Engineering

Department: Metallurgy and Materials

Degree Programme(s): Sports and Materials Science

Award(s): BSc

Year(s) of study: 3

Title(s) of Module(s): Final Year Project

Project Title Case Studies in Sports Materials – Theory and Practice

Module Credits 40 of year total 120 % project assessment 100

Project deliverables Literature review, project plan and viva (25%)  
Project Report (45%)  
Oral Presentation (10%)  
Supervisors mark (20%)

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Industrial/ Professional Involvement Sports by Design (company that runs workshop activities for schools) and Setpoint for the West Midlands (co-ordinating organisation for school activities).

Group Project: Part group work, part individual – students began the project by working in a group to gather resources but completed most of the project, and handed in work, individually.

Group Size 6

Group Selection: Chosen by project selection (see student selection section for details)

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### **Synopsis of Project (max 100 words)**

Describe the nature, objectives, structure and methodologies of the project

The project aim is to develop case study teaching for pre-university level students in the area of sports materials. Students initially determine curriculum content at key stages 3/4 (GCSE) and post-16 (AS level) relevant to Materials Science and review educational literature concerning case study teaching (group working, learning styles, assessment techniques etc.). The case study development involves researching background technical information for the chosen piece of sports equipment, carrying out appropriate experiments, using research equipment where appropriate, to determine underlying science and then developing and trialling appropriate hands-on practical components for their chosen audience.

### **Intended learning outcomes of the project**

Learning outcomes of the Final Year Undergraduate Project (generic)

- Complete a substantial piece of independent research or development
- Critically appraise relevant literature on the topic investigated

- Demonstrate practical competence in, or write reports on, techniques for the characterisation of materials and the acquisition and evaluation of experimental data
- Analyse results in order to draw conclusions and recommend further investigation
- Report, both orally and in writing, on the contribution to knowledge made by the findings of the project

Additional learning outcomes of this specific project title

- Critically appraise educational literature on case study teaching and student learning
- Identify key areas of the curriculum (key stages 3 / 4 and post-16) relevant to Materials Science
- Collect and analyse experimental data in order to recommend suitable case study content
- Develop hands-on experiments suitable for the target audience

### **Student Selection**

How are projects assigned to students? In addition, if a group project, how are the groups formed?

Final year undergraduate students are given a list of projects to select from. They are required to discuss any projects of interest to them with the relevant supervisors then to submit a rank order list of their three preferred choices. Project allocation is made to ensure that as many students as possible get their chosen project, with account taken as to whether the students met with the project supervisor. This year, six students were allocated to this specific project. Initially, the whole group decided on the generic tasks required for a successful project (with guidance by the supervisor) and allocated the tasks to individuals / small groups. Weekly group meetings with supervisors ensured that all tasks were carried out equally and that all members were aware of outcomes during the project developmental stages. Following the developmental stages, on case study teaching and learning styles, students chose an item of sports equipment / area of sports performance to investigate and carried out experimental research individually.

### **Project Implementation**

Describe the activities a student would undertake during this project

During this project students undertake the following activities:

- Educational research into case study theory, teaching and learning styles, group working, assessment strategies and evaluation techniques
- A review of GCSE and post-16 curriculum content in science to determine appropriate topics in materials science to be used for case study development
- Research into target audience – contacting teachers and students to help in the development of case study (i.e. administering questionnaires and assessing responses)
- A literature review on the relevant educational topics and technical science (related to chosen aspect of sports equipment development)
- Viva with lecturers on literature review and project plan for experimental work
- Identification of an area of sports and materials science / sporting equipment example for case study development
- Detailed experimental work to identify the underlying science in the chosen area of study
- Selection of appropriate content for a case study
- A trial run workshop with school students
- An individually written report giving details of all research and experimental work, including recommendations and proposals for a case study based on these findings
- An oral presentation to lecturers and peer group

### **Project assessment**

Describe how this project is assessed. If appropriate, include details of moderation and/or marks allocation.

#### **Draft literature/information source review, project plan and viva (25% of the project)**

Students submit an initial individual literature review (2000 words), which is assessed by two members of staff. The same members of staff conduct a viva for 15 minutes with the student to discuss understanding of work and the plan of work over the remaining two thirds of project.

### **Project Report (45% of the project)**

Students submit an individual final project report (5000 words) which is double-blind marked by two members of staff who are not responsible for supervision of the project. Marks are given for the following: Synopsis, Introduction, Methodology/Experimental, Results/Outcomes, Discussion, Conclusions and English. If marks from the two assessors differ by more than 10% then the project is moderated (marked by a third member of staff and closest two marks averaged).

### **Project Presentation (10% of project)**

This is a 20 minutes presentation with a further 10 minutes for questioning, which is presented to two members of staff and a peer group. Prior to this, practice presentations are held with supervisors to help students present their work effectively.

### **Supervisors mark (20% of project)**

The project supervisors do not mark the project report, presentation or viva but have a separate mark which covers aspects such as attendance, experimental competence, independence of work and contribution of ideas

### **Supporting Students**

Describe the facilities made available to the students undertaking this project.

Describe how your institution's staff supports the students undertaking the project.

Each project has a least two supervisors (whose research areas match the project title) to support students in their studies. There are weekly meetings scheduled as well as 'drop-in' times where supervisors are available for help. As a department, there are almost as many post-graduate as undergraduate students hence there is plenty of post-graduate support for the project for the day-to-day activities. Project students are also generally attached to a research group and can use the facilities and ask for assistance within that group. In addition, students have full use of the undergraduate laboratories and general research facilities, and there are several technicians who provide support with experimental work.

### **External Involvement**

If applicable, describe any external involvement

Students had contact with a company called 'Sports by Design' who specialise in running sports/science workshops in schools. The director of this company met with the students to help brainstorm ideas and give advice on how to design activities that are suitable for the target age group. Through another organisation, 'SetPoint', students were able to 'test-run' their case studies with school pupils visiting the University. A group of 15 pupils from local schools, as well as three students from Frankfurt, attended a workshop at the department and carried out some of the case studies produced by the students.

### **Project Design and Development**

Describe how this project evolved to its current form (if appropriate, provide some historical context)

Our BSc course in Sports and Materials Science was first of its kind in the UK (first run in 1998) and combines an appreciation of the advanced materials used in sporting equipment with the practical and theoretical knowledge of sports and exercise sciences. The materials aspects of the course have been based on well-established courses such as our BEng / MEng Materials Science and Engineering courses and therefore the final year undergraduate project uses similar guidelines and methodology to the existing system. Sports and Materials Science projects typically involve research into the materials used in an item of sports equipment. However, as the course developed, and more students were recruited, it has been noted that not all students want to use their engineering skills to move into technical careers but instead some would like to become teachers. These students are less motivated by a purely research based project looking at the detailed aspects of materials properties. This year it was decided that a new style of final year project would be offered to students (in addition to the purely technical, researched-focussed project). It was hoped that 'Case Studies in Sports Materials – Theory and Practice' project would meet students needs and allow

those students interesting in a teaching career to explore materials science education, as well as conduct experimental research.

### **Project effectiveness**

Describe what you think makes this project an effective teaching tool.

How are project resources managed to ensure the effectiveness and efficiency of this project?

By actively involving students in a subject that interests them, and widening knowledge of possible career paths, it was hoped that this project would increase motivation and desire to learn (see feedback). In addition, scheduled weekly meetings and supervisor support gave students the confidence and encouragement to approach materials science from an educational viewpoint. Students were able to use existing research facilities and were given a budget to obtain the necessary consumables for their experimental work. The opportunity to work directly with schools is a real highpoint of the project as students gain an insight into the various aspects of teaching as well as an understanding of school curriculum.

### **Student feedback**

Please provide an anonymised summary of student feedback of the project. Where applicable, explain how any issues raised have been addressed. How does student feedback demonstrate the use of this project as a good teaching tool? Have developments occurred to improve the process as a result of student feedback?

As this is the first year that this particular project has run, feedback is limited (although generic feedback on final year projects is generally very positive). Feedback we have received has been very encouraging. It seems that students chose this project as they were interested in a career in education and wanted to explore this in a materials project, for example students have stated that:

- 'I was thinking of teaching as a career and thought this would be helpful'
- 'I was more interested in looking into the educational side and applying it to materials'

Students found the weekly meetings with supervisor and the 'test-run' of their case studies particularly helpful, for example they said that:

- 'The meetings really kept me on top of things. It also meant that it was possible to ask questions and make sure you were on the right track'
- 'The test-run with the school pupils was great because we were able to see what we had developed as a project which was excellent feedback!'

These are all areas that will be included in the future running of the project. One issue the students did raise was that they felt, due to the structure of the project, that they did not have enough time for their experimental work and write-up of the project. This will be a consideration for this project in the future, the students' comment was:

- 'It would have been better to start the practical work before the end of the first term'

### **Innovation**

Are there any features of your project you consider to be innovative or noteworthy?

This project was developed in response to student needs and offered the final year students a wider choice of study. For those students who had a particular interest in teaching, they were given to opportunity to gain a better understanding of the school curriculum and explore teaching and learning styles whilst keeping a materials science viewpoint. The involvement of experts outside the normal range of contacts was of great benefit to the project and this was reflected in student feedback.