Industrial Placements for Engineering Students: a Guide for Academics

an **Engineering Subject Centre** guide

The Higher Education Academy

Engineering Subject Centre

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Acknowledgments

A separate guide for employers is available from the Engineering Subject Centre website www.engsc.ac.uk/downloads/employers-guide-on-placements.pdf

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Industrial Placements for Engineering Students: a Guide for Academics

Overview

This guide is aimed at academics and other staff involved with the provision of placements for engineering students. It provides practical advice about developing links with industry and setting up appropriate placement opportunities for students. Students will gain more from their placement if properly prepared and advice is given about how they can be supported both before and during the placement. Health and safety issues are addressed briefly, with links to further information and checklists. The guide discusses issues relating to the assessment of placements and provides some examples of approaches taken by universities.

Terminology

Employer/industry tutor
The student's manager within the workplace, responsible for managing their day to day activities.

Internship
A period of paid or unpaid work for an employer which a student undertakes during the degree programme.

Placement coordinator
The university/college academic responsible for overseeing the placement scheme within their school/department/institution.

Placement student
The student undertaking the placement.

Placement tutor
The university/college academic responsible for monitoring the progress of the student whilst they are on placement. They are often also responsible for marking the student's assessment.

Placement visit
A planned visit by the placement tutor to the student's place of work. This is usually completed within one day and involves meeting with both the student and industry tutor to monitor progress.

Sandwich placement
A period of paid work for an employer which a student undertakes during the degree programme. The student is usually required to submit an assessment reflecting on their work to the college/university.

Learning through a placement

Placement learning provides the opportunity for students to develop new skills and attributes, to apply theory that they have learnt within their programme and to contextualise what they have learnt. This view is supported by employers - the National Inquiry into Higher Education (Dearing, 1997) identified that *"the strongest single message which we received from employers was the value of work experience."* Learning on a sandwich placement has been identified as a form of work-based learning for work (Medhat, 2007). Work-based (and placement) learning is very different to traditional class-based learning in a number of ways:

- Firstly, work-based learning is centred around reflection on work practices; it is not merely a question of acquiring knowledge and a set of technical skills [although these are important], but a case of reviewing and learning from experience.

- Secondly, work-based learning views learning as arising from action and problem-solving within a working environment, and this is centred around live projects and challenges to individuals and organisations. Work-based learning also sees the creation of knowledge as a shared and collective activity, one in which people discuss ideas and share problems and solutions.

- Finally, work-based learning requires not only the acquisition of new knowledge but the acquisition of meta-competence – learning to learn. (Raelin, 2000 in Gray, 2001).

Ensuring that students maximise the benefits and opportunities of placements requires good planning. Where students learn through placements it is the awarding institution that is responsible for the academic standard of the award and the quality of provision leading to it. The awarding institution must have in place policies and procedures to ensure that their responsibilities, and those of their partners, are clearly identified and met (QAA, 2007).

Links with industry

Existing links between industry and university often form the basis for employers to work in partnership with university engineering departments to recruit placement students.

Engineering academics and employers may have both formal and informal links through research, knowledge transfer, commerce, skills development, recruitment, education and training and other areas of mutual interest.

Placement opportunities can also be identified through:

- referrals from graduates, particularly alumni, working in industry who are keen to inform students about the opportunities available with their employer;

- personal contacts and 'word of mouth' recommendations;

- direct mailing to employers;

- speculative approaches from employers.

Maintaining and developing links

Placement coordinators usually create a database of companies and potential contacts and invite employers to the university department to give a presentation to students about their company. Placement coordinators may offer to host interviews for employers and university careers services may provide support to employers when they are recruiting placement students on campus. It is important to nurture personal contacts and to support those employers who are new to recruiting placement students.

Understanding and agreeing objectives

Employers need to have a clear understanding of the aims and objectives of the placement. A useful starting point can be a job description, examples of roles that previous students have undertaken and an explanation of the assessment the student will undertake. The intended learning outcomes and development of skills which a student should achieve whilst on placement should be discussed fully with the employer (see Appendix 2).

Communication

Clear and timely communication between employers, students and the university is key to sustaining effective relationships. Problems are less likely to arise if all parties communicate with each other on a regular basis.

An appropriate placement

Placement tutors should take the following factors into account in deciding whether or not a placement would be suitable for a student:

- **working environment** – students on placement are employees of the company, however, the university has a duty of care (see Health and safety on page 9);
- **support from the employer** – students need to work with colleagues and managers who are supportive and with whom they feel that they can discuss their work;
- **suitable work** – students must be performing tasks which are appropriate for an undergraduate and relevant to the subject discipline;
- **recruitment and selection** – it must be a fair and valid process. Employers should be informed of dates when students will not be available for interview. Often greater commitment is gained by both the student and employer being directly involved in the recruitment and selection process;
- **expectations** – placements should meet the expectations of students by being sufficiently challenging and offering appropriate exposure to engineering plant, people, processes, functions and products. Students should have some opportunity to participate in project work that will help to motivate them. The placement should also broaden their understanding of working in a commercial environment and develop technical understanding and skills;
- **practical considerations** – an acceptable salary or other reward should be on offer and accommodation may need to be considered;
- **feedback from students** – www.ratemyplacement. co.uk provides a mechanism to see how previous students have rated employers.

Preparing students for placement

Embedding employability skills

Students should be made aware of what skills they are expected to gain and develop during their placement and how these will contribute to their employability (Mantz and Knight, 2006). Students can expect to gain subject-based knowledge, but personal development has been identified as a major element of the placement experience. Placement students report increased confidence, development of interpersonal skills and better time-management, team working and planning (Little and Harvey, 2006).

Students who are preparing for a placement can be supported in a variety of ways:

- previous placement students can give a presentation about their experience in industry;
- placement coordinators can organise a placement fair and ask employers to give a presentation and talk informally to students;
- placement and graduate recruitment managers can be invited to speak to students about their industry and company;
- case studies of previous placements can be created by asking students to write about their experience in their own words;
- employers can attend practice assessment centres where they can give feedback to students;
- placement tutors often produce a placement guide for students with specific university requirements and deadlines;
- careers advisers will work collaboratively within departments in preparation for the application process;
- the students' union can be a source of direct help and support for students seeking placements.

Managing expectations

Placement tutors, employers and students need to have a clear understanding of the purpose and objectives of the placement.

Expectations need to be managed to encourage successful long-term partnerships. Students, employers and university staff need to have information and guidance about:

- roles, relationships and responsibilities;
- how the students' performance will be assessed;
- health and safety;
- the purpose of visits by university tutors.

Learning contracts

Since the late 1990s learning contracts are increasingly becoming a feature of programmes featuring work-based learning. They enable individual learners, higher education institutions and the industrial placement provider to negotiate, approve and assess the intended learning outcomes (i.e. skills, areas of knowledge and attributes that a student is expected to gain from a qualification or work based learning experience (QAA, 2007)).

The learning contract sets out *"what learning goals are to be achieved […] as a result of work-based activities, and how achievement in the form of competencies is to be evidenced"* (EC UK and DIUS, 2008). The learning contract can be written as a professional development plan or, as at Salford University, comprise of a set of guidelines in the Industrial Training Manual (NEF, 2007). The process of developing a learning contract, as defined by Allin and Turnock (2007), involves:

- diagnosis of learning needs;
- specification of learning objectives;
- identifying learning resources and strategies;
- stating target dates for completing activities;
- specifying evidence of achievement;
- articulating how evidence will be validated;
- reviewing the contract with the work-based supervisor;
- implementing the contract;
- evaluating learning.

The learning contract can also enable learners to *"negotiate non-standard programmes of learning that reflect both their own professional needs as well as the needs of the employer"* (Goodwin and Foster, 2000 in Gray, 2001).

Health and safety

Health and Safety Guidance for the Placement of HE Students (UCEA, 1999) written by ASET, the professional body for placement and employability staff, and USHA, the Universities Safety and Heath Association, recommends practical health and safety procedures for student work placements.

The guidelines are directed at all parties who are concerned with the health and safety of students on placement but are particularly aimed at the university. They outline the responsibilities, minimum requirements and preparation that must be established to minimise the health and safety risks to students.

It is important to note that the proposals and recommendations here apply specifically to placements in the UK. For further information about international placements, go to:
http://www.asetonline.org/advice.htm#international

Legal responsibilities

Universities must ensure that placement tutors are competent to carry out their work and follow both statutory and university health and safety guidance. Professional training for placement tutors should be provided and placement tutors should be supported by specialist professionals where necessary.

Universities need to consider health and safety legislation carefully. Delegation of the procurement of placements to other agencies does not release universities from their legal responsibilities.

Once students are on placement they are employees of the company. The employer has the same duty of care towards placement students as it does to any other employee. Equally, students have the same responsibilities to the company for health and safety matters as any other employee and must comply with company health and safety regulations.

Procedure for the approval of placements

A health and safety checklist should be sent to every employer, for them to complete and return to the university (see Appendix 1). The university or their agent should investigate any negative answers that arise from the checklist. After the checklist confirmation and appropriate health and safety briefings the student should be given an 'authority to start placement' letter. The student should not start work before receiving this letter. Students should confirm that they have received the appropriate induction and health and safety briefings. If a student changes his or her place of work, or anything occurs that might affect the answers to the checklist, this information must be given to the university. Each stage of this procedure should be backed up by written records.

Universities should arrange for a competent person to visit the workplace at appropriate intervals. The number of visits and how often they should be carried out will depend on the level of risk and the length of the placement. Placement tutors must report on any potential health and safety issues.

Feedback on the suitability of a placement should include the careful debriefing of students. Action on any area of concern should be taken and written records should be kept in the event of any future investigation.

Students need verbal and written guidance regarding health and safety before they start their placement. They should also receive a copy of *Health and Safety Guidance for the Placement of HE Students* (UCEA, 1999). Health and safety guidance should also be provided by the employer.

Visiting students on placement

Students and employers welcome visits by university tutors and it is often a useful and rewarding experience for all those involved.

Visiting placement students has a number of purposes:
- to check that the tasks and objectives are reasonable;
- to check that the student fully understands the requirements of the placement;
- to check that the placement is progressing satisfactorily for the student;
- to encourage the student to reflect on their development;
- to deal with difficulties or conflicts which may occur;
- to identify opportunities for further development;
- to evaluate and record the student's progress.

Benefits to employers of placement tutor visits:
- to check that the placement is progressing satisfactorily for the employer;
- tutor visits can be useful in motivating students;
- if problems arise the tutor can become involved.

Placement tutor visits provide further opportunities:
- to discuss the student's progress and give feedback on performance;
- for the employer to compare the development of their placement with what is happening in other companies;
- for the employer, the tutor and the student to set joint objectives;
- to discuss course and university developments;
- to discuss potential work in other areas.

Preparation
Students should inform their placement tutor where they are working (i.e. their department or function, who their supervisor is and their supervisor's contact details). Often students are asked to organise the visit for the tutor, which might include a tour if appropriate and meetings with their supervisor and other managers. The placement tutor should also provide the student and the supervisor with their contact details.

Developing placement tutors
University staff may need some assistance in taking on their new roles as placement tutors. Less experienced staff can be encouraged:

- to speak with placement tutors and students returning from placement;
- to shadow experienced placement tutors before visiting students;

- to attend events related to placements and work based learning such as the ASET Conference http://www.asetonline.org/conf.htm.

Assessment and accreditation of placements

Universities have adopted a variety of methods for assessing and accrediting placements. Assessing and accrediting placements helps students to develop and is one element of best practice which distinguishes industrial placements from casual work experience.

The benefits of assessing a placement include:
- encouraging students to develop;
- allowing feedback so that students can improve;
- motivating students to learn from their experience in industry;
- encouraging students to reflect on their work and how it relates to their academic studies;
- students' achievements can gain formal recognition;
- helping students and employers to discuss and agree on realistic goals;
- engaging students in skill development and personal development.

Examples of how to assess and accredit placements in engineering are:
- a separate award is given by the university;
- external accreditation;
- assessment contributes to initial professional development;
- academic credit is awarded within the degree;
- companies have their own in-house appraisal and development programme;
- assessment is carried out and the successful completion of a placement is indicated on the degree certificate;

- successful completion of a placement should be recorded on the degree transcript/diploma supplement (UK HE Europe Unit, 2006).

Assessment and accreditation can also support students with the engineering institutions' requirements towards chartered engineer status and their future professional development.

Tools for assessment
There are three key questions to ask when designing the assessment strategy for placement learning:

- what should be assessed?
- how shall it be assessed?
- who will assess it?

Clearly identified intended learning outcomes for the industrial placement can help to direct *what* is to be assessed (QAA, 2007). However, care should be taken to ensure that concentrating on pre-specified outcomes does not preclude any high level and unplanned learning which may occur (Brennan and Little, 1996).

A wide range of methods for assessment of placements are available. These have been identified in the following table (Lilley and Bamforth, 2008):

Table 1. Methods for assessment of placements		
Method	**Issues**	**Source**
Dissertation	• Requires the use of higher level skills – critical analysis, synthesis and evaluation. • May be a conflict of values when choosing subject matter – academic tutor may be concerned with academic rigour, formulation of research questions/methodology, industrial tutor may tend to focus on results which have practical implications for business operations/ strategy. Preparation of a business focused executive summary is advisable. • Assessment effort very high – large volumes of material to be reviewed, intermediate feedback and guidance may be required.	Gray, 2001
Assignment	• Marking criteria and weightings required. • Contextually unique – topic will vary. • Work context of learner will provide setting and subject matter. • Assessment effort – high. Effort required to negotiate learning outcomes with learners and mark material.	Gray, 2001
Memorandum report	• Learner summarises results of a research study in 1-2 sides of A4. • Forces learners to be succinct and focus on essential issues. • Assessment effort low - relatively quick to mark.	Gray, 2001
Presentation/viva	• Tests background knowledge and understanding. • Can be assessed by academic tutor/industrial tutor/peers. • Assessment effort – low. Mainly confined to drawing up assessment criteria and completing assessment pro forma.	Brennan and Little, 1996; Gray, 2001; Costly, 2007

Table 1. Methods for assessment of placements		
Poster display	• Guidance and assessment criteria required. • Assessment effort – low. Peer assessment or assessment by one or both of the tutors (academic and industrial).	Gray, 2001
Self-assessment against criteria set by tutor (potentially agreed in a learning contract)	• Develops students awareness of own skills and knowledge and encourages reflection. • Reliability open to question. • Assessment criteria must be identified and agreed in advance and used. • Assessment effort – low. Onus is on student.	Gray, 2001
Assessment of student's learning logbook/work record	• Encourages self-reflection as a learner. • Validity can be questioned, needs to be combined with another method of assessment such as interview. • Can provide evidence towards professional accreditation.	Brennan and Little, 1996; Costly, 2007
Portfolio	• Should present evidence of achievement and reflect on what they have learned. • Students need guidance on what to include and what to omit and size of portfolio required. • Assessment effort - very high. Portfolios contain large volumes of material and usually an overarching commentary, student guidance is likely to be heavy and originality of a portfolio makes it hard for an assessor to rely on prior experience. • Encourages students to reflect upon, assess, and control their own growth according to course outcomes. For guidance on assessing portfolios see Baume, 2001	Gray, 2001; Allin and Turnock, 2007; Costly, 2007
Company assessment of placement performance	• Industrial tutor better placed to reflect on workplace tasks and performance. • Report/survey completed by industrial supervisor usual method. • Assessment effort – low (if provided with short pro forma questionnaire).	Brennan and Little, 1996

People involved with assessment may include:

- **Industrial tutor/line manager** who is responsible for the student on a day to day basis.

- **Placement tutors** usually play a large part in assessment. They make evaluations, advise line managers on how to carry out assessments, mark work submitted by students and moderate marks.

- Self assessment can involve **students** either evaluating their own work or grading it against set criteria defined by a tutor (Gray, 2001). The students will be involved in self appraisal through discussions with line managers, mentors and placement tutors about their performance. They are also often required to collect and present evidence and submit reports reflecting upon their placement experience.

- **External assessors** may take on an advisory role and visit students on placement. They can give students information about assessment before they go on placement, give additional support via email during the placement and facilitate a debrief session when students return to university.

Challenges in assessment

It is important for students, university staff and employers that everyone has a clear understanding of the aims of assessment and its *why, what, how* and *when*. One of the major issues in assessment and accreditation is whether its significance is recognised by the professional sector, university and students. Assessment must genuinely assess student performance, irrespective of the nature of the placement. Where marks are given for the placement, effective assessment practice should be followed

(QAA, 2006). A moderation procedure must exist to ensure reliability, authenticity and validity (Gray, 2001) of assessment across a number of students. Where a student's work is confidential to the employer they may request to read the student's reports and require the university to sign a confidentiality agreement which limits the number of staff who can have access to them.

Summary
Assessment and accreditation bring significant benefits for students. They help them to develop during their time in industry, ensure that their efforts are recognised and that they undertake the experience in a formal, planned and monitored way. This is important if university staff, employers and students are to see industrial placements as an integral part of their learning.

Examples of assessment practices

Award of associateship, University of Surrey
The University of Surrey recognises 'professional training' with the award of Associateship as a specific recognition of students who have completed a placement satisfactorily. Students who are awarded with Associateship receive a degree stating that they have completed a period of training and a separate Associateship certificate. The award of Associateship may also be made with merit or distinction.

City & Guilds Licentiateship, University of Newcastle
Several universities, including the Department of Process and Chemical Engineering at the University of Newcastle, have delegated authority to award City & Guilds Licentiateship to students. The student must have evidence of successfully completing a work placement, a project report and a reflective review. Students have to plan, undertake and evaluate the project and generate evidence that demonstrate key skills in:

- Self-management and development
- Managing tasks
- Communicating clearly and effectively
- Working with and relating to others
- Applying knowledge
- Applying initiative in work problems
- Reflection of learning outcomes from specific situations.

Engineering degree, Huddersfield University

The engineering degree programme in the School of Computing and Engineering at Huddersfield University assess placements using the following criteria:

A) Progress against guidelines set in the Employers Assessment Report for ten set competencies:
1. Comprehension – the ability to understand and interpret instructions;
2. Performance – the ability to carry out assigned tasks;
3. Interest – attitude to tasks set;
4. Confidence – the capacity for self reliance and assurance;
5. Communication – the ability to give a complete and concise account of a situation either orally or in writing;
6. Analytical and diagnostic skills – the ability to analyse problems and identify their cause;
7. Working with others – the ability to mix with others and to gain respect;
8. Self organisation;
9. Attitude to training – understanding the programme's content and its purpose;
10. Conduct – attitude and behaviour of the individual.

B) Progress in technical skills and projects summarised in a log book following institutional format.
C) Company evaluation contained in a profile report.
D) A report from the industrial supervisor.

Case study from *The Path to Productivity: The Progress of Work Based Learning Strategies in Higher Education Engineering Programmes* (New Engineering Foundation, 2007).

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Appendix 1. Health and safety checklist

		Yes	No
1.	Do you have a written health and safety policy?		
2.	Do you have a policy regarding health and safety training for people working in your undertaking, including use of vehicles, plant and equipment, hazardous chemicals, and biological processes (if applicable) and will you provide all necessary health and safety training for the placement student?		
3.	Is the organisation registered with: a. the Health and Safety Executive or b. the Local Environmental Health Department?		
4.	Insurance a. Is Employer and Public Liability Insurance held? b. Will your insurances cover any liability incurred by a placement student as a result of his/her duties as an employee?		
5.	Risk assessment a. Have you carried out risk assessment of your work practices to identify possible risks, whether to your own employees or to others within your undertaking? b. Are risk assessments kept under regular review? c. Are the results of risk assessment implemented?		
6.	Accidents and incidents a. Is there a formal procedure for reporting and recording accidents and incidents in accordance with RIDDOR? b. Have you procedures to be followed in the event of serious and imminent danger to people at work in your undertaking? c. Will you report to the university all recorded accidents involving its placement students? d. Will you report to the university any sickness involving placement students which may be attributable to work?		

Appendix 2: QAA Code of practice, Section 9: Work-based and placement learning: the precepts

General principles

1. Where work-based or placement learning is part of a programme of study, awarding institutions ensure that its intended learning outcomes are:
   • clearly identified;
   • contribute to the overall and coherent aims of their programme;
   • are assessed appropriately.

Responsibilities

Responsibilities for academic standards and quality

2. Awarding institutions are responsible for the academic standards of their awards and the quality of provision leading to them, and have in place policies and procedures to ensure that their responsibilities, and those of their partners involved in work-based and placement learning, are clearly identified and met.

Responsibilities of partners

3. Awarding institutions ensure that all partners providing work-based and placement learning opportunities are fully aware of their related and specific responsibilities and that the learning opportunities provided by them are appropriate.

Responsibilities and entitlements of students

4. Awarding institutions inform students of their specific responsibilities and entitlements relating to their work-based and placement learning.

Information support and guidance

Students

5.   Awarding institutions provide students with appropriate and timely information, support and guidance prior to, throughout and following their work-based and placement learning.

Partners

6.   Awarding institutions ensure that work-based and placement learning partners are provided with appropriate and timely information prior to, throughout and following the students' work-based and placement learning.

Staff development

7.   Awarding institutions ensure that:
     •   their staff involved in work-based and placement learning are appropriately qualified, resourced and competent to fulfil their role(s);
     •   where applicable, other educational providers, work-based and placement learning partners have effective measures in place to monitor and assure the proficiency of their staff involved in the support of the relevant work-based and placement learning.

Monitoring and evaluation

8.   Awarding institutions have policies and procedures for securing, monitoring, administering and reviewing work-based and placement learning that are used effectively and reviewed regularly.

Note: the precepts are printed here without explanatory text, which is available in the full code of practice (QAA, 2007 www.qaa.ac.uk/academicinfrastructure/codeofpractice/default.asp).

an **engineering subject centre** guide

Interaction

We would like to hear your views and feedback on this publication to help keep the guide up to date.

There is an interactive version of the Guide, where you can comment on each paragraph individually, or on sections as a whole, this can be found at www.engsc.ac.uk/teaching-guides

How does it work?

To view a section, click the section name in the Table of Contents on the left. The paragraphs within the section are shown in one column, with a box on the right showing the comments which have been submitted by other readers. Next to each paragraph, there's a small grey speech bubble. Click on this to bring up the comment form. Please abide by our moderation policy or your comment will not be published.

What happens next?

The feedback and discussion received will be reviewed by the Centre and author, and views and suggestions will be incorporated into new editions of the guide.

If you have any queries about this document or the process behind it, please contact us at enquiries@engsc.ac.uk

About the series:

This is one of a series of peer reviewed booklets looking at various aspects of teaching and learning aimed at all those involved in engineering education. The complete series is also available on our website.

About the centre:

The Engineering Subject Centre is one of the 24 subject centres that form the subject network of the Higher Education Academy. It provides subject based learning and teaching support for all engineering academics in the UK.

The Centre's Mission is:
to work in partnership with the UK engineering community to provide the best possible higher education learning experience for all students and to contribute to the long term health of the engineering profession.

It achieves this through its strategic aims: sharing effective practice in teaching and learning amongst engineering academics; supporting curriculum change and innovation within their departments and informing and influencing policy in relation to engineering education.