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## Credit bearing work-based learning: learning from other's practice

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*Work-based learning (WBL) in Higher Education (HE) encompasses a range of activities associated with employability and the workplace. This paper focuses on work-based learning in the context of learning for work, with campus-based learners gaining experience in the workplace, linked to formally accredited Higher Education programmes. In Engineering work-based learning typically involves industrial sandwich placements which may result in an additional award, such as a 'diploma of industrial studies', but rarely result in credit. In other disciplines such as Health and Medicine, however, there is a long tradition of awarding credit for work-based learning. This paper outlines the context and drivers for awarding credit for work based learning in Engineering and draws on literature, cross-discipline case studies and stakeholder perceptions to describe models of work-based learning and assessment practices appropriate to Engineering. It concludes by reflecting on the practical implications for academic institutions, staff, students and industrial supervisors involved.*

### Introduction

Work-based learning (WBL) is a widely used term in higher education today (Brodie and Irving, 2007). "Work-based learning is a learning process which focuses university level critical thinking upon work (paid and unpaid) in order to facilitate the recognition, acquisition and application of individual and collective knowledge, skills and abilities to achieve specific outcomes of significance to the learner, their work and the university." (Garnett, Inaugural Lecture 2005, in Costly, 2007, p.2)

Within work-based learning are three major strands (New Engineering Foundation (NEF), 2007)

- Learning **for** work (e.g. work placements)
- Learning **at** work (e.g. company in house training programmes)
- Learning **through** work (e.g. professional development).

Within this paper, the definition of work-based learning is restricted to the notion of learning for work and as such relates to campus-based learners gaining experience (paid or unpaid) in the work place, linked to formally accredited higher education programmes.

Undergraduate engineering programmes have traditionally provided opportunities for work-based learning through industrial placements in the form of sandwich placements. Typically, these placements are not credited and therefore do not contribute to the degree award. A separate award, such as the Diploma of Industrial Studies, may be offered as is the case in the University of Ulster and Loughborough University.

This paper reports on research exploring the implications and practicalities of awarding credit for work-based learning through engineering sandwich placements. Models of practice have been identified that suggest shorter placements are possible which could offer some of the benefits of work-based learning to students not undertaking a sandwich placement as part of their degree. This paper draws together the pertinent findings from this research, presenting the drivers for awarding credit for work-based learning in Engineering and describing five models of work-based learning and assessment practices that may be appropriate to Engineering.

## Methodology

This paper brings together the findings of several activities:

1. A literature review of books, articles and web-resources to examine practice and theory in work-based learning.
2. Case studies, drawing on data from semi-structured interviews (both face to face and telephone), e-mail correspondence and analysis of documentary evidence, which examine credited work-based learning in a range of disciplines including; engineering, business, computer science and geography.
3. An electronic survey to gather stakeholder (student) perceptions of work-based learning distributed to engineering students undertaking BEng and MEng degrees (with and without an industrial placement) at Loughborough University. A thematic analysis was conducted of group responses to the qualitative questions, quantitative data was logged in a Microsoft Excel spreadsheet.

## Drivers for awarding credit for work-based learning

The Bologna Process to create the European Higher Education Area (EHEA) by 2010 aims to synchronise academic systems to provide compatible degree structures, equal academic qualifications and transferable credits, throughout the EU. In 2005 Europe Note (E/05/12) suggested a number of ways for UK institutions to make integrated Masters (including MEng) programmes compatible with the Bologna Process. These suggestions included incorporating industrial placements with assessed learning outcomes into programmes. Anticipating the need to implement this was one driver behind this research. Since the UK has self certified the MEng as it currently stands this is now less of an imperative. However, other drivers for awarding credit for work-based learning persist.

Internally, Universities may feel that there is a competitive advantage in offering students the opportunity for work-based learning and for this activity to contribute to the degree award. This is particularly pertinent where a student pays full or part tuition fees whilst out on placement. Work-based learning may enable students to develop skills over and above knowledge acquisition thereby enhancing their employability as graduates, improving the institution's positioning and recognition, and enhancing its potential to attract research and consultancy (NEF, 2007).

Students recognise that engaging in WBL can enhance their employability whilst enabling them to earn a salary. A study conducted by the New Engineering Foundation (2007) determined that students perceived improved generic and transferrable skills after undertaking WBL activities. Benefits for students reported by academics who have students engaging in work placements include: enhanced student motivation, understanding the context of engineering, maturity, and enhanced transferable skills (NEF, 2007).

WBL can also meet the demands from employers for a skilled workforce. Such benefits include access to prospective employees, the opportunity to explore projects using highly skilled students and specialist academics and access to specialist equipment (NEF, 2007). Feedback from industry via a facilitated discussion by the engCETL advisory board indicates that industrialists are in support of awarding credit and believe that it would encourage greater industry involvement in a placement; Awarding credit for work based learning would mean that employers would need to plan an appropriately substantive placement prior to the student starting, leading to a better quality placement for the student and is likely to mean a more effective placement for the employer.

## The student perspective

As part of the research a survey was undertaken looking at students' perceptions of the value and the issues they associated with awarding credit for industrial placements. Twenty-seven questionnaires were returned, see Table 1.

**Table 1: Respondents to questionnaire by degree type**

<i>Degree type</i>	<i>No. of students</i>			
	Part A (Year 1)	Part B (Year 2)	Part C (Year 3)	Part D (Year 4)

MEng with sandwich placement	0	5	6	6
MEng	1	0	2	1
BEng with sandwich placement	1	2	1	0
BEng	1	0	1	0

## Perceived benefits of awarding credit for industrial placement

Several benefits were listed and then ranked of high, medium or low benefit by the 27 respondents. **Table 2** summarises the responses received, ranking them in order of value. The three main issues are explored in more detail below, illustrated by quotes from the students' free text responses.

**Table 2: Responses to survey question 6, grouped by category**

<i>Responses</i>	<i>Value of Benefit</i>		
	<i>High</i>	<i>Med</i>	<i>Low</i>
Increased employability	7	1	0
Credit for "non-academic" work	5	0	0
Increased motivation to take sandwich year	2	2	1
Increased motivation to perform well on placement	0	4	1
Development and application of technical skills	2	1	0
Additional credits could take pressure off remaining years	0	3	1
Increased understanding of academic work	2	0	0
Increased value of placement and degree	2	0	0
Recognition of work undertaken on placement	0	1	1

A third of the respondents felt that one of the benefits of awarding degree credit would be that employers value relevant, practical work experience and that industrial work experience can demonstrate to "employers that you have other 'soft skills'". A further benefit cited was the contribution of work experience towards gaining chartered status.

Five students reportedly would find great benefit in awarding credit for "non-academic" work as it would enable "those who are practical but not as academic a chance to better their class". "Not everyone learns best in lectures, some people learn better with more practical activities and therefore would gain from gaining credits on site rather in lecture based activities and university exams".

Five students felt that awarding credit may provide students with greater motivation to gain industrial experience through enrolling on a placement. "The sandwich placement will be worth considering not only for the experience, but also [because it] contributes to your degree". Linked to this was the notion that if credits were awarded for the industrial placement this would increase recognition of the experience gained.

Five students felt that awarding credit for the placement year would encourage students to work harder and increase their motivation to perform well on placement.

## Perceived drawbacks of awarding credit for industrial placement

Several perceived drawbacks were listed and then ranked of high, medium or low concern by respondents. **Table 3** summarises the responses received and the four main issues highlighted are detailed below.

**Table 3: Responses to survey question 7, grouped by category**

<b>Responses</b>	<b>Level of Concern</b>		
	<b>High</b>	<b>Med</b>	<b>Low</b>
Difficulties in ensuring consistency in <i>assessment</i> across placements	3	3	0
Additional work load and stress (for students)	3	3	0
Concerns about scope of assessment to obtain credits	3	2	0
Difficulties in ensuring consistency in <i>experience</i> across placements	2	3	0
Soft or easy credits (in comparison to academic study)	3	1	0
Provision of adequate experience and support by employers	3	1	0
Student who does not enjoy placement may not perform well	3	0	0
Disadvantages students not undertaking a placement	2	1	0
Reduced separation between 'work' and 'study'	2	0	0
Pressure to take placement increased if credits introduced	1	0	1
Other:			
<i>Low marks/loss of credits/failure if student had to resign</i>	1	0	0
<i>Advantage of previous experience</i>	1	0	0

Several issues were raised concerning consistency in *assessment* across placements. Respondents felt that it "may be difficult for tutors/employers to assess students' performance and for consistency in assessment across the wide range of placements"; "different employers may interpret marking scales differently", "it may be easier to score credits on some placements than on others" and "monitoring the students' performance may be difficult and would depend on the relationship with the employer". One student commented that the marking scheme would need to be very flexible to accommodate a wide range of experiences. Interestingly, the responses from students assumed the involvement of industry in their assessment even though the survey did not propose this.

Five students expressed concern that awarding credit for the work placement would result in additional deliverables over and above that already required to gain DIS and on top of that required by the placement company, plus additional stress and pressure.

Students were concerned about the scope of assessment, namely; the requirements, pass mark, assessment type and in which year the marks would be taken into account.

Several issues were raised concerning consistency in *experience* across placements provided by different companies, varied levels of opportunity to progress and different levels of learning provided by different companies. Concerns were raised regarding differences in breadth and depth of learning experiences offered and the students' opportunity to gain sufficient credits or a 'good' mark.

## Assessing WBL

In considering a work-based learning module, a fundamental consideration is how the learning will be assessed. Indeed, consistency in assessment is a major concern of the students surveyed.

Literature suggests that there are three key questions to ask when designing the assessment strategy for a work-based learning module:

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

Defined intended learning outcomes for industrial placements can help to direct *what* is to be assessed. 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). In terms of *how* to assess WBL, there are several methods as summarised in **Table 4**.

**Table 4: Assessment of Work-based Learning**

<b>Method</b>	<b>Opportunities</b>	<b>Challenges</b>	<b>Source</b>
Dissertation	<ul style="list-style-type: none"> <li>Requires the use of higher level skills – critical analysis, synthesis and evaluation.</li> </ul>	<ul style="list-style-type: none"> <li>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.</li> <li>Assessment effort very high – large volumes of material to be reviewed, intermediate feedback and guidance may be required.</li> </ul>	Gray, 2001
Assignment	<ul style="list-style-type: none"> <li>Contextually unique – topic will vary.</li> <li>Work context of learner will provide setting and subject matter.</li> </ul>	<ul style="list-style-type: none"> <li>Marking criteria and weightings required</li> <li>Assessment effort – high. Effort required to negotiate learning outcomes with learners and mark material.</li> </ul>	Gray, 2001
Memorandum Report	<ul style="list-style-type: none"> <li>Learner summarises results of a research study in 1-2 sides of A4.</li> <li>Forces learners to be succinct and focus on essential issues.</li> <li>Encourages summarising skills.</li> <li>Assessment effort low - relatively quick to mark.</li> </ul>	<ul style="list-style-type: none"> <li>Guidance and assessment criteria required.</li> </ul>	Gray, 2001
Presentation / Viva	<ul style="list-style-type: none"> <li>Tests background knowledge and understanding.</li> <li>Can be assessed by academic tutor/industrial tutor/peers .</li> <li>Assessment effort – low. Mainly confined to drawing up assessment criteria and completing assessment pro forma.</li> </ul>	<ul style="list-style-type: none"> <li>Valid assessment criteria must be specified before the presentation.</li> </ul>	Brennan and Little, 1996; Gray, 2001; Costly, 2007
Poster display	<ul style="list-style-type: none"> <li>Assessment effort – low. Peer assessment or assessment by one or both of the tutors (academic and industrial).</li> </ul>	<ul style="list-style-type: none"> <li>Guidance and assessment criteria required.</li> </ul>	Gray, 2001
Self-assessment against criteria set by tutor (potentially that agreed in Learning Contract)	<ul style="list-style-type: none"> <li>Develops students awareness of own skills and knowledge and encourages reflection.</li> <li>Assessment effort – low. Onus is on student.</li> </ul>	<ul style="list-style-type: none"> <li>Reliability open to question.</li> <li>Assessment criteria must be identified and agreed in advance and used.</li> </ul>	Gray, 2001
Assessment of student's learning logbook / work record	<ul style="list-style-type: none"> <li>Encourages self-reflection as a learner.</li> <li>Can provide evidence towards professional accreditation.</li> </ul>	<ul style="list-style-type: none"> <li>Validity can be questioned, needs to be combined with another method of assessment such as interview.</li> </ul>	Brennan and Little, 1996; Costly, 2007
Portfolio	<ul style="list-style-type: none"> <li>Should present evidence of achievement and reflect on what they have learned.</li> </ul>	<ul style="list-style-type: none"> <li>Students need guidance on what to include and what to omit and size of portfolio required.</li> </ul>	Gray, 2001; Allin and

	<ul style="list-style-type: none"> <li>Encourages students to reflect upon, assess, and control their own growth according to course outcomes.</li> </ul>	<ul style="list-style-type: none"> <li>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.</li> </ul>	Turnock, 2007; Costly, 2007
Company assessment of placement performance	<ul style="list-style-type: none"> <li>Industrial tutor better placed to reflect on workplace tasks and performance.</li> <li>Report/survey completed by Industrial Supervisor usual method.</li> <li>Assessment effort – low (if provided with short pro forma questionnaire).</li> </ul>	<ul style="list-style-type: none"> <li>Clear assessment guidelines must be agreed between the academic and employer.</li> </ul>	Brennan and Little, 1996

One of the differences between assessing work-based learning and assessing other learning in Higher Education is *who* is doing the assessing (Brennan and Little, 1996). Employers, acting in a supervisory or mentoring role, often have designated responsibility for assessing students learning outcomes whilst on placement (QAA, 2007). However, “academics and employers may well measure ‘success’ in different ways” (Brennan and Little, 1996, p. 121), therefore clear assessment guidelines need to be agreed. The relationship between student, academic supervisor and industrial placement provider needs to be carefully configured to ensure all parties are clear on their roles and responsibilities.

## Models of practice

Although several UK Engineering Departments offer industrial placements as part of MEng programmes (examples include Manchester, Edinburgh and Loughborough on select programmes), most do not award credits. Outlined below are five models of practice drawn from the research that demonstrate the variety of ways credited work-based learning opportunities could be offered to engineering students.

### Model of Practice 1: Multiple industry placements throughout a programme

This is a MEng degree programme that integrates both academic study and industrial experience into four years. In Year 1/ Part A students have two short placements with different companies. The first placement is for two weeks in Semester 1 and the second placement is for four weeks during the summer vacation. In Part B/C students spend at least 26 weeks with a sponsoring company involving 10 weeks during the summer vacation and 16 weeks during Semester 1 of Year 3. The Part B/C placement is supervised by a University Tutor (UT) and an Industrial Mentor (IM). The University Tutor will visit typically three times during the training period to monitor the programme of work and (where appropriate) ensure that the specific objectives are being met. The placement is assessed using two modules; the Project Report module and the Personal and Professional Development module. The assessment for the Project Report Module, worth 10 credits, is formed of three deliverables:

- Written Technical Dissertation (assessed by UT and IM) (60%),
- Assessment of student initiative evidenced by weekly reports (e-mailed to the UT) and factory visits (UT) (20%),
- Viva Voce (UT and Moderator) (20%).

The Personal and Professional Development module, worth 20 credits, is assessed based on four deliverables

- Company Profile Report (assessed by UT using set marking criteria) (25%).
- Oral Presentation at Company (assessed by UT and IM using set marking scheme) (20%).
- Company Assessment (assessment by the IM and the student using an Assessment form which is a duplicate of that used for the Monitored Professional Development Scheme (MPDS) of the IMechE) (20%).
- Personal and Professional Record (including two Quarterly Reports which closely follow the guidelines of the Monitoring Professional Development Scheme (MPDS) of the IMechE (commented on by IM, assessed by UT using set criteria) (35%).

Between 3 and 7 students undertake Part B/C placements each year. The academic tutor interviewed felt that the optimum number of students with which this model could run would be approximately 20 (limited by the assessment), with the support of one additional academic tutor. Currently four academic tutors are responsible for the assessment of three-four students each. It would be possible for an academic tutor to be responsible for five but there may be an issue in finding the time to make the requisite three visits to the student during the placement.

### Model of practice 2: Credit bearing year in industry

This is a four year MEng programme with an assessed year in industry. This programme is accredited at MEng level (SARTOR 97) by its Professional Institution. The year in industry spans semesters 5 and 6 in Year 3 and is worth 110 UK credits (55 ECTS credits). Students are encouraged to begin applying for placements at the beginning of Year 2 supported by a compulsory module specifically tailored for students preparing to spend a year in industry. The minimum duration of a work placement is 9 months usually between late September and June. Personal/Placement Tutors visit students twice whilst on placement.

Students are advised to join their Professional Institution and acquire a Career Development Diary, which forms the basis of the Logbook/Career Development Diary, one of the assessed outputs of the placement.

Seven deliverables are required as part of the assessment for the module.

1. An initial project report identifying how the year is to be spent. Looked at by the Personal/Placement Tutor and Course Tutor. This report is not formally assessed but is required for proceeding with the placement.
2. First Site Visit Report. Looked at by the Personal/Placement Tutor, Industrial Supervisor. This is not formally assessed, but it is required for proceeding with placement.
3. Logbook/Career Development Diary. This forms a record of activities during the placement, and is assessed by the Personal/Placement Tutor and Industrial Supervisor (5 Credits).
4. Second Site Visit Report (general performance, attitude, approach). Assessed by the Personal/Placement Tutor and Industrial Supervisor (5 Credits).
5. Industrial Experience Dissertation. This is an extensive report detailing the students' activities throughout the placement period. The project undertaken need not be a single piece of work. It can comprise multiple tasks under a single project theme, for example development, design, troubleshooting. Assessed by Internal Examiner 1, Personal/Placement Tutor, and Industrial Supervisor (50 Credits).
6. Skills Acquired Report. Assessed by an Internal Examiner 1, Personal/Placement Tutor, and Industrial Supervisor (40 Credits).
7. Short report/Poster presentation and Oral examination. Assessed by Internal Examiner 2 and Internal Examiner 3 (10 Credits).

Numbers of students on placement via this model varies between 22 and 40 annually.

### Model of practice 3: Flexible 3<sup>rd</sup> Year Module

This is a 20 credit level three module. The module aims to let students work in collaboration with an organisation (usually) outside of the University on a theme, investigation or project relevant to the needs of the organisation and to their programme of academic study. There is no minimum duration of placement.

Companies can have three levels of involvement in a student's placement:

1. **Minimal work-place involvement:** The work is undertaken by the student at the university, therefore students can work with organisations that are geographically distant. After completion of the work the work partner is informed.
2. **Moderate work-place involvement:** Student agrees to begin work and to visit the workplace partner to report progress and obtain more insight into the specific problem being studied. Regular meeting occur with supervisor and work place partner to monitor progress and to assess the work after its completion.
3. **Maximum work-place involvement:** The student begins work on the project in the university but undertakes a part of the research at the offices of the work place partner, using facilities, resources and data which are available there. Regular meetings occur with work place partner and supervisor.



Project, objectives, programme of work, method etc are agreed by student, University and work place partner in a joint meeting at the outset. Depending on company location this meeting can take place face to face or over the telephone. This meeting is used to ensure that the agreed project is appropriately limited so it is viable for the student to undertake given the time constraints of the module and the resources available.

The project must be subject related and be one to which the discipline's theories, methods or approaches can be applied. In reality 'subject related' is loosely interpreted.

Students are flexible in when they can undertake their projects, this can be in the summer vacation before the start of the third year; in semester 1 or 2 of the third year or over the Easter vacation.

Students are assessed using the following methods:

- Presentation. A presentation to the supervisor(s) and others of the work; describing what was done, its highlights and short comings and the personal views of the student (10%).
- Report. A written report of up to 3500 words providing a concise summary of the work and outcome. The report should include the principles, values, theories etc behind the work that the student was involved in (70%).
- Reflective log. A reflective log showing how the project developed from start to finish, what decisions were made and what consequences those decisions had on the outcome. Students are required to describe, evaluate and reflect on the activities and decisions they are taking as part of their project. When marking the logbook supervisors are looking for evidence of students own thoughts and insights, and how well the supervisor can see how the project has developed and what the student thinks about it (20%).

All assignments are marked by the supervisor. While the work place partner can be involved in assessment this tends to be limited to formative verbal feedback.

The module typically runs with 70 - 90 students. The module is run by the module leader with no significant administrative support. Six academics act as project supervisors for the students on the module. According to the module leader the optimum size of this module would be about 35 students.

### **Model of Practice 4: 2<sup>nd</sup> Year Module focusing on Management Practice**

This is a 20 credit level two module. Students undertake a short placement within an organisation. The module aims to introduce students to aspects of the professional environment and for them to observe and develop skills in relation to management practice.

Students work within a company/organisation for a minimum of 6 weeks working on an activity provided by the company, whilst making observations necessary for the assessed element of the module. Placements can be undertaken in a convenient time frame for example, one day a week over the year or in the Christmas or Easter vacation.

Assessment is comprised of a report on the organisation (commentary on and evaluation of the organisation); a learning log (assessed on their analysis of their personal development and learning); and a poster.

Companies are asked to do an appraisal of the student. Typically companies will use the appraisal form provided through the module, however they can use their own in house appraisal form if they prefer. This form is used in the pass fail sense, with feedback to the student.

The module leader, in addition to being responsible for the module, invites industrial speakers to give seminars, and provides one-to-one 20 minute sessions with students to track progress in finding a placement. One of two Academic Supervisors are allocated to students once they have found a placement and these supervisors are responsible for marking all three forms of assessment.

16 – 20 students usually undertake the module each year. According to the module leader 27 on the module is highly manageable now that supervisors no longer visit students on placement.

### **Model of Practice 5: Short Placement 2<sup>nd</sup> or 3<sup>rd</sup> year Module**

This is a 20 credit module that can be undertaken at either level two or three. Students undertake a placement of at least 80 hours within an organisation. The student project must reside within a context relevant to the discipline. The main purpose of the study time outside of the placement is for students to relate their work experience to their wider studies. The module aims to enable student to reflect upon and apply their subject knowledge, expertise and skills in the workplace.

Students undertake a project within an organisation. The project can be identified and arranged in three ways:

- Proposed by the student who can identify work to complete which would be of benefit to the organisation.
- By the organisation who have already identified projects requiring development.
- By the student in collaboration with the academic advisor.

All placements and projects are approved by the academic advisor prior to the start of the working period. A placement agreement is negotiated and signed by the company, student and academic advisor prior to the commencement of the placement. The agreement outlines the student's programme of work, the expected outcomes and the forms of assessment. It also specifies other operational matters including health and safety regulations, insurance and student conduct.

Placements can be undertaken in a flexible manner, for example in a two week block, over the summer vacation period or one day a week.

Assessment comprises three deliverables:

8. A project proposal,
9. An academic report (3000 word report),
10. Personal development review (1500 word reflective report).

Students are assigned an academic advisor who is an expert in the area that they are working on. The advisor is there to check the quality of the placement, make sure that the project is subject related, agree the roles on the learning agreement form, agree the focus of the report and mark the report. Employer feedback is not formally integrated into the assessment of the module.

Typically, 40 students undertake this module each year. The module is run by the module leader with support from academic advisors who supervise the student reports. Support is also provided through a placement officer (2.5 days per week) and a placement assistant (1.5 days per week). According to the module leader, the optimum number of students for the current level of support is about 40.

## Discussion

### Model Evaluation

**Table 5** below outlines critical evaluations of each of the models of practice described, identifying the advantages and limitations of features of each approach and how each model fits with the survey results of students' expectations.

**Table 5: Critical evaluations of the models of WBL practice**

Model of Practice	Advantages	Challenges/Limitations	Alignment to Student Expectations
1: Multiple industry placements throughout a programme	<ul style="list-style-type: none"> <li>• Programme sponsoring companies take students – working relationship with university ensures quality of placement.</li> <li>• Project jointly agreed between tutor, student and industry mentor.</li> <li>• Assessment closely linked to professional institution CPD - development recorded in professional manner.</li> <li>• Discipline related projects giving students experience of technical problems and management techniques.</li> <li>• Length of placements increases with course so</li> </ul>	<ul style="list-style-type: none"> <li>• Industry involvement in assessment beneficial to students but requires clear assessment criteria. Majority of assessments are also assessed by university tutor where the industry mentor is involved, helping to ensure standards.</li> <li>• Tutor visits student three times on placement -useful in terms of monitoring placements and relationship with company but increases workload on staff making it more difficult to scale up numbers.</li> <li>• Student experiences limited to a small number of sponsoring companies.</li> </ul>	<ul style="list-style-type: none"> <li>• MEng with industrial experience in 4 years instead of 5.</li> <li>• Experience of multiple, high caliber companies – increased employability.</li> <li>• Increased recognition of experience gained.</li> <li>• Close liaison between company, tutor and student helps to ensure quality of the experience.</li> <li>• Development and application of technical skills.</li> <li>• Broad scope of assessments gives students opportunity to perform well.</li> </ul>

	<p>students have more technical knowledge and maturity when undertaking longer placements.</p>		<ul style="list-style-type: none"> <li>• Industry involved in assessment</li> </ul>
<p>2: Credit bearing year in industry</p>	<ul style="list-style-type: none"> <li>• Yearlong placement in industry allows for a deeper experience.</li> <li>• Placement undertaken in year 3, students likely to be more mature and to have more technical knowledge when starting their placement.</li> <li>• Assessment focuses on both technical and professional development.</li> <li>• Assessment link to professional institution.</li> </ul>	<ul style="list-style-type: none"> <li>• Placement undertaken within a single company limiting experience to one company.</li> <li>• University tutors visit student twice on placement. Reduced number of visits help to lessen workload but will still affect scalability of scheme.</li> <li>• Students are responsible for finding their own placement but are supported.</li> </ul>	<ul style="list-style-type: none"> <li>• MEng with industrial experience in 4 years instead of 5.</li> <li>• Divide between work and study blurred by distance learning module.</li> <li>• Development and application of technical skills.</li> <li>• In depth placement – increases chances of gaining valuable experience – increased employability.</li> <li>• Broad scope of assessments gives students opportunity to perform well.</li> <li>• Industry involved in assessment</li> </ul>
<p>3: Flexible 3<sup>rd</sup> Year module</p>	<ul style="list-style-type: none"> <li>• Multiple modes of undertaking a project mean reduces the commitment required from a company potentially making it easier for more students to find a project – readily scalable.</li> <li>• Project jointly agreed between tutor, student and industry mentor.</li> <li>• Flexibility in when students can undertake their project.</li> <li>• Flexibility in model means that students can be geographically distant from company – increasing scalability of approach.</li> <li>• Assessment focuses on both technical and professional development.</li> </ul>	<ul style="list-style-type: none"> <li>• The lowest mode of company involvement means that the students WBL experience is extremely limited.</li> <li>• Multiple modes of undertaking a project means a lack of consistency between student experiences.</li> <li>• Company not formally involved in assessment - company feedback needs to be structured in to the process so that students do not miss out.</li> <li>• Students are responsible for finding a placement with little support from the university – although they are provided with a list of companies who have previous taken students.</li> </ul>	<ul style="list-style-type: none"> <li>• Three way project agreement helps to ensure that the academic content is appropriate.</li> <li>• Discipline focus of project means that students have the opportunity to develop and apply technical skills.</li> <li>• If lowest mode of company engagement used then impact on employability may be limited.</li> <li>• Difficult to ensure consistency in experience across placements.</li> <li>• Broad scope of assessments gives students opportunity to perform well.</li> <li>• Three way project agreement helps to ensure quality of the experience.</li> <li>• Industry not formally involved in assessment process.</li> </ul>
<p>4: 2<sup>nd</sup> year module focusing on management practice</p>	<ul style="list-style-type: none"> <li>• Management focus of project removes the requirement for a technical placement which means a placement need not necessarily be</li> </ul>	<ul style="list-style-type: none"> <li>• Management focus means that students may not benefit from being able to develop and apply technical skills on placement.</li> </ul>	<ul style="list-style-type: none"> <li>• No requirement for the project to have a discipline focus means that students miss an opportunity to develop and apply technical skills.</li> </ul>

	<p>undertaken in an engineering company – making it easier to find a placement.</p> <ul style="list-style-type: none"> <li>• Flexibility in when students can undertake a placement.</li> <li>• Company feedback to students built into the process via appraisal form.</li> <li>• With tutors no longer required to visit students this mode of WBL can be more readily scaled up.</li> </ul>	<ul style="list-style-type: none"> <li>• The potential that a placement may not have a technical dimension may mean that the WBL experience is not as highly valued by engineering employers as other experience– limiting its value in terms of enhancing employability.</li> <li>• Students are responsible for finding their placement although their progress is tracked.</li> </ul>	<ul style="list-style-type: none"> <li>• Scope of assessments gives students opportunity to perform well.</li> <li>• Industry involvement in assessment process limited.</li> </ul>
<p>5: Short placement 2<sup>nd</sup> or 3<sup>rd</sup> year module</p>	<ul style="list-style-type: none"> <li>• Significant module support ensures that new companies are attracted and maintained, high quality administration of placements and administrative burden borne by non-academics.</li> <li>• Students significantly supported in finding a placement.</li> <li>• Students undertaking a placement in their 3<sup>rd</sup> year are felt by staff to be more mature and better technically prepared and therefore benefit more from a placement.</li> <li>• Assessment focuses on both technical and professional development.</li> <li>• Flexibility in when students can undertake their project.</li> <li>• Flexibility in who proposes a project – supported by a three way learning agreement.</li> </ul>	<ul style="list-style-type: none"> <li>• The potential for student to undertake the module in either the 2<sup>nd</sup> or 3<sup>rd</sup> year means that different levels of assessment criteria are required for 2<sup>nd</sup> or 3<sup>rd</sup> year students.</li> <li>• Companies not involved in assessment therefore feedback needs to be structured into the process.</li> <li>• Students only gain experience with one company.</li> </ul>	<ul style="list-style-type: none"> <li>• Discipline focus of project means that students have the opportunity to develop and apply technical skills.</li> <li>• Increased recognition of experience gained.</li> <li>• Scope of assessments gives students opportunity to perform well.</li> <li>• Three way project agreement helps to ensure quality of the experience.</li> <li>• Industry not formally involved in assessment process.</li> </ul>

### Cross-comparison of Approaches to Company Involvement and Assessment

While there is significant overlap in the different models of work-based learning presented in this paper the type of placement, duration and extent of company involvement can vary widely.

#### Company Involvement

There are a variety of models with varying degrees of company involvement through which students can engage in work-based learning, these include:

1. Work experience within a company, undertaking work which informs the basis of an academic enquiry relating to the discipline area.
2. Work experience within a company, which provides an opportunity for the student to observe management practice in operation and to relate this to theories of organisational management.
3. Undertaking a project of interest to a company which informs the basis of an academic enquiry relating to the discipline, but the student is not necessarily located within the company.

The extent of company involvement in the academic side of the placement varies greatly between the observed models of WBL. Where company involvement is high, a three way agreement is often negotiated between the academic, company and student to agree the scope of the placement e.g. the student's placement duties; the student's course related goals; the resources required for the placement and the responsibilities for providing those resources; assessment requirements and health and safety responsibilities. Where company involvement is low, the nature of the placement is approved by the academic and the assessment focus is agreed between the student and the academic.

### **Assessment Methods**

A variety of assessment methods can be observed in the models of WBL. All the modules observed in the study were assessed using 100% coursework however the weighting placed upon each piece of coursework and the number of types of assessment varied. Common assessment methods are the use of academic reports and a reflective logbook/report. However, presentations and posters are also sometimes used. The academic reports in the models tended to require students to relate their placement work to the principles values and theories underpinning their work; putting what they have learnt into a wider context.

Reflective reports/logbooks are a key feature of the WBL models and are intended to provide evidence of a student's analysis of their personal development and learning, encouraging student to describe, evaluate and reflect on the activities and decisions made throughout the lifetime of the placement.

Responsibility for assessment appears to be shared between the student (self-assessment), the academic (who takes the majority share) and the industrial tutor (whose level of involvement varies). The literature suggests that the involvement of employers or work-place supervisors in the assessment process helps to overcome the assessor's lack of control concerning the contextualisation of the assessment in the work situation (Costley, 2007).

The findings of the research demonstrate that consistency in experience and assessment is key. The design of the module specifications and assessment for the industrial placement need to be flexible to cope with the variety of placements projects undertaken and the size of the company offering the placement. The assessment process needs to be replicable across a range of companies to ensure students have (as far as possible) an equal opportunity to achieve credit for WBL.

### **Recommendations**

The literature and survey suggest that work based learning has a number of significant benefits recognised by academic institutions, students and industry including; enhancing the student learning experience and positively impacting on student employability. Whilst students can readily see the benefits offered by work-based learning they also have concerns relating to consistency in assessment (validity, reliability, flexibility and fairness) and experience that need to be addressed through the design of a work-based learning module regardless of the model used.

The models of work-based learning identified through this study suggest that WBL opportunities can be offered to students in a number of different ways, depending on the availability and location of potential companies and organisations. There are many practical implications of introducing credited WBL for students, staff and industry. The following recommendations are based upon the findings of this research:

1. Do not consider introducing credited WBL opportunities without ensuring adequate support for the process e.g. the administration of placements (tracking students, making sure they have filled out required forms before they start their placement), cultivating and maintaining a group of companies who regularly take placement students, sufficient willing academics to support/visit/mark students on placement.
2. Put in place a clear and robust administration process for placements so that the university is covered with respect to relevant liabilities and students, companies and academics know what is required of them and when.
3. Consider the assessment strategy. A broad scope of assessment gives the opportunity to focus on both technical and personal development. Some assessment methods common to WBL may not be widely used in engineering education but are valuable tools. Be aware that students may need support and guidance in using methods new to them.

4. Consider how industry will be involved in the assessment process. What training, support and structure must be developed to help ensure consistency in assessment? Any process must not be too onerous for industry and roles and responsibilities need to be made clear.
5. Consider the level of support that will be provided to students who are looking for a placement and the implications of students who fail to find a placement or whose placement terminates prematurely. What are the alternatives for these students?

In making the transition to a credited work-based learning system, students and industry can provide valuable input to ensure that the resulting processes are effective.

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