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# A Guide To Developing Employer Links In Higher Education: with case studies from the sciences

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*Mandy Burns, Stuart Lane and Jo-Ann Phillips*



Science Education Enhancement and Development

# SEED

## AN INTRODUCTION TO SEED

The programme for Science Education Enhancement and Development ('SEED') is based in the Faculty of Science at the University of Plymouth. It is resourced principally by the Higher Education Funding Council for England through its Fund for the Development of Teaching and Learning. Additional support has been received from many areas of the University and particularly from Academic and Information Services. SEED builds on the success of the University of Plymouth Science Faculty in the national Teaching Quality Assessment system where Plymouth achieved 'excellence' in Environmental Science, Geography, Geology and Oceanography.

SEED's overall aim is to develop, document and disseminate good practice in Science teaching and learning. The programme consists of a series of projects in areas such as lab-work, field-work, graduate teaching assistants and computer-aided learning, which are itemised inside the back cover. Most are based in the Science Faculty but some are being taken forward by staff in the University's School of Computing and in Educational Development Services (EDS). All the projects are linked to dissemination partners in other institutions who act as external advisors, ensure that SEED's outputs are capable of being used in other institutions and help to disseminate and embed SEED's end-products.

Anyone wanting further details on the SEED programme is welcome to contact Brian Chalkley or Andy Elmes at the address below. Contact details for the individual project leaders are available inside the back cover.

### The SEED Programme

Faculty of Science  
University of Plymouth  
Drake Circus  
Plymouth PL4 8AA  
Tel: 01752 233530 or 01752 233053  
Fax: 01752 233534 or 01752 233054

Programme Manager: Brian Chalkley  
e-mail: [bchalkley@plymouth.ac.uk](mailto:bchalkley@plymouth.ac.uk)

Programme Officer: Andrew Elmes  
e-mail: [aelmes@plymouth.ac.uk](mailto:aelmes@plymouth.ac.uk)  
<http://www.science.plym.ac.uk/departments/seed/>

### Acknowledgements

We are particularly grateful to all those who provided case material.

Special thanks are due to Jennie Blumhof (Hertfordshire), June Harwood (EDS), Marc Lintern (Careers, University of Plymouth) and Carl Gilleard (Chair AGR) for their time, feedback and constructive comments. We would also like to thank Andy Elmes (SEED) for patient production work, Lawrie Phipps for assistance on production and Judith Gill (SEED) for hours of secretarial support, coffee and getting us together for meetings.

Brian Chalkley's endless personal support and major editorial work was especially appreciated.

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# **A Guide To Developing Employer Links In Higher Education: with case studies from the sciences**

**Mandy Burns, Stuart Lane and Jo-Ann Philips  
University of Plymouth**

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**ISBN 1-84102-036-2**



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**Section I**  
**Handbook aims and organisation**



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## Section I. Handbook aims and organisation

### *Aims*

- This is designed as a handbook of good practice intended for use by academics in higher education who wish to enrich their teaching and the learning experience of their students by developing improved employer links within the curriculum.
- It is a practical tool not an academic treatise and is particularly aimed at undergraduate programmes.
- It suggests a range of employer-related activities from simple first steps to rather more innovative approaches and is designed for the 'non expert' interested party. It is intended to stimulate ideas and thinking about the issues but in no way tries to be prescriptive.
- It encourages a partnership and strategic approach which includes other professionals within the university or college who actively work with employers. Such collaborations yield positive benefits and increase the goodwill of employers.
- Set against a backdrop of various government initiatives encouraging universities to modernise the curriculum and develop a wider range of skills in their graduates, the handbook argues that strong employer links are essential in order to enhance opportunities for students in what is becoming an increasingly improvisational workforce, demanding effectiveness and commitment to life-long learning and professional development.
- Although the case studies presented in the handbook concentrate on the science curriculum, the principles outlined and recommended have a significantly broader application and relevance. Academics from a wide range of disciplines should find ideas and suggestions which will help them to develop employer links in their own teaching and courses.

### *Organisation*

The handbook begins by outlining the changing nature of higher education and the call for more priority to be given to preparing students for the realities of the work culture. Surveys are reviewed which clearly demonstrate the need to strengthen employer links in the undergraduate curriculum. The handbook then proceeds to outline and evaluate a range of different kinds of employer link and to offer some ideas on curriculum design and development. The final section contains a set of detailed case studies which promote examples of good practice which, it is hoped, will encourage readers to extend the pattern of employer links in their own programmes and modules.



**Section 2**  
**Introduction and context**



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## Section 2. Introduction and context

During the last decade, higher education has been buffeted by one body after another stressing the need for change, and arguing that graduates were not meeting the standards desired by the increasingly demanding job market. The drivers for change are well documented - the global competitive economy, the accelerating impact of technology and various government-led initiatives to strengthen the contribution of higher education to the national economy.

“It is expected that within five years we will need to learn new ways of using 80% of our current technology”. (DfEE, 1998)

“In another fifteen years time many of us will be in work that has not yet been conceived”. (Harvey 1998)

Flatter organisational structures, more flexible work patterns and a contingent work force have all led to a demand for a different type of graduate. Early responsibility in the workplace has largely replaced traditional graduate training schemes and this early responsibility has effectively meant the need for work readiness on graduation (Dearing, 1997).

Robin Linneer of KPMG Consulting has famously said “There is no such thing as a career path - it is crazy paving and you have to lay it yourself”.

Indeed, recruitment into the traditional graduate training schemes is now only an option for the most capable minority - only about one in ten graduates. Coupled with this trend has been significant growth in the SME (small and medium-sized enterprise) sector. Well over 90% of companies employ fewer than twenty people. Such firms do not provide the training opportunities of larger organisations and need a ready-made bag of skills and employees who can hit the ground running. If evidence of competence is highly rated by the larger companies, it is absolutely imperative for the SMEs. For this reason they sometimes favour graduates from courses such as business studies, engineering or technology degrees where there is already buoyancy in the job market. About 24% of graduates find work with SMEs (Labour Force Survey, 1995). A 1997 DfEE Research Report, RR29, indicated that 60% of SMEs want graduates with work experience though only 50% require a particular degree subject.

Schemes such as Teaching Company and other graduate projects have done much to introduce a wider range of students to these companies. However, the graduate with a pure academic background and little evidence of transferable skills or work experience has little to offer or interest them.

Mirroring these requirements, recruitment and selection procedures have increasingly focused on firm evidence of competence in a number of key skills often gained in contexts outside academia. Evidence of self-reliance and the ability to manage and lead change and to cope with the constant demands of the market-place have become the employers' refrain. More generally, high level skills are increasingly recognised as the key to economic competitiveness in global markets (Porter 1990) and as the means by which people will remain employable in an ever more transactional market.

“Employers want not only knowledge and intellectual ability but transferable skills such as communication skills, group work, personal, interpersonal, organisational, teaching/training, learning, information gathering, problem solving, language, information technology and entrepreneurial skills” (Gibbs 1994). The ability to make informed choices and decisions is also critical.

In Graduate Work, Harvey et al., (1997) found that graduates needed to be adaptive, adaptable and transformative:

**Adaptive** = the ability to fit into the organisational culture.

**Adaptable** = the ability to learn and add to knowledge and skill, and to use knowledge and skills in the face of change. To interact effectively, work in teams and communicate at a variety of levels.

**Transformative** = the ability to use high level skills (analysis, critique, synthesis, multilayer communication) to facilitate teamwork and motivate colleagues and inspire change.

Hawkins and Winter (1995) confirmed that graduates need to have four types of skill. They must be:

- Self-reliant - able to manage their career and personal development.
- Connected - effective team players.
- Specialist - have expertise in a particular field.
- Generalist - also have general skills and knowledge which can be applied in a variety of different situations within the world of work.

Faced with an increasingly demanding and complex employment market, many graduates have experienced difficulties in obtaining appropriate positions. Given the need to be more enterprising and opportunistic, many flounder and drift into work rather than making informed choices and decisions. This “brave new world” has made demands on their initiative, decision making and marketing skills which by no means all possess.

Some have found things worked out eventually - others have not and there is substantial evidence of under-employment from the surveys of graduates’ first destination (FDS). Such studies also clearly show the competitive edge of vocational courses with integrated, good quality, work experience. Research also suggests that an increasing number of graduates are now accepting jobs for which they would previously have considered themselves overqualified (IES, 1996).

There is another key factor to consider - student debt. Of 5000 graduates surveyed at random in Great Expectations (Purcell & Pitcher, 1996), student debt averaged £3000, and 7% had debts of over £5000. With the abolition of traditional grants and the increasing need for some students to professionalise their degree at postgraduate level or to undertake research to gain creditability in their field, the financial situation faced by students can only deteriorate. They will, therefore, expect their courses to be fully linked to the world of work and to enhance their prospects of earning good salaries quickly.

### **The agenda for change**

In recent years, waves of government communications have urged higher education to give priority to enhancing student skills and self reliance. Institutions have also been strongly encouraged to look at modernising this curricula. Enterprise in Higher Education was one of the first initiatives to take forward to this agenda. Whilst higher education’s response has been variable and patchy - some institutions rallying to the call, others resisting on the basis that academic values are being threatened (Skilbeck & Conell, 1996) - the government voice has become more insistent and determined.

In 1997, Sir Ron Dearing chaired the National Committee of Inquiry into Higher Education (NCIHE) and was especially keen to promote work experience as a structured part of degree programmes (summary point 39). Dearing hopes that business will respond by putting more investment into training, by providing more work experience for students and by integrating their relationships with higher education into their strategic plans (recommendations 19 and 30). If work experience truly is the “missing link” in undergraduate education (Harvey *et al.*, 1997/98), then employers too need to look at new ways of dealing with the universities and colleges. This is particularly true of small businesses and there is still much to be done both in making the SME sector attractive to graduates and in facilitating links between SMEs and higher education universities.

The DfEE has funded forty initiatives to make higher education more responsive to the needs of employers. Moreover, the Higher Education Funding Council for England (HEFCE) has established a Fund for the Development of Teaching and Learning (FDTL) part of which is being used to resource projects (like SEED at Plymouth) which are being used to promote good practice in fields such as transferable skills and work experience.

The pressure to change is unremitting. “Skills Development in HE” (CVCP, DfEE, HEQC, 1998) brought all parties together to push the point home. There is a clear need for universities and colleges to consider employability skills alongside delivery of intellectual skills, personal attributes and knowledge of how organisations work such things are not optional but imperative. The report concedes that programmes should be varied according to the needs of each institution and carefully balances and analyses the issues. None the less, it sees employers playing a major role in the future, placing strong emphasis on work experience, live projects, voluntary work and careers guidance.

The government also sees these issues as a major part of the race to step up the economy and make the country more competitive in global markets. It wishes to see partnerships between companies and “educational institutions at all levels”. In the White Paper, “Our Competitive Future” (DTI, 1998) it is clearly stated that the government will “reward universities for strategies and activities that enhance interaction with business”.

### **What does all this mean for teaching and learning strategies in HE?**

Universities and colleges are under pressure to “reposition themselves within the wider learning support infrastructure which will underpin and resource the learning society of the twenty first century.” (TEC National Council, 1997)

One of the most effective ways of developing skills in students and helping them to prepare for life beyond education is by using employer-linked initiatives. Work experience and contact with employers is vital for students to build on skills and self-awareness and so to develop the career management skills that will become their survival kit in the increasingly contingent and competitive arena of work.

“In business the global forces of competition and new technology are creating the need for organisations which can respond rapidly to market demands. Gone is the job for life with its planned career structure and company training scheme. Gone is the clear functional identity and progressive rise in income and security. Instead there is a world of customer and clients, adding value, lifelong learning, portfolio careers, self development and an overwhelming need to stay in employment. University teaching needs to move from a model of teaching knowledge to enabling learning.” (Hawkins and Winter, 1995)

Integrating employer links into the curriculum in a well-considered, creative and strategic way can bring an array of positive benefits to all stakeholders and provide an excellent vehicle for the delivery of key personal and career management skills. It seems almost inevitable, therefore that the growth of university-employer partnerships will continue to replace the traditional models. However, our own Plymouth-based surveys reviewed in the following two sections suggest that many higher education science courses are still near the beginning of this process and that even high-quality and well-regarded departments have some way to go.

**Section 3**  
**Undergraduate science education**  
**as a preparation for employment:**  
**a Plymouth survey**



## Section 3. Undergraduate science education as a preparation for employment: a Plymouth survey

The study reported on in this section was funded by the DfEE and produced in 1998 jointly by the University of Plymouth's Centre for Innovation and External Development and its Science Faculty: the author was Kathryn Lamble.

The survey addressed employers of Plymouth science graduates and also considered the perceptions of science graduates (from geology, environmental science and chemistry programmes) as to the career relevance of their degree studies. Both employers and graduates reiterated the importance of developing key skills for use in the workplace balanced with knowledge of the discipline, appropriate technical competence and the ability and confidence to learn new skills. It was also apparent that graduates need be aware of how to relate these skills to the different employment contexts and situations which may arise as their careers develop. An increasing proportion of science graduates are working outside science in areas such as accountancy or management where their scientific knowledge may be rarely, if ever, called upon.

### Employer views

Many expressed the view that degree programmes are somewhat outdated, too academic and need to be rewritten with an emphasis on the skills which are essential in the workplace. They indicated that these core skills were often more important than the detailed subject-based knowledge.

Students who had spent time on placements were considered much more valuable and to possess a more mature attitude. This experience was also found to make the graduate more productive in a shorter space of time, proving to be more of an asset to a company than a graduate with no work placement experience.

### Student views

Comments from the students contacted in the Lamble survey also emphasised the need for courses to give more priority to transferable skills and work experience.

“too much emphasis was placed on knowledge rather than skills that could be transferable between jobs and therefore help graduates get their first job.” (Lamble, 1998).

Graduates sometimes felt, with hindsight, that they expected too much from their courses. They entered higher education in the belief that a good honours degree would make getting a rewarding job relatively easy. Too often, sadly, this proved not to be the case.

Many Plymouth graduates in the Lamble work also viewed increasing industrial awareness on undergraduate programmes as important: 37% thought that the introduction of a work placement would have helped them gain employment and 89% of graduates felt that they would have benefited from more ‘industrial input’ into their programmes of study.

In summary, employers and former students held similar views as to how undergraduate programmes should be changed. The key points were:

- Improving links with employers and increasing undergraduate awareness of the workplace, including providing more opportunities for work experience.
- Improving the development of transferable skills and increasing undergraduates' recognition of the benefits of doing so.
- Improving access to careers advice and job-seeking skills.
- Placing more emphasis on teaching and improving fundamental scientific knowledge and practical skills.

Finally, it is important to emphasise that these concerns are by no means confined to science at Plymouth. Indeed, the University's Science Faculty has a strong reputation, with several of its course being rated 'excellent' in the national Teaching Quality Assessment (TQA) exercise. If science at Plymouth needs to strengthen its employer links, the same message will apply, at least as forcibly, in many other institutions too. The main message from the Lamble survey is that even well regarded courses with good reputations need to do more to strengthen links to the world of work.

**Section 4**  
**A national survey of existing patterns  
of employer links in higher education  
science departments**



## Section 4.

# A national survey of existing patterns of employer links in higher education science departments

### *The survey's purpose and methods*

This section reports on a rapid response survey of all UK Heads of Higher Education Science Departments undertaken in the course of preparing material for this volume. Its aims were to determine the extent and type of employer contacts and how such contacts were being used, and particularly to see if most were 'bolt on' or whether strategic embedding of such links was taking place.

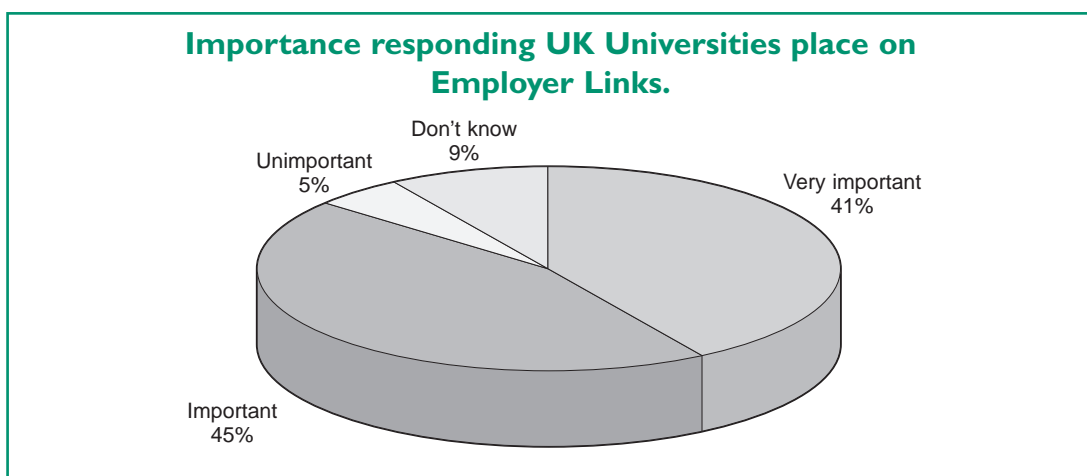
The survey was undertaken by e-mail in March 1998 and focused on the following disciplines:

- Biological Sciences
- Biomedical Sciences
- Chemistry
- Computer Science
- Environmental Sciences
- Geology/Earth Sciences
- Geography

Of the 252 Heads of Department contacted, 73 replied - a response rate of 29%. A list of respondents is presented in Appendix A. Respondents were asked about the types of employer links that existed in their departments and asked how important they considered such contacts to be.

### **Results**

As shown in the diagram below, 86% of respondents considered employer links to be important or very important.



The survey results in the table below show the proportion of departments using various types of employer link.

Type of employer link	Percentage of departments using link
Guest lecturers	85
Consultancy	74
Industrial placements	71
Industrial visits	70
Support for student projects	66
Prizes/awards form employers	60
Case Studies	52
Sponsorship	41
Participation in management/steering committees	36
Employer role in course design	33
Employer role in careers guidance	30
Staff placements/secondments	22
Short courses	16
Teaching company schemes	14
Work based learning modules	11
Employer/industrial role in exam boards	8
Shadowing	3
Other	7

It was significant that in the replies little really innovative work was in evidence. Where useful employer contacts did exist it was in the traditional and somewhat easier to arrange areas such as guest lectures. Industrial placements, also featured quite strongly and so did employer support for student projects and the use of case studies. Consultancy, it appeared, was more popular from an income-generating perspective than from a desire to develop student learning and enrich the under-graduate curriculum.

With a response rate of just under a third, it might be fairly assumed that those replying were generally the most enthusiastic and possibly the most active departments and that the real national picture might therefore be somewhat gloomier than the sample suggests. None the less, the survey did identify a number of interesting practices, some of which were followed up to provide examples and case studies referred to later in this volume.

Despite the fact that 86% rated employer links as important or very important, there seemed to be little attendant evidence of implementing strategies to support this level of priority. The survey also highlighted the very low number of initiatives in areas such as work shadowing, work based learning modules and the use of systems such as Teaching Company Schemes. These initiatives are still comparatively new, although they are expected to grow and develop. Overall, there was little evidence of employer links being used in a strategic way - rather they appeared in an *ad hoc* fashion, dotted around programmes and stages with no obvious rationale in terms of progression or development of skills. They did not appear to be embedded in the process of curriculum design.

**Section 5**  
**Some common types of employer link**



## Section 5. Some common types of employer link

Later parts of this handbook deal with strategies for the development of employer links and their involvement in the curriculum design process. Before we can do this, however, we need a firm grasp of the different kinds of employer links which can be developed and used. In assembling the total curriculum jigsaw, we need first to examine the individual pieces and then to see how they might be brought together to provide a meaningful picture. In this chapter we have therefore taken some of the most popular employer links identified in our survey, outlined the ways in which they may be implemented, indicated their positive and negative features and given some contact names for further information which you may find useful.

### **i: Guest Lectures**

In our study, guest lectures stand out as the most frequently used employer contact and an example of a guest lecture programme (Case study viii) is given at the end of this handbook. The lecturers usually come from an industry or profession relevant to the course. They generally deliver a one-off class for a specific module in order to inject ideas and information drawn from everyday experience of the practicalities of operating in the world of work.

- *At UMIST the Biomolecular Science Department guest lectures for third years help to give an industrial perspective - A. Doig.*
- *Within the Chemistry department at Staffordshire University, guest lecturers are frequently utilised both in specific subjects, (e.g. an aspect of mass spectrometry), and for general science education. Industrialists are used to give a presentation of the challenges offered to chemists by their particular industry - J. Tebby.*
- *Another perspective is taken in Biological Sciences at Keele University where guest lecturers are brought in to discuss careers with students. - D. Hoole.*

### **Where to begin:**

- Often the easiest and most cost effective way is to use past graduates. They have first hand and often recent experience of both the university and the industry or profession and are usually willing to help. However, past graduates may occasionally not be permitted to take part due to concerns of employers over the potential disclosure of sensitive commercial information.
- Another common approach is to utilise existing links such as consultancy partners. Existing contacts are often more aware of how the university works and are less wary of getting involved.
- All universities have an industrial liaison or careers department and established links which may already exist within another cognate areas of the university (e.g. alumni associations) could also be utilised as a source of possible guest lecturers.
- An alternative but generally rather less successful route is to 'cold call' employers. The outcome from this kind of approach is difficult to predict but you may 'strike it lucky'.

### Points to consider:

- One way of getting the most out of a guest lecture is to use it as the basis for an assessment. This heightens student interest and motivation and reduces the risk of the session being seen as a 'bolt on'. However, the content must be sufficiently important to justify its inclusion as an item of assessment: do bear in mind that you will need to have a good knowledge of the subject area in order to mark the students' work. It is unlikely that guest lecturers will volunteer for marking duties!
- Care must be taken to ensure that the speaker is up to date and likely to give a balanced view - a poor speaker can do more harm than good.
- Do consider collaboration within the institution. If a speaker may have relevance to a wider group of students than just your own, it might be worth liaising with the Careers Service in your institution who could organise and promote a larger presentation. The speaker and the students all then benefit.

### Costs and benefits:

- Guest lecturers will often provide their services free of charge, although departments may choose to offer a small payment.
- The main benefits are to make the course more relevant, to motivate students and to provide an insight into industrial and professional life. Guest lectures also allow students to ask questions about a specific area they may be interested in and can often aid their career choices by meeting people working in the area.

*S.van Heyningen from The University of Edinburgh has found that industrial guest lectures are seen as valuable by some students but not all as turnouts can be disappointingly low.*

This may be because they feel it is not part of the mainstream curriculum. This highlights the need for students to see the event as part of a process and something that fits into an integrated and understood whole.

- The main cost is one of time to set up the initial lecture. Careers advisers may help on this, as they may already offer employer-led seminar programmes. Once set up, costs to the department are relatively low. Most employers will take part on a voluntary basis and welcome the opportunity to make contact with higher education and students. However, it is worth considering the provision of good hospitality, covering expenses or the payment of a small fee to make the link more attractive to the employer, and as an indication that it is valued and appreciated.
- Non-academics are sometimes asked to contribute to teaching on a regular basis and to make a sizeable contribution. In this case they may well need careful briefing, support, advice and, of course, payment. If they are expected to play a role in assessment, remember that they are unlikely to be familiar with high education standards and marking conventions.

### Contacts:

J. Tebby - J.Tebby@staffs.ac.uk

D. Hoole - D.Hoole@keele.ac.uk

A. Doig - Andrew.Doig@umist.ac.uk

S. van Heyningen - S.vanHeyningen@ed.ac.uk

## ii: Consultancy

- This is a well known activity for most academics, and needs little additional information or analysis here. It is obviously a two-way process illustrating clearly and effectively how some employer alliances can be mutually beneficial.

*“Consultancy has been particularly successful as the school has expertise that is valued by public and private sector clients” - P. Daniels, Geography Department, The University of Birmingham.*

- In our survey it was also one of the most well used and supported vehicles for employer liaison but it was not difficult to establish the driver as income generation rather than more altruistic curriculum development. Any benefits to the curriculum or to the development of student career management skills were often regarded as welcome but essentially incidental ‘spin-offs’.
- Usually academic staff will undertake the consultancy project but students, both undergraduates and post-graduates, may be utilised to carry out aspects of the work under supervision.
- In the main, consultancy liaison was generated by companies requiring specialist expertise which they were not able to provide and resource in house.

### Where to begin:

- Consultancy links can begin in many ways but at the output there may be work to do in raising awareness of how the University/department can be accessed and utilised, particularly by smaller organisations who may not have had previous contact with a university and may not initially see you or your students as in any way associated with their needs. They may be pleasantly surprised by what is on offer.
- Effective marketing of your facilities and services is therefore very important. It is sensible to investigate current practices in your institution - your PR, careers or business links departments may well have leaflets/brochures/web pages outlining such services and could discuss with you how best to promote and advertise your own areas of expertise through their links with national and local employer bodies.
- Consultancy links sometimes spring from existing contacts. For example, an undergraduate work placement project may lead on to a much larger staff consultancy.

### Points to consider:

- High quality outputs obviously help to forge future contacts and help to generate more consultancy business in the future.
- Where students assist with a consultancy project, it is important to ensure that this involvement is enhancing the HE educational experience and that they are not being exploited as cheap labour. In the present climate, students are likely to welcome even a modest financial return and an employer might perhaps be persuaded to offer some further student sponsorship/prize or award.

### **Costs and benefits:**

*At Stirling University within the Biological Sciences department, consultancy has been very successful with clear benefits to both university and industry. Contracts for environmental impact assessment have been undertaken by staff with help from students. This has improved the CVs of participating students, provided research funding and enhanced course/department relevance to the local community/industry. D. McClusky.*

- It is clear that benefits are not restricted to one-off problem solving exercises. Such liaison provides an excellent opportunity to share good practice and to bring an expanded range of expertise into the university department which can inform the curriculum in innovative ways.
- Students can also benefit by becoming supervised partners in the consultancy process and so develop project management skills in real time situations.
- One of the possible dangers of consultancy is that it can deflect staff from their main teaching duties or from research of the kind most likely to contribute significantly to the Research Assessment Exercise (RAE).

### **Contacts:**

D. McLusky - d.s.mclusky@stir.ac.uk

### **iii: Work Placements**

This is a huge topic and one that can only be covered in a very general sense here. Useful reference material is proliferating. Some excellent and authoritative reviews are available, including Brennan and Little (1996), Harvey *et al.*, (1998) and Little (1998). New developments such as the National Centre for Work Experience will begin to make an impact and there are likely to be other initiatives in the offing. Case study v in the final section of this handbook provides an example of a work-based learning module.

- The brevity of this overview does not, however, seek to minimise the overwhelming importance of this area, for it is one that warrants urgent and immediate attention from academics and employers alike. Of all the ways in which students can increase their employability skills and work readiness and provide evidence of contexts in which key attributes have been learned and developed, there can be few more effective means than work experience - in particular high quality and relevant work experience.
- An attractive menu of possibilities exists for both full-time and part-time students and can range from a few hours work shadowing to the classic 'sandwich' placement. Other options can include accredited work based learning modules, usually related to the course, employer linked project work undertaken in the workplace, 'tasters', structured vacation work etc. It can be organised as part of a programme of study, organised but external to study time or ad hoc work experience which may not be formally accredited or part of the course.

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**Where to begin:**

- The usual routes to setting up employer links may be used, such as past graduates, existing contacts, cold calling, using contacts within the university etc.
- The enthusiasm of organisations to take part tends to increase where there is no financial cost to the employer e.g. work based learning modules, general project work, periods of unpaid work experience.
- The academic supervisor often has the role of initiating and monitoring the work placement experience.
- Initial contacts may take a considerable time to organise but may then be utilised for several years - contacts can be used to generate further contacts.
- Planning placements should start several months in advance. Organisations, particularly public sector or smaller organisations, may not commit themselves to work placements until the last minute but early planning avoids last minute panics and complications.
- Students can be placed with public, private and voluntary sector employers.

**Points to consider:**

- A wide variety of industrial placements have been reported ranging from attending for one day a week during a semester to form a 10 credit module, through to year long placements forming a full sandwich programme.
- Work placements can often allow employers to have work-related problems solved or a project carried out by a student for minimal costs.
- In setting up work placements, it is advisable to co-ordinate contacts with colleagues in other cognate academic departments. There is nothing worse for an employer than being contacted by six departments of one university in a given week all relating to different matters and none knowing about the others. This is not the way to gain goodwill!
- It is important that the work content of the placement does not stand in isolation but relates to course content and/or skills development. It is also important that students have some way of reflecting on, assessing and understanding the learning that has taken place.
- Some “field” or research projects may not involve the student in spending much time “in situ” at the host’s premises. You may need to decide whether this kind of pattern offers the student sufficient experience of the day-to-day realities of life in the work-place such as “office politics” and departmental rivalries.
- The assessment method also needs to be decided prior to the placement. This can take many forms including: presentations, written reports or observations by the industrial supervisor or academic staff. Work logs on how the project has developed from start to finish can also be utilised and contain information on what decisions were made and their consequences. More formal accreditation or certification could be considered.

- “Learning contracts” can be used to set out the objectives, the programme of work, the resources that should be made available and a timetable covering how the objectives are to be achieved. Such contracts (although obviously not legal documents) provide a record of what the student and the other parties involved agree to do. The contract should be drawn up at the outset but may need to be modified later in the light of experience. (Brennan and Little 1996).
- Briefing notes on the nature and purpose of work placements may be helpful for students to get the most out of the experience and for hosts to be alerted to what is expected of them.
- Pre-placement sessions are critical: the employer will want the students to be clear about what they want to get out of the placement and what they are able to contribute to the organisation. They will also expect the student to have researched the organisation and to have understood its needs in relation to the placement or project. Careers advisers could be involved in this.
- You will need to consider areas like health, safety and insurance.
- Employers will need to be aware of who they can contact at the university and this may require on-going administrative support. It is also important to consider how the student on placement will be monitored.
- De-brief sessions following a placement can be useful and the student feedback very valuable for future planning. This also gives students a further opportunity to reflect on what has been gained from the experience and how it might affect future career ideas. Involving careers advisers can be useful here.
- Reviews with the placement provider may also help to identify areas for improvement or for further co-operation.
- Usually a single student attends a particular firm but it is possible for a number of them to work on a joint project if the host is willing to take on more than one student. Larger companies may be more prepared to take on extra students.
- Students can also derive ‘work experience’ and useful transferable skills from the part-time/temporary work many of them undertake to supplement their income both during their course and in the vacations. However, formal placements and relevant work experience will normally be stronger selling points to future employers.
- It is worth getting your students to contact the university or college Careers Service. There are many schemes that would help them to broaden their skills and experience, some offered by larger graduate recruiters. Students often remain unaware of these schemes or are not alert to early closing dates (e.g. November/December for the following summer vacation).
- Students also have much to gain from voluntary work experience and should look at ways of building this in throughout the course, bearing in mind that the long vacations may have to be reserved for earning cash to help minimise debt. Students should really be building on work experience from the start of the course, so that through the years a variety of different types of experience, on and off the course, can be acquired.

### Costs and benefits:

- There are many benefits of industrial placements, not least the potential for developing transferable skills. Here are just a few favorable comments:

*“Student grades and employability improve.”* - E. Metcalfe, Biological and Chemical Sciences, University of Greenwich.

*“They lead to an appreciation of the work ethic”* - S. Smith, Life Sciences, Kings College London.

*“Students can gain successful employment with operating companies.”* - K. Roberts, Geography, Royal Holloway, University of London.

*“Staff have exposure to current practices and technology development and there is potential in terms of consultancy etc. arising from direct contact with the work done in the company.”*

- R. Hearing, Electronics and Mathematics, University of Luton.

- Students may gain maturity, self confidence and a sense of responsibility.
- The main disadvantage is the time involved in establishing and managing placements particularly if hosts have to be found for large numbers of students.
- Also on the negative side, some academics express doubts about the attractiveness of placements to students when they are not paid for this work, have no grants and have to pay fees. Another problem is the risk of the project stalling if the industrial contact offers poor support or worse still the organisation closes down.
- Employers too are having their problems, often operating within tight economic constraints, and may be too busy to provide students with the necessary support and guidance. The quality of the student experience can, therefore, be very variable.

### Contact:

K. Roberts - departmental address - [elizabeth.young@rhbnc.ac.uk](mailto:elizabeth.young@rhbnc.ac.uk)

E. Metcalfe - [E.Metcalfe@gre.ac.uk](mailto:E.Metcalfe@gre.ac.uk)

### iv: Industrial Visits

- “Industrial” visits most often involve providing a group of students with a tour of an organisation which closely relates to their subject area. (The term “industry” is used here in its broadest sense to include site visits to any relevant employer.)
- Visits can be arranged singly or perhaps as part of a field trip where several companies are visited over the course of a week. Case study iii in the final section of this handbook provides an example of this field trip approach.
- Industrial visits can be a useful source of case study material for problem-solving exercises, role-plays, lectures and assessments.

### **Where to begin:**

- Industrial visits are often one of the easiest employer links to arrange. Many large companies are experienced at arranging visits as they see this as good PR.
- Try contacting an appropriate recent graduate. A useful arrangement would be for them to lead a session, pointing out the ways in which the principles learned as an undergraduate can later be applied in the working environment.
- Problems may occur where companies are concerned about commercial/industrial confidentiality.
- Careers advisers often have links into companies and may have reports, videos, etc. that could be used in conjunction with visits.
- Arranging a visit may also be a good place to start before trying to develop other types of employer links. It enables the academic to obtain a rapport with the organisation before moving on to closer ties.

### **Points to consider:**

- It is normally important to ensure that the organisation is directly relevant to the subject area of the course and, if possible, that the trip is assessed in some way so as to maximise student motivation.
- Trips can also, however, be organised which are less strongly linked to the curriculum. These are often used to widen experience and can be attended on a purely voluntary basis.
- Visits to organisations of different sizes can broaden the student experience. There is a big difference between working in a multi-national and working in a local small business.
- It can be advantageous to collaborate with other academic departments. Could the visit involve other interested student groups so to maximise efficiency and available employer time?

### **Costs and benefits:**

- As already stated, visits are relatively easy to set up though difficulties may arise in finding a locally based company which is relevant to the course and is willing to participate.
- Travelling and accommodation costs may need to be considered.

*“At the Camborne School of Mines in Cornwall, industrial visits have been found to ensure students and staff have a close relationship with industry, helping to keep the curriculum up to date and promote graduate employment awareness.” - K. Atkinson.*

- They also:

*“Keep lines of awareness and communication open.” - R. Scrutton, Geography and Geophysics, Edinburgh University.*

*“Stimulate student interest” - A. Cooper, Biophysical Chemistry, Glasgow University.*

*“Are very useful to give students first hand experience.” - T. Watt, Environmental department, Wye College, University of London.*

- “Are very valuable in those courses particularly concerned with industry e.g. Microbial Biotechnology, Pharmacology.” - S. van Heyningen, Biology, Edinburgh University.

### Contacts:

R. Scrutton - rascrutt@glg.ed.ac.uk

A. Cooper - alanc@chem.gla.ac.uk

T. Watt - registry@wye.ac.uk

S. van Heyningen - S.vanHeyningen@ac.ac.uk

K. Atkinson - K.Atkinson@csm.ex.ac.uk

### v: Case Study Material

- Information can be gathered from employers for use as lecture, seminar or practical material, in order to illustrate a particular topic, theme or issue. This approach is illustrated by the LIAISE and HILP projects outlined in the case studies of this handbook.
- Case study material can be particularly useful for problem-solving exercises and role-plays.

*“The University of Plymouth’s Environmental Sciences Department uses a case study based on the environmental problems caused by the Wheal Jane tin mine in Cornwall. This involves information retrieval, data analysis and presentation of findings within groups of students.”* (Belt and Phipps 1998). (See case study ii in section 8).

### Where to begin:

- Useful material can often be found by capitalising on existing employer links. They can be a good place to start. People who you already have some relationship with are more likely to make information available to you.

### Points to consider:

- A problem which has occurred as part of a consultancy exercise may be suitable for a case study, depending on its complexity and professional sensitivity.
- The content of a particularly outstanding student honours project may also provide an up-to-date case study.

*“The Roehampton Institute in London has approached the issue of case studies by producing a 10 credit module where each student is required to produce a case study on the environmental impact of a particular business or organisation. The majority of businesses are chosen through an existing student link e.g. the student has a part time/ vacation job with the organisation”.* (Horner & Gardiner 1998).

### Costs and benefits:

- The time input required by academic staff can vary depending on the difficulties involved in assembling the material and on what proportion of the course/module is case-study based.

- Once in place, studies may be used for several years if the information is kept up-to-date.

*A. Cooper from Glasgow University Biophysical Chemistry Department has found the benefits not only enable course work/modules to be based on real life events thus making the course content far more relevant, but they also stimulate student interest and motivation.*

- Problem-based learning covered in this form allows students to develop analytical skills independently and gives a flavour of the type of work they may be involved in once they graduate and join the world of work.

### Contact:

A.Cooper - alanc@chem.gla.ac.uk

## vi: Programme Sponsorship

Programme sponsorship can help to ensure that a course is professionally relevant. This kind of curriculum impact is particularly likely in courses where there are a large number of sponsored students or where one or more organisations makes a significant contribution to programme funding. Case studies iv and vii in the final section of this handbook provide examples where industry plays a major part also in the actual delivery of the curriculum.

- Programme sponsorship occurs where an organisation and/or a government body sponsors an Institution to provide a course or a student to embark upon it. Other related forms of financial support can include supporting undergraduate projects, post-graduate research or other work in an area which is considered important to the sponsor. (Contact number/e-mail addresses for some government sponsors can be found in section B)

*“Within the Chemistry department at Liverpool University, industrial sponsorship is seen as very important as it supports about half of the 200 post-graduates in Chemistry”. - P. Bentham*

- ‘Old’ (pre-1992) universities may find sponsorship easier to arrange due to their established reputation and strength of existing partnerships. However ‘new’ universities are also gaining a reputation for excellent research and thus increased sponsorship may well follow.

### Where to begin:

- Much sponsorship is at post-graduate level and is linked to research. It may be sensible, therefore, to begin in this area.
- Some companies may be willing to sponsor short courses to meet particular training needs.
- Collaboration between employers, universities and other bodies such as research councils may also prove to be particularly beneficial in engendering industrial-higher education liaison.
- In some cases, where existing employer links are proving particularly successful, it may be possible to use these as a basis from which to develop sponsorship arrangement.

**Points to consider:**

- Sponsorship may be arranged to enable students to undertake courses as a matter of company policy and to ensure a good supply of future people to meet recruitment needs. This demonstrates the value that some employers place on maintaining close links with higher education, although it is recognised that this form of sponsorship may not be an affordable option for many organisations (and especially for small businesses).
- The 'Graduates Work' publication (Havey *et al.*, 1997a) points out that sponsors want feedback. This is important because as 'customers' they want to know they are getting value for money.

**Costs and benefits:**

- Sponsorship improves students' contacts and therefore their employment prospects.
- The greatest benefit of sponsorship is financial assistance. Students who might otherwise be unable to study due to financial reasons may be sponsored, having their course fees paid. However, there can be many other 'spin off' benefits, for example guest lectures and industrial visits.
- Problems may arise if the sponsor uses their financial muscle to exert undue influence on the course or on the content of the curriculum.
- Some courses are much more likely to attract sponsorship than others. Indeed, programmes of a highly "academic" nature may well find it difficult or impossible to obtain external funding of this kind.

**Contacts:**

P. Bentham - sjll@liverpool.ac.uk

**vii: Employer Participation in Management/Steering Committees**

Participation by representatives from the world of work in management/steering committees can be at a range of levels. Routine attendance may not be feasible due to cost and time constraints but occasional specialist advice on particular issues may be more readily available.

- Management/steering committees are used by universities and colleges to give direction to their courses and to ensure that they are up to date and providing a high standard of education.
- Some courses involve an industrial or professional partner in programme management committees, whose role is to help to ensure that graduates from the course are fully prepared for the world of work.
- Some academic institutions have employer's steering groups made up entirely of professionals from the world of work. Normally these operate at institutional or faculty level and oversee a range of degree programmes.

**Where to begin:**

- Involvement of industrial or professional partners in management/steering committees is easiest to achieve where links already exist, as organisations and individuals may be more inclined to participate under these circumstances.

- None the less, there can be benefits in approaching organisations not directly connected to the university but which are large graduate employers. Some companies perceive advantages in developing links with courses which could supply them with suitably qualified future graduates.

**Points to consider:**

- Employers with a vested interest in the programme are more likely to be committed to its success. On the other hand, more objective advice might be obtained from organisations which can afford to take a more detached view.

**Costs and benefits:**

- Most employers who contribute to management/steering committees do so without charging a fee (though they might expect a reasonable level of hospitality!).
- Meetings of management/steering committees can result in regular contacts between academics and employers, thereby enhancing the opportunities for developing other types of link such as consultancy, sponsorships and placements.

*“Participation in committees can facilitate/initiate industrial visits perhaps leading on to case studies etc.” - A. Cooper, BioPhysical Chemistry, Glasgow University.*

- Some employers with little knowledge of academia may at the outset feel unable to make substantial contributions to academic debates about questions such as teaching methods and modes of assessment. They may need to be carefully briefed and supported in order to empower them and to maximise their contribution.
- Senior professionals are busy people and will want to be sure that the time they devote to higher education is well spent. Be sure they have a clear role and are seen to be making a difference.

**Contacts:**

A. Cooper - [alanc@chem.gla.ac.uk](mailto:alanc@chem.gla.ac.uk)

### **viii: Employers’ roles in curriculum design and validation**

In addition to an ongoing management or steering role, employers can also play a part in the actual design and review of the curriculum.

**Where to begin:**

- Appropriate representatives from employment/employer organisations can be invited to inject a “practising professional” dimension into the work of course design or validation committees.

*Recent graduates may be utilised to obtain guidance on the current expectations and needs of employers - an approach being used, for example, at the Environmental Sciences department of Bradford University - M. French.*

- In addition to validation, another quality assurance role is that of the external examiner. Particularly in the case of vocational courses, there can be advantages in asking a senior figure from the world of

business (perhaps a former academic) to become external examiner. It is essential, however, that they are familiar with the assessment procedures used in higher education.

#### **Points to consider:**

- Many points which apply to participation in management/steering committees are also relevant to an employer role in curriculum design/delivery.
- Courses may be tailored for a specific area where there is a skills shortage. This gives a department's students an important competitive edge and may guarantee a job at the end of the degree programme. An employer's advice can be very helpful both on the curriculum content and on the likely level of demand for the course.

#### **Costs and benefits:**

- A curriculum designed for career preparation can help to ensure that your students have a good employment record which in turn can help your reputation and student recruitment.

*At the Camborne School of Mines in Cornwall, industrial advisory panels ensure that they import the latest industrial trends/priorities/pressures and needs into their courses, making the courses relevant to the industries to which they are connected, therefore enhancing their image in a specialised field. - K. Atkinson*

- The costs of obtaining external advice on curriculum design are likely to be minimal, as few representatives from the world of work are likely to charge for their guidance.

#### **Contacts:**

K. Atkinson - K.Atkinson@csm.ex.ac.uk

M. French - M.J.French@bradford.ac.uk

### **ix: Some Other Forms of Employer Link**

Contacts with various work cultures can come in many different shapes and sizes. In addition to the types discussed above, readers may wish briefly to consider a number of other alternatives.

#### **● Teaching Company Schemes (TCS)**

These schemes, which are part of a national initiative, are designed to encourage post-graduate students to work on a special research project for a host company or organisation (Burns, 1996). This kind of arrangement is most commonly operated by university Business Schools and can bring real benefits to the industrial partner, the academic partner and to the student. At Plymouth, TCS is now part of the university Centre for Business Development. One recent TCS project in a Cornish shipyard reportedly saved the company £170,000. Using a specialist computer design package, the company has cut the time taken to design hull frames from two months to two weeks.

- **Student Projects**

In many undergraduate courses, final year students are expected to undertake a substantial project. These can provide an excellent opportunity for students to make contact with external organisations and to learn how they work.

- **Science Parks**

In recent years a number of universities have established science parks for the development of high technology and other science based companies. Some of the firms are established by academics and others come to the science park to benefit from the university's research expertise and facilities. Particularly well known examples are found at Cambridge, Limerick and Warwick. In the Warwick case there is a substantial summer vacation programme which gives students the opportunity of working in the science park environment (Skilbeck & Connell, 1996).

- **University Careers Services**

Academics keen to encourage employer links could do well to use the expertise and information available in their institution's Careers Service. Many of the careers advisors will be in regular touch with national and local organisations and will be experienced in hosting events such as employer-led seminars, presentations and fairs. All university careers professionals are members of the Association of Graduate Careers Advisory Services and work closely with employer bodies such as the Association of Graduate Recruiters (AGR).

Opportunities advertised for students include, for example, vacation projects with local government, summer visits to Government departments, vacation courses and more formal work experience schemes which are rarely capitalised on by students. Sometimes it is difficult for a second year science student, for instance, to see how they could benefit from a work scheme with for example a supermarket chain but the skills gained could be useful. Many fail to understand that most scientists are managers in a very real sense e.g. in managing resources, bidding for funds, organising time and project management etc. It is understanding the transferability value of skills to new contexts that students are often unable to demonstrate when it comes round to those demanding final year job applications.

- **The Shell STEP programme**

This involves students in eight weeks of summer employment prior to their final year. The programme is a Shell initiative but can involve students in project based work as part of a placement with a wide variety of organisations including major companies, SMEs and voluntary bodies. Contact and further information details are given at the end of this chapter.

- **Learning from part-time and vacation work**

The DfEE have recently funded a number of pilot schemes which are designed to allow students to earn academic credits (towards their degree qualifications) from undertaking part-time/vocation work. This experience is carefully monitored to ensure that students formerly record the skills acquired and lessons learned. An example is the JEWELS project at the Universities of Plymouth and Exeter. Part of the rationale for this approach lies in the fact that it is often impossible to provide a proper work-based learning or placement experience for all the

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students on a course. If appropriately managed, there can be a lot of learning to be derived from routine vacation and part-time work.

- **Prizes and Awards**

One reasonably straight-forward way of promoting employer links is to ask appropriate organisations to offer a student prize. This could be perhaps for the best overall student, the best student in a particular area of the course or the best final year dissertation. For the organisations concerned this can be a relatively inexpensive way of demonstrating publicly their interest in higher education. Typical prizes at undergraduate level are often in the order of £50 - £100. Normally, organisations will only wish to sponsor prizes in subjects which are relevant to their main activities. At the University of Plymouth, for example, Zeneca award an annual prize for the best performance in a chemistry related subject.

- **Staff Placements**

Academics are sometimes criticised for having little direct experience of the world outside higher education. It is legitimate, therefore, to ask whether academics know enough about industrial and commercial life in order to prepare students for entry into careers outside education. In the light of this, a case can be made for encouraging academic staff to take a placement period in an external organisation relevant to their main areas of teaching and research. Sabbaticals could, for example, be used for this purpose.

- **Mock interviews**

Final year students in particular can derive substantial benefits from mock career interviews. Although in principle these could be conducted by members of the university staff, the experience will probably be more realistic if the interview is lead by someone drawn from an appropriate profession or industrial background.

Again, do remember if using an employer that just being an employer does not necessarily make them up to date on interviews styles and recruitment trends. Also, the criterion/competence based style of a multinational might be very different in approach from that of a smaller organisation. Students need to be aware of this. The Careers Service can be a useful source of advice in this area, and on current trends in matters such as interview formats, CVs and application forms.



**Section 6**  
**The case for employer links: a synopsis**



## Section 6. The case for employer links: a synopsis

It is hoped that the previous sections will have aroused interest and stirred enthusiasm to a point of further exploration of this vast area of opportunity - perhaps even to the point of readiness to introduce more external contacts into your teaching and learning. Those requiring more persuasion might like to reflect on a list of the main benefits which extended employer links can offer. Building on the examples outlined in the previous chapter, these advantages can be summarised as follows:

### **Benefits to students**

- An opportunity to apply their subject-based knowledge in a professional setting.
- Greater understanding of work cultures and the realities of professional life.
- Increased motivation for learning.
- An insight into possible career avenues and opportunities.
- Enhancement of employability skills and improved job prospects.
- Possible opportunities for sponsorship or other income generation.

### **Benefits to the University**

- Opportunities to enrich the curriculum, making it more responsive - a more dynamic learning milieu.
- Enhanced prospects of success in the Teaching Quality Assessment process (now referred to as Subject Review)
- Improved levels of graduate employment.
- Increased student applications and recruitment.
- Possible new research and consultancy links.
- A higher profile in the local region.
- Sharing of good practice
- Staff development and training opportunities.

### **Benefits to employers**

- Access to a pool of talent and facilities.
- Opportunities to contribute positively to higher education.
- Staff development opportunities/on-going training.
- Getting projects completed.
- Possible increased competitiveness.
- Widening of contacts.
- Possible help in terms of future recruitment needs.

Of course, many of the above benefits are cumulative and will not be generated with every individual link. Moreover, there are clear resource implications as previously indicated, not least in terms of costs and staff time. However, the pressure to change is one that cannot be sidelined or ignored and the benefits can be substantial. There are risks and costs involved - but those of **not** being involved could be greater.



**Section 7**  
**Rethinking the curriculum with  
employers in mind**



## Section 7. Rethinking the curriculum with employers in mind

This chapter begins with the case for a clear strategy for integrating employer links within higher education, in a way that will ultimately benefit all stakeholders. However, it is accepted that changing the culture of a whole institution is an ambitious agenda and so the chapter focuses principally on the kinds of initiative that can be undertaken at the level of departments, programmes and individuals.

### *Institutional priorities*

In an ideal world, the strategic thinking starts at corporate level. There is certainly a strong case for a clear policy and steer from the centre. Institutions need from time to time to review their mission statements and values in order to ensure that they are meeting society's needs. The development of employer links is obviously more readily undertaken where the institution's philosophy is sympathetic to this kind of approach. Institutions can also help in a number of other ways as illustrated below:

- Supporting and rewarding staff who take employer links initiatives.
- Providing staff development and advice in this field.
- Sharing best practice between departments and courses.
- Coordinating links to avoid duplication.
- Building employer links into the course design and validation process.

### *Making a start*

It helps to have a supportive institutional framework but no matter what the wider climate, there are plenty of useful activities which can be undertaken at departmental and module level. Previous chapters have demonstrated the variety and range of potential employer links and so there is no shortage of opportunities. A key first task will therefore be to think strategically about the kinds of employer links programme which would be most appropriate to your course.

This also provides an opportunity to look at developing contacts within the university, for example, with the institution's Careers Service, business links, external contacts groups etc. It is logical to make use of these services. Partnership is a key word - in this case requiring the inclusion of all stakeholders and a professional, coherent approach.

### *Such an approach might involve:*

#### **External partnerships e.g**

Employer contacts/departments  
Steering groups  
Local employer bodies  
DfEE/TEC etc.  
Professional institutes and associations  
Alumni

#### **Internal partnerships, e.g**

Careers  
Business development units  
Other academic colleagues  
Educational Development Units or similar  
Support staff  
The students  
Administrative colleagues  
Alumni/graduate associations

To date, much employer involvement in higher education has tended to be ‘bolt-on’ and not really part of an overall strategy. It is important to begin therefore by considering objectives and what you might hope to achieve by enlarging your portfolio of employer links. Listed below are some questions which it may be helpful to address at an early stage:

- What role should employer links play in your curriculum?
- What outcomes do you want from employer links?
- What kinds of collaboration could produce these outcomes?
- When, where and how might they be provided and introduced?
- Are the intended benefits actually deliverable in practice?
- How can you ensure long-term embedding?
- Will the students be assessed and if so how?
- How will the links be evaluated?
- What are the obstacles to progress and how might they be overcome?
- What support is available from the institution?

Having begun to address these questions, it will be important to begin to influence your colleagues. Having the Head of Department on your side is a distinct advantage, so he or she may need to be reminded of the benefits of employer links (as outlined previously) and persuaded that they can be introduced without undue cost. It will be important also to have the active support of at least two or three of your colleagues. Initiatives which rest entirely on a single individual rarely flourish or last. A certain amount can be achieved on your own and it can be exciting to be a pioneer but it certainly helps to have encouragement, support and friends.

### ***Mapping existing links***

Even in the most conservative of departments, there are likely to be some already established external contacts. It is obviously important at the outset to establish clearly what these are and to identify strengths and weaknesses in the existing provision. Within higher education much attention has recently been given to the principles and practice of mapping transferable skills across the curriculum: however, this mapping concept has very rarely been extended to employer links, although it can be equally valuable in this area. The precise details of how the mapping is undertaken can vary with individual circumstances but one model is presented in the accompanying diagram. This kind of approach can be useful in obtaining an overview of the pattern of employer links across the degree. At a more detailed level, one could produce separate maps for individual groups of students dependent upon the particular modules and options they are studying. In this way maps can be produced which show the employer links experience for groups of students as well as for the degree programme as a whole.

## A Framework for Mapping Employer Links in the Curriculum

	Stage 1	Stage 2	Stage 3	Student Assessment	Careers/Personal development relevance
Work Based Learning					
Industrial visits					
Industrial placement					
Preparing for TCS					
Staff placement/ secondments					
Vacation - work experience					
Shadowing					
Links with programme development					
Management/ steering committees					
Course design					
Consultancy/Employer sponsored research					
Student sponsorship					
Project support					
Case studies					
Guest lecturers					
Short courses					
Prizes/awards					
Mock Interviews					
Exam boards					

### Designing a new curriculum

Producing maps of the existing pattern of employer links is a useful starting point but it is only a first step in developing the curriculum to achieve a more interesting and extensive programme of links to employers and work cultures. The maps will probably identify clear gaps in the existing provision but a more creative approach will be needed in order to design a model of what a good employer links curriculum might be

like. Indeed, it could be helpful to produce two or three different models for discussion with colleagues and students. This process of curriculum design can be facilitated by brainstorming not only with departmental colleagues but also by incorporating ideas from other departments within the institution and elsewhere. Talking to colleagues in the Careers Service and to staff developers can also inject some new thinking. You may also use the checklist presented earlier in the section on 'making a start' which raises a number of questions which will need to be addressed.

The details of any new curriculum will be shaped in part by local circumstances and by resource constraints. None the less, in broad terms an effective programme of employer links would have some or all of the following features. It should ideally be:

- Relevant to the subject curriculum.
- Carefully designed and planned.
- Diverse and covering a spectrum of organisations.
- Embedded rather than 'bolt-on'.
- Progressive across the three/four years of the degree.
- Available to all students.
- Linked to assessment.
- Linked to a careers guidance programme.
- Regularly evaluated.
- Capable of change and flexibility.

Given the competing pressures on staff time and the insistent demands of the Research Assessment Exercise (RAE) there will be limits on what can be achieved. For this reason, your ideal model may be a long-term target rather than something which can be achieved overnight. Resource constraints may make it necessary to implement change gradually and to prioritise the most important employer developments. However, once you have made the decision to go for change do forge ahead in a positive way - determination and imagination can find ways to get around what might at first seem like pretty formidable obstacles.

It is important to demonstrate the benefits of employer links both to staff and students and so you may wish to begin with developments which have a very high probability of success. Try to back winners at the outset because in this way you will have some clearly positive evidence with which to persuade your Head of Department and others of the advantages of investing in employer contacts. It is sensible to build on your early successes, but there is little advantage in wasting time on colleagues who are utterly resistant to change. Be sure that your own modules provide examples of good practice and seek to strengthen departmental activities by encouraging those colleagues who appear potentially sympathetic.

### **Selecting your contacts**

Identifying and choosing organisations to work with is obviously a central part of developing employer links. This task can be made easier by talking to: academic colleagues, the Careers Service, educational advisory units, research and consultancy contacts, past graduates and local employer organisations. Do not be shy also of simply using people who you or your family and friends happen to know. Sometimes these personal links can be the easiest way of getting started and much more comfortable than 'cold calling' firms with whom you have had no previous contact. Whatever methods you adopt, try if possible to get a record of organisations currently being used by other departments so as to avoid the danger of perhaps treading on colleagues' toes or giving the impression to an outsider that one part of the University does not what another other part is doing. Some organisations may be willing to develop links with two or more university departments but others will see this as overloading.

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Other factors relevant to the task of selecting appropriate organisations can include:

- Matching with a particular curriculum need (filling a subject gap).
- Achieving a sectoral balance (private, public and voluntary).
- Obtaining a size mix (multi-nationals to small businesses).
- Geographical location (ease of access).

### **Evaluation**

Student participation and learning outcomes will need to be evaluated. For each activity it can be useful to ask a number of questions. How effective has the contact been? What skills or experience were gained from the activity? What was the level of student interest and motivation? Was the knowledge acquired at an appropriate level? To what extent were the objectives actually achieved? Is the student able to accurately identify and measure what was learned/developed? If the activity were to be repeated, in what ways could it be improved? In addition to evaluating individual employer links in isolation, it will be necessary from time to time review the employer links curriculum as a whole.

**A final point** - It is easy to assume that established links continue to serve their purpose, but the needs of students, employers and the market place do not stand still for long. The pattern of employer links will from time to time need to be updated. Similarly, the world of higher education is subject to continuing pressures for change and improvement. These pressures, particularly post-Dearing, will include increasing demands for courses and curricula which are connected to work and economic competitiveness. So, employer links are likely to become a still higher priority in the future. There is no better time to get started than the present.

**A final progress check list:**

- ✓ Does your department/university have a coordinated approach to employer links?
- ✓ Do you have a longer term vision for your curriculum which is informed by and responsive to external developments?
- ✓ Do you have clear aims for the way in which to use employers in your programmes and how that might fit into an integrated policy regarding mapping career and general graduate skills on to the curriculum?
- ✓ How might such skills be mapped on to the curriculum to allow for progression and development over the stages?
- ✓ Does your course/department have a careers policy and how does this operate professionally with the Careers Service in your institution?
- ✓ How are employers used already in your course e.g. in curriculum design, assessment etc.?
- ✓ How much contact do your students have with representatives from work? Are they encouraged to make contact with the Careers Service and to use their facilities/presentations and seminars?
- ✓ Is effective use made of alumni?
- ✓ Are you aware of what is going on within the university in terms of employer visits and contacts?

**Section 8**  
**Some sources of further information**



## Section 8. Some sources of further information

### **Centre for Education and Industry**

Centre for the study and dissemination of information and experience of education-industry collaboration.

University of Warwick, Coventry CV4 7AL.

[http://www.warwick.ac.uk/fac/cross\\_fac/cei](http://www.warwick.ac.uk/fac/cross_fac/cei) Tel: 01203 523 909

### **Confederation of British Industry (CBI)**

Commissions and undertakes reviews and research, publishes reports and offers advice to industry on working with education

CBI, Centre Point, 103 New Oxford Street, London WC1A 1DU.

<http://www.cbi.org.uk> Tel: 0171 379 7400

### **Council for Industry and Higher Education (CIHE)**

Comprising heads of large companies and senior academics, encourages closer working between industry and higher education and represents their joint thinking to government.

CIHE, 100 Park Village East, London NW1 3SR.

### **Department for Education and Employment (DfEE)**

Has policy responsibility for the encouragement, development and improvement of links between education and business.

DfEE, Sanctuary Buildings, Great Smith Street, London SW1 3BT.

<http://www.dfee.gov.uk/>

### **Department of Trade and Industry**

1 Victoria Street, London SW1H 0ET.

<http://www.dti.gov.uk> Tel: 0171 215 5000

### **The Fund for the Development of Teaching and Learning (FDTL)**

This is resourced by the Higher Education Funding Council for England (HEFCE) with the aim of promoting best practice in higher education teaching and learning. It is currently supporting a number of projects in areas such as student placements and transferable skills.

FDTL & TLTP National Coordination Team centre for Higher Education Practice, The Open University  
<http://www.ncteam.ac.uk/fdtl/>

**Leonardo da Vinci** is the European Union's programme for vocational training set up to support, promote and provide funding for transitional student and staff work placements.

Email [Leonardo@dg22.cec.be](mailto:Leonardo@dg22.cec.be)

<http://europa.eu.int/en/comm/dg22/leonardo.html>

Tel : +32.2.227.01.00

**The LINK** initiative promotes partnership in research between industry and the research base. Sponsored by Government Departments and Research Councils LINK provides up to 50% of costs, the balance coming from industry.

<http://www.dti.gov.uk/ost/link/pip.htm> Tel : 0171 215 0053

**STEP project** - This is a summer 8 week work placement run by SHELL and designed to help small and medium sized businesses. Copies of their recruitment information pack are available from - Shell International Recruitment Division, Shell Centre, London SE1 7NA.

<http://www.shell-step.org.uk> Tel: 0171 323 9158

**Teaching Company Scheme** - a national initiative sponsored by DTI, EPSRC, BBSRC, ESRC, The Scottish Office, The Welsh Office, MAFF, The Department of the Environment, The Department of Economic Development (NI). Contact TCD, Hillside House, 79 London Street, Faringdon, Oxfordshire, SN7 8AA. Tel: 01367 242822

**Section 9**  
**Feedback and contact form**



## Section 9. Feedback and contact form

If you are interested in increasing employer inputs into your programme and would like to discuss your ideas, we would be interested to hear from you and would be happy to comment on your plans. Please complete the sections below and return a completed photocopy of this form to the authors at the University of Plymouth, Drake Circus, Plymouth PL4 8AA.

Type of industrial link:	
Academic module/programme:	
Year/Stage:	Duration of exercise:
Aims:	
Anticipated number of students:	
Outline details ( <i>Please continue on separate sheet if necessary</i> ):	
Name & Department:	
Institution:	
Email address:	



**Section 10**  
**Case Studies**



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## Section 10. Case Studies

The following case studies of employer links extend the depth of coverage afforded in earlier sections. It is hoped that they will provide a range of examples of good practice to help you develop your own ideas and initiatives.

### *Case Studies from the University of Plymouth*

- i. The first case study illustrates how links with government bodies and professional organisations can enrich fieldwork teaching and learning. It is based on an Environmental Science field trip to the Maltese Islands.
- ii. Project LIAISE uses a series of actual industrial scenarios from a number of local industries. Not only have the companies involved found this collaboration beneficial but the students have also found the programme offers a way of acquiring skills not strongly developed in the mainstream degree modules.
- iii. The third case study is based on a Biological Sciences field trip, which visits a number of contrasting plant sciences industries. This is an excellent example of how industrial visits can be used to highlight differing career opportunities and also how such trips can provide useful assessment material.
- iv. Here the delivery of a short course within the Institute of Marine Science is reviewed. The course was conceived between Flagship (the commercial arm of the Navy) and the university. It is a course for industry, taught by industry.
- v. The fifth case study involves Work-Based Learning (WBL) experiences in the Department of Geographical Sciences. A WBL module allows the students to put their theoretical knowledge to use in practical, real-life applications.

### *Case Studies from Other Universities*

- vi. The Hertfordshire Integrated Learning Project (HILP) has been included due to its coverage of a wide range of disciplines and its work in developing a model for integrating skills development into academic programmes. A key dimension is preparing students for the world of employment. This project is resourced by the Fund for the Development of Teaching and Learning (see Section 8).
- vii. Within the final year of the geophysics degree at Leicester University a course is run in collaboration with industry to cover the essentials of geophysical field data collection and interpretation. The university provides the equipment and manpower and the company provides the logistics.
- viii. At Sheffield University, practising applied geologists are invited to present talks to students. These talks are focused on one or more areas of the course and many indicate the type of work practising geologists do in industry. Thus this case study highlights how guest lecturers can be effectively used to complement course content.

## CASE STUDY i

### *Employer Links in the Creation of a Fieldwork Web Site*

#### Authors

Lawrie E. Phipps & John Stainfield

Department of Geographical Sciences, University of Plymouth

email: [iphipps@plymouth.ac.uk](mailto:iphipps@plymouth.ac.uk); [jstainfield@plymouth.ac.uk](mailto:jstainfield@plymouth.ac.uk)

Website; <http://www.science.plymouth.ac.uk/departments/seed/med/>

#### Keywords

Computer Based Material (CBM); Industry links; Fieldwork; Information Forum.

#### Outline

In order to support and enhance a second year Environmental Science field trip to Malta, a learning resource has been developed which takes the form of a Web site. While the development of this site has made extensive use of academic sources, it has been considerably enriched by information and documents provided by professional bodies such as environmental consultancies and government agencies. These bodies not only contributed to the Website but also took part in the peer review process of the academic material and of the student projects published on the Internet. The consultancies and government organisations have also contributed during the field courses, providing expertise on various issues from waste management and water supply to local archaeology. As a result, both the Website and the students' fieldwork benefited substantially from the contribution of professional organisations active in environmental management.

#### Context

The resources (Website and associated CBMs) are available to anyone with access to the Internet. However, material on the Website is aimed primarily at an academic audience.

#### Aims and Objectives

- To provide a resource of information for studying environmental issues in the Mediterranean drawn from both academic and non-academic sources.
- To enhance the student fieldwork experience by linking with industries, consultants and government agencies.

The Website is targeted at:

- Students visiting Malta as a field course location to study aspects of the Mediterranean environment.
- Academics and other professionals researching Mediterranean issues.
- Professional bodies needing a resource of information (e.g. the Website has already been used by the BBC in the production of a documentary and they are currently writing an article for the site).
- Individuals who are interested and want to learn more about both Malta and the Mediterranean.

## Description

The Website concept was born out of the need to develop and document information to aid future field trips to the Mediterranean. John Stainfield has lead several undergraduate trips to the islands and developed many links and accumulated a considerable amount of local information. The driving force behind the project was the desire to enhance the student learning experience by having in place information relevant to any field work they undertook whilst in Malta. However, a major drawback found with some overseas trips was the lack of local 'professional' input. Using John's local contacts as a starting point the project built a considerable database of local professionals willing to aid students in their projects and/or give lectures during the field trip. Added to this, these people were also canvassed to write specific articles on their subject area for the Website so as to prepare students before the trip. The site therefore goes well beyond the academic domain and gives interesting insights into the day-to-day work of professionals active in the field of environmental management.

The major themes were selected to reflect the broad spectrum of students visiting the islands. These are shown below:

- Agriculture
- Archaeology
- Climate
- Ecology
- Economics
- Environment
- Geography
- Geology
- History
- Politics
- Resources
- Tourism

For each theme a 'core text' was written (or selected) and this was supported by various other articles. Links to other web sites were also used where appropriate. The core texts have been written by a mixture of academics and professionals from outside higher education as illustrated below.

- Ecology Core Text  
*Prof. Patrick Schembri, University of Malta*
- Environment Core Text  
*Louis F Cassar, Executive Co-ordinator, International Environment Institute, Malta*
- Geography - Urban Conservation  
*Malcolm Borg, Environmental Management Unit, Maltese Planning Authority*

All of the authors listed have participated in the development of the web site and in the evaluation and review process of both the Website and the students' work.

To use the various supporting articles, copyright needed to be negotiated with a number of publishing houses and authors. This benefited the project in two ways. Firstly, already refereed work became available for publication on the Website and provided a wider resource base. Secondly, publishing houses and authors became aware of the work being done and were able to offer advice and in some cases more material than actually asked for. Some of the main publishers used are listed below.

- Advantage Advertising Ltd
- Butterworth-Heinemann
- Elsevier Science
- Kluwer Academic Publishers
- RBI Ltd

One of the key advantages of developing the site has been the access it has created to local experts in the Maltese Islands. This has greatly enhanced the learning experience of students by exposing them not only to academics but local people talking about local issues.

### Resource implications

The development of the Website has required the employment of a research assistant for six months. This was paid for by the SEED programme which is resourced by HEFCE's Fund for the Development of Teaching and Learning (FDTL). Hopefully, future Websites will benefit from the experiences of the web authors. In terms of copyright a precedent has been set which should allow more articles to be published in the future. The act of creating the Website has led to the establishment of further links with the Maltese Islands. This in turn has allowed some savings to be made in terms of staffing of field trips, with Maltese academics and local professionals contributing both in the lecture theater and in the field.

### Student Assessment

Student assessment is based on a standard fieldwork pattern; namely group work, presentations, and individual and group written assignments. The students give oral presentations of their work on the field trip to those individuals from government and industry who have been involved with the group. This gives the students more valuable feedback than from academics alone and allows the visitors to see the value of participating in the project. Student surveys show that they regard the Website as an excellent pre-field trip guide and a resource base for work carried out in the UK after the field trip. Student work carried out post-fieldtrip in the UK is reviewed by accessing the Internet. Individual students can then be emailed questions by other students about specific aspects of their work.

### Evaluation

#### Strengths

- The Website provides a flexible learning resource whose value is much enhanced by the inclusion of material from local professional organisations.
- The Website is also available for students in other universities and colleges.
- During the trip the local professionals provide insights and information which enrich the students' learning.

#### Weaknesses

- The costs of developing a Website can be high particularly in terms of staff time, although in theory, institutions mounting field trips to the same location could cooperate in the production of a similar site and share the development costs.

### Key Advice

- Use existing Websites as a template.
- Build on existing contacts to write articles and provide expertise.
- Use the resources and expertise of appropriate non-academics to inject a 'world of work' dimension, both into student learning materials and the actual field trip.

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## CASE STUDY ii LIAISE

### *(Linking Industry and Academia in Scientific Education)*

#### Authors

Dr Simon T. Belt & Lawrie E. Phipps

Department of Environmental Sciences, University of Plymouth

email: sbelt@plymouth.ac.uk; lhipps@plymouth.ac.uk

#### Keywords

Chemistry, Transferable Skills, Group work, Industrial Links, Case Studies.

#### Outline

Case studies have been written with the aim of developing new and existing skills in Chemistry and Environmental Science students in order to prepare them for the world of work. The case studies have been developed around real events that have occurred within various industries. Partners from industry have been involved in the development of the case studies and in the assessment of student work. Students gain experience in developing key skills that have been identified by industry as being desirable in new graduates. This paper describes the first case study - 'Heavy Metal Pollution ~ a strategy for an abandoned mine discharge'.

#### Context

The case studies are complimentary to other skills based exercises and can be incorporated into existing BSc. Chemistry and Environmental Science courses. The case studies have also been used as a skills development exercise with PhD. students.

#### Aims and Objectives

- To identify the skills required by industry in new graduates and links to the world of work.
- To develop a format (case studies) whereby a range of key skills are developed.
- To provide a stimulating teaching experience for students.
- To provide a setting where students can work on real (industrial) problems within a team and identify their own strengths and weaknesses.
- To liaise with industry in the development of their prospective employees by:
  - ❖ Consulting with relevant companies/agencies on the type of case study used.
  - ❖ Discussing with industry the key skills they feel graduates need/are lacking.
  - ❖ Developing a strategy whereby industry can be involved in the assessment of student work.

## Description

The first case study - 'Heavy Metal Pollution ~ a strategy for an abandoned mine discharge' was developed in consultation with the Environment Agency (EA) and Knight Piesold Consultants. The study was based on the incidents surrounding the Wheal Jane Tin Mine in 1991, when, after heavy rainfall, an adit plug burst releasing millions of gallons of contaminated minewater into the nearby stream and consequently into Cornwall's Fal estuary.

The case study consists of four tasks tackled in a number of sessions over a 5 - 10 week period by students working in groups of 4 - 6. Figure 1 gives a general timetable for the delivery.

### Figure 1. General Timetable for Case Study Delivery

<b>Session 1</b> (30 - 40 mins)	Overall aims of the case study are described Students are divided into groups. Newspaper article and Task 1 are given out (General hints document or specific help available (if needed) via e-mail)
<b>Session 2</b> (1 - 1.5 hours)	Presentation of Task 1 findings and submission of report Further considerations given Task 2 given (help via e-mail if needed)
<b>Session 3</b> (1 - 1.5 hours)	Presentations for Task 2 Further considerations given Task 3 given (help via e-mail if needed)
<b>Session 4</b> (1 - 1.5 hours)	Presentations for Task 3 Further considerations given Task 4 given (help via e-mail if needed)
<b>Session 5</b> (2 - 2.5 hours)	Formal presentation to experts* (30 mins) Presentation to non-experts (10 mins) Submission of final report**

\*\*This includes the presentation and report for Task 4

As can be seen from Figure 1, the case study is delivered over 5 sessions. This has been carried out on both a weekly and fortnightly basis though the latter proved more popular with students from a time management perspective. If the case study is timetabled for a lecture slot, spare sessions can be used as 'surgery' sessions.

During the first session, the overall aim of the case study is explained and students are divided into groups. Several features of the case studies will be new to the students and a rationale of these features is also provided and explained (this is expanded upon in the assessment section). A newspaper cutting of the incident, a brief outline of the situation and task one are then given out.

It is envisaged that students should spend 6 hours per task which includes all group meetings and individual work. The first task involves researching methods for analysing metal concentrations in water and investigating long-term and short-term treatment methods for the contaminated mine water. Figure 2 outlines the various tasks.

During the second session, students present their findings and submit a written report. This is carried out for the first three tasks in sessions two, three and four respectively. During the final session, students submit a fully integrated report and deliver a 30 minute presentation as if to an expert (e.g. a colleague in the same field). Students are also expected to deliver a 10 minute presentation to a non-expert. The ability to explain a scientific problem (and solution) in non-scientific terms has been identified as a key skill required by industry.

### Figure 2. Tasks from the abandoned mine case study

<b>Task 1</b> (6 hours)	Research methods for analysing metal concentrations in water Investigate treatment systems for acidic mine water
<b>Task 2</b> (6 hours)	Building on the data collected in the first task students should have recognised the importance of an existing tailings dam where the metal can be precipitated out as a sludge. Therefore they: Estimate the volume of the tailing dam Identify methods of disposal of the precipitate
<b>Task 3</b> (6 hours)	Using two scenarios identified by the EA; Develop a working equation (both chemical and numerical) for the deposition of metals in the tailing dam Consider the viability of commercial metal recovery from the dam
<b>Task 4</b> (6 hours)	Integration and consolidation of information acquired during the case study; Consider quantitatively how to reduce metal concentrations to legal limits. Consider environmental factors which control metal concentrations Estimate the life expectancy of the current treatment system.

### Resource Implications

The case studies have been integrated into existing modules with little disruption. In terms of lecturer time, the use of e-mail to request and receive further information has greatly improved the time management efficiency of the module. In contrast, the development of the individual case studies has proved to be extremely time consuming. This is not only because each case study has been researched in detail, but extensive supporting documentation has also been written. This document has, however, made the case studies extremely transferable with minimal start-up time required for another tutor. Resources are otherwise minimal. Students require library and Internet access. In-class sessions require OHP and whiteboard facilities.

### Student Assessment

Various methods can be employed in the group assessment of students including quality and clarity of reports and presentations. However, a concern has been the assessment of individual contributions. In order for the tutor to gain a better understanding of this, students are required to keep minutes of meetings. This serves a two-fold purpose. Firstly, it identifies the effort put in by individuals in their attendance and participation at meetings and secondly, a tutor is able to identify the rationale behind decisions made by the group for choosing particular directions. These minutes can then help the tutor in awarding marks based on a set of criteria within the case study documentation. During the final presentations, individuals from the relevant industry have attended to give their assessment of the students. This appears to give more value to the overall assessment than tutor marking alone.

## Evaluation

### Strengths

- The case study provides an opportunity for students to work as individuals and in teams.
- The case study exposes students to the types of real problems that they may find in an industrial setting.
- It provides a framework for the development of key skills that are required by industry. In some cases, these activities will be new to students (eg presentations to non-experts) and/or require researching new types of information (e.g. EU law).

### Weaknesses

- The development of the case studies is time consuming and can be costly.

## Key Advice

### Do

- Build on existing material/documentation where possible.
- Maintain a consistent format through all the case studies.

## CASE STUDY iii

### *An Industrial Observation Field Course for Plant Sciences*

#### Authors

Dave N. Price & Stuart Lane  
Department of Biological Sciences, University of Plymouth  
email: dnprice@plymouth.ac.uk; slane@plymouth.ac.uk

#### Keywords

Plant Sciences; Agrochemical Industry; Biotechnology; Career Awareness

#### Outline

This case study describes an industrial observation field course run for Stage 3 Plant Sciences students in S.E. England. This is an unusual form of employer link as the whole field trip involves a series of industrial visits. During the trip, by visiting a series of commercial and government institutions, we aim to enhance the commercial and research awareness of our students and in so doing improve their competitiveness in the job market.

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## Context

This field course is run immediately before the autumn semester of Stage 3, being the initial component of BIOA 384 Industrial Applications of Plants which is taken by BSc Plant Science and a number of BSc Biological Sciences students. Student numbers range from 15-30.

## Aims and Objectives

- To put our degree programmes in an appropriate commercial context
- To inform curriculum development
- To promote good links between industry and the university
- To focus student attention on careers and professional issues in the Plant Sciences
- To meet the needs of industry by producing graduates with an appropriate commercial awareness
- To promote group cohesion and good staff-student relations

## Description

The field course provides the opportunity to visit a range of commercial and government institutions which undertake activities relevant to plant sciences and are the potential employers of our graduates. The sites visited vary from large established organisations to small evolving companies often established on venture capital.

The course started in 1989 as an optional component of the BSc Biological Sciences degree, becoming an integral component of the BIOA 384 module Industrial Applications of Plants in 1995.

The course extends over three days and is run in mid-September, prior to the start of the autumn semester. It provides an ideal springboard for the module and the associated report enables students to make an early start on their final year assessment programme.

The course is located in South East England to give students a different perspective to that pertaining to the South West and to target an area with a large concentration of plant science industries. We choose a centre (currently Silsoe, Beds) which allows visits to appropriate sites within 100 mile radius. Being residential, we are able to fully concentrate students' minds on commercial/career and research awareness. The course is very intensive, involving four separate visits in three days. We feel this to be an optimum, allowing appropriate focusing without causing fatigue - a problem encountered in earlier courses where more site visits were attempted.

The enterprises we visited have included those in the following fields: agrochemical companies; food industries; plant breeding institutes; bio-technological companies; government research stations; and agricultural advisory services. In all courses we attempt to provide a mix of activities and scale of organisation.

Briefing papers are sent to students over the summer vacation. Most students travel with staff from Plymouth, although some meet us at the first site we visited. A briefing talk including details of the associated assessment is given before entering the first site. The standard of behaviour expected is highlighted, encouraging students to consider themselves as ambassadors of the University of Plymouth and encouraging them to ask questions.

Whilst the context of the visit differs between sites, all include:

1. A talk from a staff member (where possible a former Plymouth student) explaining the activities of the company and the role of the particular site.
2. A tour of the facilities with talks from staff working in individual sections.
3. Discussions on career structure and employment opportunities, with an emphasis on what the organisation is looking for in graduate recruits.

The nature of presentations varies between organisations; in some they have a very commercial focus, whereas others take the form of a series of research seminars.

Students are required to write a full report on at least one organisation visited and in some years they compare two. They work in small groups which encourages interaction between students during and after visits. The assessment prompts appropriate and critical questioning during the visit.

We and the students believe that this contact with companies benefits under graduates because:

- It gives them an awareness of the commercial/real world context of their subject and introduces them to relevant issues they would otherwise not address e.g. patenting
- It identifies careers they would like to follow and, just as importantly, those which they definitely would not.
- It improves their readiness for gaining employment for example, in writing applications and CVs in which they are able to incorporate the commercial awareness derived from the site visits.

The University benefits through:

- Fostering valuable links with industry
- Improving up-to-date programme and module design
- Providing materials and real-world examples which we use in our teaching

The organisations visited benefit by:

- Meeting the next generation of graduates
- Influencing the education of potential employees

### Resource Implications

This course is inexpensive compared with most field courses; the visits are free and the small domestic costs are met by the students supplemented by the hospitality of the companies. The cost to the University is limited, arising mainly from transport costs (2 minibuses + fuel etc.). Staff availability is not a problem as the trip takes place outside the formal teaching period.

### Student Assessment

The assessed component of the course is a 1500-2000 word report. As well as information gathered during the visit, students are expected to scrutinise company reports, web pages etc. The results of the assessment have always been successful. Although the quality of report varies, the objectives associated

with the course have been met by all students. The best reports have been of an extremely high standard as confirmed by external examiner scrutiny.

Students are also required to submit an overall evaluation of the company visits and of the whole trip both of which have always been favourable, even if in some cases they have come to realise that certain careers are 'not for them'. The following closing comment is typical:

*“Overall I found the field course to be a very valuable experience. It gave me a good insight into plant industries and I learned many things I did not appreciate before. For example, I did not realise there were so many stages in the development of a single agrochemical and I was not aware of the cost and complexity of patents. The course has given me ideas of the kind of career that I would like to follow.”*

## Evaluation

### Strengths

- Broadens student experience by exposing them to a range of commercial and research perspectives.
- Fosters good group cohesion at the start of their final year and promotes good staff-student relations.
- Provides materials and case studies to use in a range of teaching.
- Develops good liaison between the university and industry which in turn contributes to curriculum design and validation; generates student projects and placement opportunities, career fairs, prizes, etc..
- Raises the profile of the University of Plymouth in the marketplace.

### Weaknesses

- Travel: About 800 miles in three days.
- Intensity: we cover a lot of information and issues. In its original form the course ran for 5 days, which gave more time for reflection and socialising but suffered the information overload problems referred to above.
- Financial burden on students: both in terms of cost and in restricting the period students can work over the summer.

## Key Advice

### Do

- Plan early and thoroughly.
- Be aware of company sensitivity e.g. confidentiality.
- Brief students thoroughly on acceptable behaviour and also to ensure they get the maximum benefit from each visit.

### Don't

- Take too many students (20 - 30 max).

## CASE STUDY iv

### **A Course for Industry Taught by Industry: the Plymouth Shallow Water Swathe Sounding Programme**

#### **Authors**

K M Miller and V J Abbott

Institute of Marine Studies, University of Plymouth,

Drake Circus, Plymouth, PL4 8AA.

email: kmiller@plymouth.ac.uk; vabbott@plymouth.ac.uk

#### **Keywords**

Hydrography, Royal Navy, Short Course, Industrial Practitioners.

#### **Outline**

This case study describes a short course taught almost entirely by industrial practitioners and summarises the strategy adopted to provide industrial support to an academic programme for a short intensive period. In making the course suitable for industrial attendance, such a programme can be resourced with modern technology at no cost to the academic institution. There are significant benefits to be gained by both industry and the university from collaboration in this way, but a tight reign needs to be maintained by the academic organising body.

#### **Context**

The course was developed as a vocational programme, an enhancement to existing academic programmes run independently by the Institute of Marine Studies and the Royal Navy. The intention was to educate staff, students and industrialists on the application of modern technology in the field. The course was therefore not credit rated, but from the University perspective served as a means of integrating the information provided under various credit rated modules on an MSc programme in hydrography. The students saw various elements coming together in an industrial application which improved their understanding of the material delivered under their MSc course. Delegates from industry were also able to obtain an understanding of the operation, application and quality of data acquired by modern swathe sounding systems.

#### **Aims and Objectives**

Swathe sounding is a modern technique that is used for acquiring spatial sea bed data. Traditionally, it would form the basis for charting; today many other applications such as siting offshore structures, pipelines or cables rely on data from this source. Swathe systems are taking over from echo sounders; they are more sophisticated and acquire much more data to provide complete coverage of the sea bed. There are at least five manufacturers who are placing systems on the market. They use different methods of operation and require precision in their installation and calibration procedures. The data that is acquired needs adjustment and finally extensive processing is required to give a useful end product.

The aim was to provide a one week short course for MSc Hydrography students and anybody from industry who has a requirement for the use of swathe systems or the data obtained from their use.

This was not a training programme on use of the equipment, but an overview of systems, techniques and procedures. In an industrial context it is designed for a client's representative who may be charged with the task of quality assurance of a swathe sounding survey, or an oil company representative who may be given a chart which has been produced from data acquired by a swathe system. Being a new technology, the market exists for a short course to assist existing staff and bring them up to date, it would then be classified as continuing professional development (CPD) for members of relevant professional bodies. In order to meet this aim, the course should have a minimum amount of underlying theory, and any theoretical content must be directly relevant to the application. The lectures were designed to concentrate on good survey practice and identify appropriate survey procedures. The best people to address these issues are not academic staff, but those who manufacture and use swathe systems every day in their work.

With the exception of an introductory lecture, the course was therefore taught entirely by industrial practitioners. Staff from the University of Plymouth and the Hydrographic Training School at HMS Drake acted as an organising body to provide the programme and their establishments provided some of the resources required to run the programme. It became a vocational course for industry, taught by industry. Industry sponsored extra curricula activities including an evening out for the delegates. One company arrived unexpectedly wanting to demonstrate their equipment, which is an ancillary but essential component to swathe sounding operation, and time was duly made available. These examples show the interest which exists in such events and the resources which are available for the University to access at no cost and with mutual benefit.

## Description

The course includes five half-day lecture sessions covering:

- Introduction to swathe systems - delivered by an academic.
- Swathe systems theory - delivered by a manufacturer.
- Swathe systems in practice - delivered by two different manufacturers.
- Quality control of swathe data - delivered by an industrial practitioner who specialises in quality control of the data and would normally act as a client's representative in the field. The company produces specialist software which assess data and identifies systematic errors in the acquisition process as a result.
- Independent overview of installation and operation of swathe systems - delivered by a senior surveyor from a survey company who has experience of operating a variety of swathe systems in the field and processing the data acquired.
- In addition to the lectures, three afternoon practical sessions afloat with three boats operating simultaneously. These sessions were run by three different manufacturers who then had the opportunity to demonstrate their systems to the delegates. Systems were selected such that each of the three systems provided used a different method of operation.

## Resource Implications

The staff load was reduced to administration and distributed amongst three staff from the University and two from HMS Drake. The exception was the introductory lecture, which would have been given to the

students by that member of staff anyway. As a whole, staff lecturing time was reduced as a consequence of the course. Three boats were provided, two from Drake and one by the University; the University also provided a lecture room. While speakers and demonstrators were offered remuneration for their time, only one participant made a full claim. Others made some small claim towards accommodation and travel: they were prepared to give their time for the possible return in services or sales.

### **Student Assessment**

There was no assessment.

### **Evaluation**

All parties can benefit from this approach which:

- Provides a considerable enhancement to the post-graduate experience, enabling students to meet industrial delegates and allows costs to be offset by selling extra capacity to industry.
- Enables staff involved in teaching to be kept up-to-date with industrial developments.
- Reduces the danger in modular programmes of the curriculum becoming disjointed. A short industrial course can bring in material from various modules together to give an integrated overall picture.
- Provides professionals with an opportunity to update their knowledge.
- Provides companies with a keen audience for the demonstration of their equipment.

However, there are some disadvantages:

- In using industry to provide systems and material, the timing of the course needs to suit their schedule and also to fit appropriately with the academic programme;
- Industrial pressures can lead to prospective presenters withdrawing at a late stage;
- The presentation skills of some of the industrial presenters are unknown;
- Where boat work is involved, the practical sessions are dependent on the weather.

### **Key Advice**

#### **Do**

- Define the content of each lecture carefully. Lecture sessions must give unbiased information; the practical sessions are for manufacturers to sell their product;
- Give due consideration to the industrial potential of the course and target the correct audience with the marketing.

#### **Don't**

- Expect everything to run smoothly, but build flexibility into the programme and make contingency plans;
- Feel that you have to obtain credit rating for the course, in spite of pressure that may be applied.

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## CASE STUDY v

### A Module in Work-Based Learning

#### Author

Brian Chalkley  
Department of Geographical Sciences  
University of Plymouth, Drake Circus, Plymouth PL4 8AA  
email: bchalkley@plymouth.ac.uk

#### Keywords

Placement, module, project, work experience.

#### Outline

The Department of Geographical Sciences at the University of Plymouth has for the last three years offered Work-based Learning (WBL) as an optional, credit-weighted module for Stage Two (second year) students taking its BSc (Hons.) Geography degree. The student experience has been successful and ways have been identified of running the module which do not make excessive demands on the time of academic staff.

#### Context

Recognising the need to develop further its employer links, in 1996 the University of Plymouth developed and approved a policy on work-based learning modules in degree programmes. This policy provided a framework which was designed to promote and encourage the introduction of work-based learning modules and to offer guidance to degree programmes which might be contemplating steps in this direction. Geography and Sociology were the two pilot disciplines and more recently several other disciplines have also announced their intention to introduce work-based learning in line with the University model.

#### Aims and objectives

The University framework document identifies a variety of possible aims for Work-based Learning modules including, for example, the encouragement of student autonomy and the building of bridges between higher education and the world of work. The two main aims specified for the Geography module are as follows:

- To allow students to apply their geographical knowledge and expertise in a professional setting.
- To provide insights into the world of work and enhance student employability.

#### Description

This module involves the student in either 10/12 or 20/24 days of work, depending on whether they take the 10 or 20 credit version. The timing of these days can be flexible and is scheduled to avoid clashes with other academic commitments. The WBL centrepiece is a programme of work (typically a small project) which is undertaken by the student for the host and with guidance from an academic member of staff.

The work programme is negotiated at the outset by the student at a meeting with the host and the academic advisor and it is summarised in a document called the Learning Agreement which all three parties sign. For the Geography modules, typical hosts have included the Environment Agency, Dartmoor and Exmoor National Parks, a waste disposal organisation, local schools, local authority planning departments and voluntary organisations working in the environmental field. A principal benefit to the host is, of course, the 'free' production of a report on a topic in which they have a particular interest. Potentially suitable hosts have been identified through a range of sources including academic staff, the University's Careers Service, the University's Educational Development Services Unit (EDS) and the students themselves. The module has been offered on an optional basis and has been heavily oversubscribed with student demand substantially exceeding the number of placements available. The students have been selected on the basis of their past academic record, their CV and letter of application and on their performance at a selection interview. This process is designed to mirror standard job application procedures. At the end of the module, the students' work is normally assessed on the basis of their project report and a personal written statement in which they outline what they feel they have accomplished and learned through taking the WBL module.

### Resource implications

The module has been run with seven students (in the pilot year) and more recently with totals of 13 and 20. The resource implications for the department have been reduced by using local hosts, minimising the number of meetings (using telephone and e-mail instead) and by obtaining support from EDS and the Careers Service (who provide pre-placement, preparatory workshops for the WBL students). By these kinds of measures, departments need not find WBL prohibitively expensive.

### Student assessment

The students' reports and personal statements have generally been of a good standard and about half have achieved upper-second class marks, with one first. The marks are decided by the academic advisor, having taken into account the views and insights offered by the host.

### Evaluation

The hosts have been pleased by the standard of the students' work and the student feedback on the WBL module has also generally been positive. Most have found it a much more interesting exercise than taking another lecture or practical-based module. However, the quality of the experience has varied between placement organisations and some students projects have involved too much time in the field or library and not enough with the host.

### Key advice

- Start with a small-scale pilot and with hosts you already know.
- You may wish not to select students whose work or attitude could lead to disappointed hosts.
- Non-academics are unfamiliar with degree-level assessment standards. Discuss the students' work with the host but retain with academics the final authority for marks.

## CASE STUDY vi

### *The Broadland Case Study - The Upper Waveney Valley Sustainable Development Project*

#### Authors

Jennifer Blumhof, Hertfordshire Integrated Learning Project's Core team:

Marianne Hall, Andrew Honeybone, Sharon Korek.

With the help of: The Broads Authority, Dr Agneta Burton, University of Hertfordshire and Kate Leese - placement student.

The Hertfordshire Integrated Learning Project,

Department of Environmental Sciences,

University of Hertfordshire.

email: J. R.Blumhof@herts.ac.uk or HILP@herts.ac.uk

Website; <http://www.cs.herts.ac.uk/hilp/>

#### Keywords

Graduate Skills; Transdisciplinary; Environmental studies; Broads Authority

Problem-based case studies

#### Outline

This case study was developed by the Hertfordshire Integrated Learning Project (HILP). HILP is a project involving a consortium of academic departments at the University of Hertfordshire and is resourced through HEFCE's Fund for the Development of Teaching and Learning (FDTL). The project's focus is on the integration of skills development with academic content, through transdisciplinary problem-based case studies suitable for a wide range of disciplinary applications.

#### Context

The Broadland Case Study has been designed to be transdisciplinary in nature and the list below shows the different disciplines that have used it, focusing on their particular disciplinary context and skills interests. The detail of this document, however, describes the work undertaken by the Environmental Studies students.

<b>Degree Programme</b>	<b>Level</b>	<b>Module</b>	<b>No. of students</b>
Environmental Studies	2nd	Global Change	65
Law	1st	Legal methods	20
Music	1st	Introduction to Sonic Arts	20
Business Management	1st	Geography: Travel and Tourism	37

## Aims and Objectives

The Broadland Case Study aims to help students develop an understanding of:

- sustainable tourism development as a major global trend
- sustainable tourism development at a local level
- planning in National Parks
- ecology/nature conservation in a wetland environment

The Case Study also helps to develop the following 'Graduate' skills:

- information gathering
- presenting
- synthesising
- self & peer assessment
- adopting an interdisciplinary approach

## Description

The Broadland Case study is a 'real world' 'real time' exercise, based around the Broads Authority's Upper Waveney Valley Sustainable Development Project. This has as its goal the development of sustainable recreational, educational and economic activities in an environmentally sensitive and economically depressed part of Broadland. The case study was developed in close collaboration with the Broads Authority who supplied support material, an introductory lecture (which was videoed) and on-site assistance. The Broads Authority were interested in developing the collaboration as it not only offered them other useable perspectives on local issues but also brought a wider range of students into contact with the work of the Broads Authority. This contact builds on the long standing collaborative arrangements that the university department has had with the Broads Authority covering teaching, research and placements. The link is particularly valuable as the Broads Authority is a good example of the type of organisation offering employment to Environmental Science graduates.

The case study ran over seven weeks with an average of two hours of class time per week and an all day field visit. Students were expected to spend some of their private study time to review the resources provided, collect new material and prepare posters. The case study was problem-driven and assignment-driven. The problem posed for students was 'How can your site in the Upper Waveney Valley be sustainably developed for tourism and recreation?' Students worked in groups of four and were required to prepare and present a poster, incorporating a site specific plan, detailing proposals and constraints for sustainable development. The field visit was jointly organised by Environmental Sciences staff and the Broads Authority. Students were introduced to the case study area and allowed time to reconnoiter their particular assignment site with Broads Authority officers.

The class work was based on introductory framework lectures outlining the structure and content of the case study, interspersed with skills workshops to support the development of certain graduate skills required for the completion of the assignment (i.e. information gathering, synthesising, and adopting an interdisciplinary approach). A surgery session was scheduled during the fifth week for students needing help with their work.

The poster presentation session was designed to enable students to practise the skill of self and peer assessment. Using the assessment criteria sheet provided, each group of students allocated a mark to

their own and others' posters. Each poster was given a final group mark based partly on staff marking and partly on peer group assessment. Each group of students then decided on how their group mark should be divided up between the individual members, to reflect the value or contribution made by each member of the group.

The method of assessment detailed above has proved to be a particularly successful element of the exercise, as it provides a method for dealing with some of the problems associated with the allocation of group work marks. This exercise builds upon teamwork workshops developed in an earlier course. The Broads Authority officers were invited to participate in the poster presentation marking process but pressure of work made this unfeasible for them so the posters were sent to them for comment.

### Resource Implications

As with all case studies, initial development is heavily frontloaded in terms of time and resources but a shelf-life of at least 3 years together with use by students from several disciplines helps to make it cost-effective.

We also envisage that the information base of the transdisciplinary case study will be augmented by feeding in selected course work from students in each discipline participating in the case study, resulting in a rich resource benefiting staff and students.

Resources developed included:

- A student information pack containing details of the case study, timetable, guidelines for poster production, assessment criteria and a project brief prepared by the Broads Authority.
- a video of a lecture given by Broads Authority Officers to Law students at the University.
- a Broadland Reader and a Sustainable Development Reader (produced by HILP).
- skills workshops.

### Student Assessment

Most students appeared to be well motivated and engaged positively in the skills workshops. The students' posters have been of high quality, demonstrating both their academic grasp of the interdisciplinary problem and their skills development.

### Evaluation

Student evaluation:

- Students were required to complete a self-evaluation sheet, designed in two sections: a pre- and post-testing exercise, where students were asked to assess their level of ability in five specific skills at the beginning and at the end of the case study. This provided an opportunity to reflect on how their skills development was affected by taking part in the case study (i.e. what went well, what didn't go well and proposals for improvement).
- The biggest positive change in students' skills development occurred in the skills of 'adopting an interdisciplinary approach' and 'self & peer assessment'.

- Many students commented on the success of their group work, although others were less satisfied with the organisation and effort of their particular group.
- Many students treated the second part of the self-evaluation sheet as course evaluation feedback, giving negative comments regarding time constraints on the field visit and making suggestions for reorganisation.

Staff evaluation:

- In order to accommodate the high number of students involved (i.e. 65 Environmental Studies students), organising the skills workshops and the field visit needed careful planning.
- Staff collaboration with the Broads Authority officers to develop the case study was stimulating and rewarding but arranging meetings and field visits to fit in with the work commitments of students, academics and collaborators was difficult.
- The case study provides scope for the development of a range of graduate skills.
- Students were not altogether clear about the purpose of the self-evaluation sheet.

### Key Advice

#### Do

- Be aware of heavy resource implications for the first run.
- Foster a good relationship with employers to enable real joint ownership of the case study.
- Offer collaborators return resources (e.g. we sent a copy of the Broadland Reader to the Broads Authority officers).
- Strike a good balance between academic content and skills work.

#### Don't

- Abuse the employer's goodwill (e.g. after the field visit, we asked students to limit their contact with the Broads Authority officers to one email request per group).

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## CASE STUDY vii

### *A Joint Industry/University Field Course in Exploration Geophysics*

#### Author

Dr. Ian Hill  
Geology Department, Leicester University,  
email: iah@le.ac.uk

#### Keywords

Field course; Geophysics; Exploration; Industry

#### Outline

Students studying the undergraduate degree in geophysics have an extended field course in exploration geophysics which aims to simulate a complete exploration exercise. A geological problem is identified, then the geophysical surveys are planned, executed and interpreted. A final report is produced concluding with the resolution, as far as possible, of the original geological problem. While it is perfectly possible to achieve these ends as a completely self-contained academic exercise, collaboration with commercial companies carries a huge benefit.

The students become highly motivated by the realisation that they are working on a problem with an unknown solution which has commercial importance. Contact with working geoscientists, both formally and informally, provides them with a unique view of the lifestyles and pressures of possible future careers. Additionally, the commercial company will benefit by receiving data it would otherwise not collect, and having an opportunity to gain a detailed knowledge of potential recruits for the following year. They recognise this by contributing to the costs of the exercise. This results in a longer field course, with enhanced logistic support, in more exotic locations, whilst reducing the fieldwork cost to students. Where possible, students also have a tour of mining or mineral processing plants relevant to that mining operation.

Over the past five years we have run courses of up to 4 weeks in duration to Eastern Europe and Cyprus. There are a number of tensions between the objectives of the commercial partners and ourselves, but once these are solved the exercise can be a great success.

#### Context

The field course is held in the summer preceding the final year of the Geophysics undergraduate degree. Formally it is a 10-credit module of the final year of the degree. The module produces a pass/fail result, with no numerical mark contributing to the final degree mark. The cohort involved usually consists of 10 to 15 students. They have already studied taught modules in:

- The fundamentals of the exploration geophysics techniques.
- The background physical and mathematical theory.

They have previous fieldwork experience in:

- Staff-led geological field courses.
- Independent field geological mapping and report presentation.
- Local one-day geophysical field survey exercises.

## Aims and Objectives

### Aims

- To provide the student with a field experience which integrates and extends their existing knowledge of field geophysics, and provides insight into the practical aspects of planning and performing geophysical surveys within the context of a large-scale geological exploration exercise. Ideally this should also be carried out in a challenging environment, particularly with respect to climatic conditions, local language, and time constraints.

**Objectives:** The students will develop the skills to:

- Design a geophysical survey to address a specific geological problem.
- Design suitable quality assurance (repeat readings, error analysis, ties to outcrop and boreholes, links to other interpreted data etc.).
- Perform a hazard assessment and build a survey plan incorporating safety briefings and precautions. Be aware of MedEvac plans.
- Lead a field party, including liaison with surveyors, geologists and unskilled labourers.
- Conduct the survey, including the tasks of instrument operation and care, data recording, data reduction, initial interpretation.
- Document their actions and conclusions, and communicate them to other field parties and the field leaders.
- Present the key aspects of the survey and its geological interpretation to interested geologists.

### Description

Typically the field course is organised in July each year, and the planning cycle takes about 15 months.

- **July** the list of possibilities for the following Summer is drawn up by the appointed leader, who will make initial approaches to external bodies who may be involved, typically a commercial company and/or a geological survey (usually both).
- **September** The first choice field area is identified, approved within the department by the geophysics group, along with an outline budget. A reserve location is also similarly planned. At the start of term students are informed or the outlines of both the primary and reserve field areas.
- **January** Commercial companies do not tend to commit to field programmes until April, but for our own planning, particularly in avoiding cancellation fees for logistic arrangements for the reserve location, we need to make an assumption about the course location at this stage. Initial preparations for logistics, rental/loan of equipment, and a detailed budget are prepared.

- **February** Students are informed of the progress of arrangements and set tasks to prepare an extended essay and a seminar presentation on an aspect of the geology of the survey area.
- **April** The collaborator confirms the commitment to the course. Logistic bookings are confirmed. Students are issued with an information pack concerning dates, travel arrangements, health precautions, costs. This is normally done on a single day, also dedicated to the students successively giving their presentations on the geology of the area.
- **May** Students are little involved due to examination revision. Technical preparations continue with the checking of equipment, preparation of packing and customs lists.
- **June** After the examinations are completed, but before the equipment is packed, the students have a field day of geophysics locally to familiarise themselves with the equipment to be used.
- **July** The Field course itself. The field party would typically be 10-15 students, one academic staff (lecturer), two experimental officers, one or two research student demonstrators. Usually about 1 tonne of geophysical equipment valued at £250k is transported to the field area.
- **August** Preparation of summary reports by the field leader for the university internally, and for the collaborating bodies.
- **September** Report back to the geophysics group at the meeting to agree the selection of the areas for the following year.

### Resource Implications

The financial implications for the university are broadly neutral, compared to a non-collaborative field course. However, much more staff time is committed, principally due to the liaison and logistic arrangements made in the planning schedule as above, and the final reporting stage. The field course duration is normally extended to 3 or 3.5 weeks instead of 2 weeks.

Commercial companies generally pay for all equipment transport, and all logistic and subsistence costs in the field area. They also provide field assistants, and surveyors. Usually the local company geologist/geophysicist will be closely involved with the planning of the survey and the progress made during the field course. Where possible, students will report interim results and discuss modifications to the survey plans with him.

Students normally receive an extended field course with little or no financial contribution required from themselves.

### Student Assessment

Students are highly motivated by these courses, and enjoy them. The usual replies to our standard questionnaires include comments about never having worked so hard in their lives, and never having enjoyed it so much. They like working on 'real' problems.

Students appreciate the broad objectives of the course, and its contribution as a foundation to their final year studies. The fact that it contributes no numerical mark to the final degree assessment has never been an issue.

Students typically work 6-7 hours in the field each day, with 2-3 hours data processing and analysis in the evenings. One rest day per week is allowed, when some cultural excursion is planned.

## Evaluation

We regard these collaborative courses as a highly desirable educational experience for our students, and are prepared to support them with the considerable extra staff time involved, which may amount to as much as 1 man-month, in addition to the actual time spent in the field. Thus, the workload for academic staff leaders is considerably larger than for a non-collaborative field course.

The interaction with industry may spawn other contacts and research opportunities which provide a longer-term payback for the initial outlay of staff time.

Industrial partners realise that they can receive a geophysical survey and effectively the consultancy services of our academic staff for a very small cost, but must accept that the productivity will be, and the data quality may be, lower than for a commercial survey.

## Key Advice

Liaison with the partner organisation must be very close. Each party must be very clear about what its contribution and returns will be.

### **The survey objectives and field area must provide:**

1. A defined geological objective to be achieved, using a variety of geophysical methods most of; magnetic, gravity, EM, Electrical, seismic).
2. Geological control to constrain and validate interpretations.
3. Relatively easy ground conditions so that minimum time is lost in logistics compared to the useful geophysics.
4. Time to let the students make mistakes, realise them and correct them.

## CASE STUDY viii

### **An Earth Sciences Guest Lecture Programme**

#### **Author**

John C. Cripps  
Department of Earth Sciences  
University of Sheffield, Dainton Building,  
Brookhill, Sheffield S3 7HF  
email: j.c.cripps@Sheffield.ac.uk

#### **Keywords**

Earth sciences, Environmental issues, Careers.

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## Outline

This is a guest lecture programme available to undergraduates, postgraduates and staff. Postgraduate students may take a research training module which includes attendance at these lectures.

## Context

The lectures are advertised in the Department, cognate Departments and widely in the University. Apart from postgraduates who elect to take Current Issues in Earth Sciences as part of their compulsory research training programme (RTP), they are not compulsory. Most lectures are attended by third level students, staff and postgraduates. The lectures usually attract between about 15 and 50 people, depending on the topic.

## Aims and objectives

The aims are as follows:

- To enhance the material in taught modules.
- To show the relevance of earth sciences to a variety of environmental issues.
- To promote an appreciation of transferable skills.
- To promote discussion of earth science and environmental issues.

Not all these aims are addressed in every lecture. Post graduates taking the RTP module also practise their oral presentation skills and receive feed-back on these and their written report.

In terms of objectives, the programme is intended to:

- Demonstrate the importance of geological information and geological techniques of investigation, analysis and interpretation
- Provide information about career options and professional development.
- Supplement, show the relevance of and extend the content of modules.

## Description

Current issues in Earth Sciences are explored by arranging a programme of about five guest lectures with discussion (each lasting one hour) linked to the undergraduate teaching programme. The lectures are attended by the whole Department, including undergraduates from all three years, staff and postgraduates. The topics addressed are chosen to be relevant to popular, level-three modules, and are given in the same semester as the relevant module. The speakers are asked to give general subject-based talks or to relate geology to environmental issues and careers in the earth sciences. The lectures include discussion. The lectures are not compulsory but it is made clear to students that information relevant to the taught course may be included and this should be regarded as part of the out-of-class study connected with modules. The more general talks tend to be more popular with level one and two undergraduates compared with topics more closely orientated towards a particular module. The programme is changed each year with a return period for a particular lecture of at least three years.

Speakers are invited from industry, the British Geological Survey, Environment Agency, other academic institutions etc. They are asked to bear in mind the mixed nature of the audience when preparing and presenting their talks. To maximise the attendance, the lectures are held in the late morning or at lunch time. It has not been possible to allocate one slot in the timetable when all potential participants will be available. Times when students taking the linked module have other commitments are not selected and care is taken to avoid clashing with times when other potential participants have timetabled classes.

First or second year post-graduates undertaking RTP attend these lectures (a series of research seminars given by staff, postgraduates and external speakers) and present a seminar themselves. To gain credits for the course, students submit a report on the lecture and seminar, including the discussion of their own seminar. Although, primarily aimed at earth sciences students, the course is available University wide.

### Resource Implications

The main costs are a lunch for guests and a couple of colleagues and travelling expenses. The coordinator has to spend a few hours per semester arranging the programme and ensuring publicity for the individual lectures. The latter requires some input from secretarial staff. I attempt to invite people from nearby to minimise travelling and time commitments, so seldom is the cost of travel greater than £30 and the lunch costs about £15 to £20. Some lectures are given by people who are visiting the Department for other purposes and the opportunity is taken in many cases to engage visitors in useful joint research activities or discussions with staff.

### Student Assessment

The guest lecture programme is not formally assessed, but it is satisfying to see these lectures referred to in examination answers and project work. The RTP module is assessed by means of the report prepared by the student. The performance of students doing the module has been satisfactory and it has provided useful feed-back to students on oral and written presentation skills.

### Evaluation

As the guest lectures are non-compulsory and not part of the modular programme, they are not evaluated by the formal student questionnaire used for taught modules. Informal feedback has been very encouraging, although this does depend on the topic of the talk and the presentation skills and level of enthusiasm displayed by the lecturer concerned. Formal evaluation of the RTP module is by questionnaire. The reaction has been mixed with some students being excited by the variety of topics covered, while others have been frustrated by the lack of relevance in some of the lectures to their particular research topic.

### Key advice

Great care has to be taken with the selection of the speakers, as it is essential that they have good presentational skills and pitch the lecture at a suitable level. This is not an easy task, particularly for people from industry. I have found it helpful to use titles that emphasise the relevance of the lecture to particular aspects of modules or topics of popular interest (e.g. dinosaurs or volcanoes). I include female speakers and draw attention to the scope for careers in the environmental earth sciences. The lectures have to be well publicised with posters and announcements in lectures. Discussion is an important part of the lectures, as this typically involves staff, students and people from other Departments; sufficient time must be allowed for this.

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## APPENDIX A

### List of survey participants (See Section 4)

#### by alphabetical order of institutions

We are grateful to the following individuals who responded to our employer-links survey:

D. Green	<b>Anglia Polytechnic University</b> , Chemistry/Geology.
D. Reynolds	<b>Bath</b> Biosciences.
N. Brown	<b>Birmingham</b> , Biological Sciences.
A. Sloman	<b>Birmingham</b> , Computer Science.
P. Daniels	<b>Birmingham</b> , Geography.
T. Baker	<b>Bradford</b> , Biomedical Sciences.
D. Cotton	<b>Bradford</b> , Environmental Sciences.
M. French	<b>Bradford</b> , Environmental Science
P. James	<b>Bristol</b> , Chemistry.
M. Headley	<b>Bristol</b> , Physiology.
R. Paul	<b>Brunel</b> , Computer Science.
K. Atkinson	<b>Exeter</b> , Camborne School of Mines
H. Jones	<b>Cambridge</b> , Chemistry.
I.N. McCave	<b>Cambridge</b> , Earth Sciences.
V. Forbes	<b>Cambridge</b> , Geography.
O'Connor	<b>Coventry</b> , Natural & Environmental sciences.
N. Jenkins	<b>De Montford University</b> , Applied Biology.
P. Craig	<b>De Montford University</b> , Chemistry.
A. Watson	<b>Dundee</b> , Mathematics.
D. Parker	<b>Durham</b> , Chemistry.
A. Blanchflower	<b>UEA</b> , Environmental sciences.
I. Nimmo	<b>Edinburgh</b> , Biochemistry.
S. van Heyningen	<b>Edinburgh</b> , Biology
B. Gittings	<b>Edinburgh</b> , Geography.
R. Scrutton	<b>Edinburgh</b> , Geology & geophysics.
K. Stead	<b>Exeter</b> , Chemistry.
A. Cooper	<b>Glasgow</b> , Biophysical Chemistry.
E. Metcalfe	<b>Greenwich</b> , Biological & Chemical sciences.
M. Gibbon	<b>Greenwich</b> , Earth Sciences.
B. Austin	<b>Heriot-Watt</b> , Biology.
A. Welch	<b>Heriot-Watt</b> , Chemistry.
F. Priest	<b>Heriot-Watt</b> , Biological & Environmental Science.
R. Slater	<b>Hertfordshire</b> , Biosciences
D. Hoole	<b>Keele</b> , Biological sciences
S. Smith	<b>Kings College London</b> , Life Sciences
G. Robinson	<b>Kingston University</b> , Geography

R. Manly	<b>Kingston University</b> , life sciences.
R. Jones	<b>Lancaster</b> , Biological sciences.
P. Bates	<b>Lancashire</b> , Computing.
G. Chapman	<b>Lancaster</b> , Geography.
B. Duncan	<b>Leeds</b> , Microbiology.
S. Mobbs	<b>Leeds</b> , Environmental Sciences.
I. Hill	<b>Leicester</b> , Geology.
A. Millington	<b>Leicester</b> , Geography.
P. Cullis	<b>Leicester</b> , Chemistry.
R. Hartnoll	<b>Liverpool</b> , Marine biology.
P. Bentham	<b>Liverpool</b> , Chemistry.
D. Collins	<b>London - Queen Mary &amp; Westfield</b> , Mathematical Sciences.
K. Roberts	<b>London - Royal Holloway</b> , Geography.
T.A. Watt	<b>London - Wye College</b> , Environmental Dept.
M. Worthington	<b>London</b> , Environmental Technology.
R. Hearing	<b>Luton</b> , Electronics and mathematics.
T. Looker	<b>Manchester Metropolitan</b> , Biology.
J. Lloyd	<b>Newcastle</b> , Computing science.
D. Buswell	<b>Northumbria and Newcastle</b> , Geography and the environment.
B. Perkins	<b>Nottingham</b> , Food Microbiology.
D. Ebdon	<b>Nottingham</b> , Geography.
E. Moore	<b>Open University</b> , Chemistry.
M. Godley	<b>Oxford Brookes</b> , Construction & Earth Sciences
C. MacDonald	<b>Paisley</b> , Biological sciences.
J. Mann	<b>Reading</b> , Chemistry.
J. Strachan	<b>University of St. Andrews</b> , Chemistry.
M. Holcombe	<b>Sheffield</b> , Computer Science.
J. Cripps	<b>Sheffield</b> , Earth Sciences.
D.J. Sanderson	<b>Southampton</b> , Geology.
J. Tebby	<b>Staffordshire</b> , Chemistry.
D. Roberts	<b>Staffordshire</b> , Geology.
D. McLusky	<b>Stirling</b> , Biological & Molecular Science.
H. Kirkpatrick	<b>Stirling</b> , Environmental science.
G. Jones	<b>Strathclyde</b> , Geography.
A. Doig	<b>UMIST</b> , Biomolecular Science.
I. Laidlaw	<b>University of Wales</b> , Geography and Earth Sciences.
R. Whittenby	<b>University of Warwick</b> , Biological Sciences.

We acknowledge and thank the following careers advisers who responded to an E-mail survey of HE careers services: A. Barnshaw, Durham; J. Eglin, UEL; P. Crawford, Stirling; S. Hughes, Swansea and S. Doug, Westminster. Although our focus was on academic initiatives we recognise the many employer activities instigated by careers services in HEIs and thank them for their input.

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## THE SEED PROJECTS AND THEIR CONTACT DETAILS

**Project 1: A web based bibliographic database on Science teaching and learning, designed to support the information requirements of the SEED Projects.**

Nigel May, Science Faculty Team Co-ordinator,  
Tel: 01752 - 232318, E-mail: nmay@plymouth.ac.uk.

**Project 2: An investigation of the potential development of Curriculum Support Teams.**

Nigel May, Science Faculty Team Co-ordinator,  
Tel: 01752 - 232318, E-mail: nmay@plymouth.ac.uk.

**Project 3a: A handbook on field teaching in the Sciences.**

Colin Williams, Geological Sciences,  
Tel: 01752 - 233103, E-mail: cllwilliams@plymouth.ac.uk.

**Project 3b: Field discovery days.**

Colin Williams et al, Geological Sciences,  
Tel: 01752 - 233103, E-mail: cllwilliams@plymouth.ac.uk.

**Project 4: Fieldwork issues and developments.**

Les Ternan, Geographical Sciences,  
Tel: 01752 - 233060, E-mail: jternan@plymouth.ac.uk  
and Andy Elmes, SEED Programme,  
Tel: 01752 - 233532, E-mail: aelmes@plymouth.ac.uk.

**Project 5: A handbook on laboratory teaching.**

Les Jervis, Biological Sciences,  
Tel: 01752 - 232929, E-mail: ljervis@plymouth.ac.uk.

**Project 6: Peer assisted learning strategies (Supplemental Instruction) (P.A.L.S (S.I.)).**

Stuart Johnston, Educational Development Services,  
Tel: 01752 - 233317.

**Project 7: Development of a framework for the training and management of graduate teaching assistants.**

Rhona Sharpe, Educational Development Services,  
Tel: 01752 - 232346, E-mail: rsharpe@plymouth.ac.uk.

**Project 8: Development of a computer-aided learning package for environmental organic chemistry.**

Steve Rowland, Environmental Sciences,  
Tel: 01752 - 233013, E-mail: srowland@plymouth.ac.uk.

**Project 9: Environmental issues in the Mediterranean: a case study of the Maltese Islands.**

John Stainfield, Geographical Sciences,  
Tel: 01752 - 233069 - E-mail: jstainfield@plymouth.ac.uk.

**Project 10: Computer based assessment in science: a review of good practice.**

Dan Charman, Geographical Sciences,  
Tel: 01752 - 233058, E-mail: dcharman@plymouth.ac.uk  
and Andy Elmes, SEED Programme,  
Tel: 01752 - 233532, E-mail: aelmes@plymouth.ac.uk.

**Project 11: CAL and basic Science.**

Neil Witt, Institute of Marine Studies,  
Tel: 01752 - 232417, E-mail: nwitt@plymouth.ac.uk.

**Project 12: A handbook on employer-links in Science.**

Stuart Lane, Biological Sciences, Tel: 01752 - 232908,  
E-mail: slane@plymouth.ac.uk and Mandy Burns,  
Learning and Research Support Services,  
Tel: 01752 - 232255, E-mail: mburns@plymouth.ac.uk.

**Project 13: Using multimedia for providing feedback to students undertaking concurrent project-based practicals.**

Graham Bradley, Biological Sciences,  
Tel: 01752 232934, E-mail: gbradley@plymouth.ac.uk and  
David Gaudie, Biological Sciences,  
Tel: 01752 - 232945, E-mail: dgaudie@plymouth.ac.uk.

**Project 14: An environmental data base for projects in environmental impact assessment (EIA) and conservation.**

Andrew Williams, Geographical Sciences,  
Tel: 01752 - 233059, E-mail: awilliams@plymouth.ac.uk.

**Project 15: Webkit - a toolkit to produce interactive web pages in support of CAL.**

Kevin Rowley, School of Computing,  
Tel: 01752 - 232621, E-mail: krowley@plymouth.ac.uk.

**Project 16: Qualifications update in applied Science for industry (QUSI).**

Mike Lister, Cornwall College,  
Tel: 01209 - 712911, E-mail: m.lister@cornwall.ac.uk.

**Project 17: Baseline assessment of competencies and skills for Science and Computing.**

Dave Croot, Geographical Sciences,  
Tel: 01752 - 233070, E-mail: dcroot@plymouth.ac.uk and  
Stanley Oldfield, School of Computing,  
Tel: 01752 - 232552, E-mail: soldfield@plymouth.ac.uk.



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### **The SEED Programme**

Faculty of Science  
University of Plymouth  
Drake Circus  
Plymouth PL4 8AA

Tel: 01752 233530  
Fax: 01752 233534

Programme Manager: Brian Chalkley  
e-mail: [bchalkley@plymouth.ac.uk](mailto:bchalkley@plymouth.ac.uk)

Programme Officer: Andrew Elmes  
e-mail: [aelmes@plymouth.ac.uk](mailto:aelmes@plymouth.ac.uk)

<http://www.science.plym.ac.uk/departments/seed/>