Teaching International Students (TIS)

An engineering perspective with a focus on group and project-based work

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Author biographies

Richard Dales is a consultant with RD Research Consultancy, a company he established in August 2010 to provide research support and solutions for projects in Higher Education (HE). Apart from the Higher Education Academy-funded 'Teaching International Students' project, other current projects include NHS West Midlands-funded 'End of Life' projects with Warwick and Coventry Universities. Richard's experience comes from 40 years in HE as an undergraduate; postgraduate; post-doctoral research fellow; lecturer; senior lecturer; business and research administrator; and consultant. In recent years Richard has been involved with a number of projects with the Higher Education Academy Engineering Subject Centre, most notably as a researcher on the Royal Academy of Engineering, DIUS/BIS-funded 'Engineers for Enterprise' project: Engineering Graduates for Industry (www.engsc.ac.uk/graduates-for-industry) and as co-ordinator of the HE Academy-funded employer engagement project 'Engage: Facilitating Dialogue between Employers and Engineering, Physical Sciences and Materials Academics in Higher Education' (www.engsc.ac.uk/engageconf/).

Andrew McLaren has a BEng and PhD in Materials from the University of Sheffield. He is currently Associate Dean for the Department of Mechanical Engineering, University of Strathclyde, Glasgow, Scotland and Director of Undergraduate Studies. Alongside being an Associate of the Engineering Subject Centre, Andrew is also involved in the CDIO initiative, with a particular interest in the teaching of design.

Simon Steiner is a Chartered Engineer and has a PhD in the area of manufacturing management and systems design. He gained both his first degree and Masters degree at Loughborough University, and subsequently worked for 10 years in the aerospace industry before moving into higher education – firstly at the then Coventry Polytechnic, and for the past 13 years at the University of Birmingham, where he continues as a Visiting Senior Lecturer. Simon joined the Engineering Subject Centre in 2004 and has responsibility for the Centre's programme of work with engineering departments and other academically related activities that include external examining, internationalisation and education for sustainable development.

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Note: Appendices 1 - 3 are available as a download at:
www.engsc.ac.uk/downloads/scholarart/TISresearchreport.pdf

An engineering perspective with a focus on group and project-based work

Executive summary

The study described in this report forms part of the Teaching International Students (TIS) Project being co-ordinated by the Higher Education Academy (HEA) along with the UK Council for International Student Affairs (UKCISA). The aim of the project is to recommend ways in which academic staff can enhance the learning of international students. Several HEA Subject Centres are involved with the project and this report details work by the Engineering Subject Centre, which has a focus on group and project-based working.

Higher Education Statistics Agency (HESA) data from 2008/9 was screened for those engineering schools and departments within UK universities that were identified as having recruited significant proportions of international students. Twelve universities were chosen from across the mission groups [see Table 1] and staff at a sample of 11 engineering units from within eight of these institutions were consulted [see Table 2]. The purpose of the consultation was to assess perceptions and activities in the teaching and support of international students and to assess factors in students' engagement in group and project-based working. The consultation with staff was undertaken through semi-structured interviews using a brief questionnaire [see Appendix A] that had been sent to interviewees in advance so that they had time to consider their responses. Transcripts of the interviews were written up as case studies and these are presented in the supplementary appendices [Appendices 1 to 3][1]. Analysis and extracts from the 11 case studies were used to distil information on current and possible future practices surrounding international students, particularly on the students' interactions with group and project-based work. The following conclusions and recommendations were derived.

Relating to staff:

International students on arrival

- Staff may not be fully aware of the intensity of the culture shock experienced by international students. Staff who are international themselves can help with this but academic staff overall may benefit from more tailored support to increase their awareness of issues and improve access to available tools.
- Initially language and communication difficulties may be prevalent among international students, occasionally compounded by regional UK accents among staff. This can lead to clique formation by students along national or common language lines. This can become a challenge both to staff and to peer students and requires prompt intervention. Academic staff practices should therefore be all-inclusive and should endeavour to treat all students within a peer group on an equal basis.
- The biggest barriers to cultural integration for pre-existing students, including other international students, is when there is direct entry of large cohorts of international students from a single geographical source into subsequent years of a degree programme. Efforts need to be made to support both the incoming cohort and the pre-existing students in these situations.
- The appreciation of cultural differences needs to be reciprocal from the outset and, if adopted, can form a positive basis for the benefit of all. Efforts should therefore be made to derive this mutual benefit from the cultural capital that is available in international classes, where all students are encouraged to learn with and from each other.

Group and project-based working

- Group formation can be challenging, and can give rise to unseen issues in cultural and intellectual perceptions amongst the students. Carefully considered methods of group

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[1] Appendices 1 to 3 are available as a download at www.engsc.ac.uk/downloads/scholarart/TISresearchreport.pdf

and leadership selection that are inclusive and seen as fair to all, as well as the use of peer assessment, can be beneficial in anticipating and addressing such issues.

- International students may not have had prior exposure to group and project-based working and may have difficulties appreciating and tackling open-ended problems (particularly in the areas of design, enterprise and entrepreneurship) and in engaging in role-plays. [Note: Some international students understand this deficiency and have consciously chosen tertiary education in the UK in order to gain this experience].

- Problems with communication can lead to initial tension in group work situations. For example, international students may be reticent and relegated to mundane tasks; UK students may interpret this as parasitism while, at the same time, international students may be dismissive of the mathematical ability and work ethic of UK students. These problems are often the hardest to manage and staff would benefit from more informed guidance and support on group formation and ongoing student mentoring and group supervision.

- Group and project-based working highlights the need for specific student skills in critical thinking and enquiry-based learning and their understanding of unfamiliar marking schemes. Whilst these issues are applicable to all students, staff might need to gain a fuller understanding of:

    o the different ways that critical thinking is understood and used in different cultures
    o the need to provide instruction in approaches to tackling enquiry-based learning
    o the need to provide fuller explanations of marking practices
    o the differential understanding for the submission of one's own work and related issues of plagiarism.

- All of these considerations may influence curriculum design in the future, possibly in terms of a more inclusive and student-supportive curriculum.

Ongoing support

- Group- and project-based working is challenging for all students and requires ongoing support from staff throughout. The detection of issues or difficulties needs to be at an early enough stage so that there can be effective remediation. Consideration should therefore be given to introducing peer assessment at an intermediate point in projects, along with practice and formative assessment opportunities.

Relating to students:

In-course

- Student-led sports clubs and societies can help with cultural integration. Discipline specific societies and staff/student liaison committees can help with academic integration.

On graduation

- Group and project-based working are an increasingly important aspect of engineering pedagogy, often seen as necessary for enhancing industrial readiness.
- In terms of their global competitiveness, international students may ultimately be at an advantage as they have already made their first global step. They may also feel and be more enabled to engage with global groupings such as Engineers Without Borders[2].

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[2] EWB-UK is an international development organisation that offers programmes which provide opportunities for young people to learn about technology's role in tackling poverty. Supported by the EWB-UK community, student members work on projects around the globe – see www.ewb-uk.org/.

Relating to institutions:

Pre-arrival

- Universities recruit from around the globe and with differing engagements in each country (by agencies, by local offices, by staff visits) which can result in varied student perceptions of the institution prior to and immediately on their arrival.
- Universities may need to take more account of students' difficulties prior to arrival with regard to obtaining visas and satisfying entry requirements that can then lead to a delay in them starting their course of study.

Ongoing support

- International student support systems at universities are experiencing higher demands from students, from accommodation arrangements through to travel and making visits home and pastoral care during their studies.
- Despite higher English language expectations, language support systems within some universities may need to be better resourced, enhanced and improved.
- Universities may need to have in place enhanced support systems for international students who are experiencing difficulties (such as family bereavement, political unrest and civil disturbance, climatic and natural disaster issues) that require a level of support which is beyond the pastoral care role of academic staff.

An engineering perspective with a focus on group and project-based work

Introduction

The *Teaching International Students (TIS) Project* is a two year programme established and hosted by the Higher Education Academy (HEA), in combination with the UK Council for International Student Affairs (UKCISA), as part of the second phase of the Prime Minister's Initiative (PMI2). The project is focusing on enhancing the ways in which academic staff address the diverse learning needs of their international students. This is being achieved by raising the profile of teaching and learning for international students, establishing a repository of resources and research, identifying and disseminating information and guidance and establishing a network of interested people.

The Engineering Subject Centre is one of several HEA Subject Centres that have supported the TIS project. The Centre's contribution has been to carry out research work looking at teaching international students from an engineering perspective, focusing particularly on group and project-based working. This report provides a distillation of the opinions and experiences of academic staff in engineering disciplines at a range of UK universities where there is a relatively high proportion of international students. It is very much a 'snapshot in time' of the views and perceptions of individuals and reveals some of the problems that they have encountered with group and project-based working, their understanding of the issues that international students face and the methods that they and their colleagues have adopted, or are proposing to introduce, to enhance the learning potential of their group and project-based activities. Finally, the mutual benefits to be gained by enrichment of the student body with international students are reviewed, as are the competitive issues facing UK students in an expanding global market for engineering enterprise.

Methodology

The report has been developed using a case study approach based on interviews with academic staff. In order to target prominent academic staff with experience in dealing with issues relating both to group and project-based working and also working with international students, it was first necessary to establish those engineering units that recruited significant numbers of international students. An initial survey of Higher Education Statistics Agency (HESA) data[3] from the 2008/09 academic year highlighted significant concentrations of international students at a range of 12 higher education institutions (HEIs) that offer engineering undergraduate programmes in any of six engineering disciplines (aerospace, chemical, civil, electrical/electronic, mechanical, and manufacturing), classified on the basis of Joint Academic Coding System (JACS) codes (see Table 1).

The HESA data were assessed further to compile the geographical origins of the international student populations within these six engineering disciplines at the 12 HEIs identified. These demographics are displayed as histograms in Appendix 1[4,5]. A range of considerations were subsequently used to target academic staff for interview. The Engineering Subject Centre's network of Heads of Department and Departmental Contacts was cross-referenced to identify the most appropriate academics to contact. From this preliminary work, a sample of 11 academics at eight HEIs was identified for interview (see Table 2).

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[3] HESA Student Record 2008-09, British Council website. Copyright Higher Education Statistics Agency Limited 2010. HESA cannot accept responsibility for any inferences or conclusions derived from the data by third parties.

[4] To comply with the Data Protection Act, HESA data are rounded to the nearest five students. Cohorts of zero, one or two are rounded down to zero and do not appear in the graphical summaries in Appendix 1. All other numbers are rounded to the nearest five. This will mean that the numbers of students represented in the graphs in Appendix 1 do not necessarily add up to the totals in Tables 1a and 1b.

[5] It should be noted that these data do not include international students that have acquired UK status through residency qualification, for example, nor do they consider the ethnicity of UK students.

Table 1. International student populations at a) undergraduate and b) postgraduate level at 12 HEIs for six engineering disciplines (HESA data 2008/09)

a) Summary: Undergraduate Students

Institution	Aerospace engineering	Chemical, process & energy engineering	Civil engineering	Electronic & electrical engineering	Mechanical engineering	Production & manufacturing engineering	Total
Birmingham, The University of	0	120	85	175	125	0	505
Coventry University	45	0	55	90	120	0	310
Greenwich, The University of	0	0	50	105	75	5	230
Imperial College of Science, Technology and Medicine	90	230	125	305	200	0	950
Liverpool, The University of	50	0	50	110	75	10	290
London, University College	0	145	65	70	70	0	350
Loughborough University	15	65	25	60	90	20	275
Manchester, The University of	40	215	65	185	90	0	595
Northumbria at Newcastle, The University of	0	0	70	180	20	10	280
Nottingham, The University of	5	90	115	130	190	85	610
Sheffield, The University of	55	85	50	185	115	30	510
Strathclyde, The University of	0	15	5	150	20	5	190
Total	305	960	755	1735	1185	160	5100

b) Summary: Postgraduate Students

Institution	Aerospace engineering	Chemical, process & energy engineering	Civil engineering	Electronic & electrical engineering	Mechanical engineering	Production & manufacturing engineering	Total
Birmingham, The University of	0	50	100	65	20	80	315
Coventry University	0	0	40	5	130	180	350
Greenwich, The University of	0	0	10	210	25	30	275
Imperial College of Science, Technology and Medicine	10	135	115	115	55	0	430
Liverpool, The University of	5	0	5	70	5	15	105
London, University College	0	50	30	65	35	0	180
Loughborough University	15	50	50	80	105	20	320
Manchester, The University of	10	70	210	255	100	10	655
Northumbria at Newcastle, The University of	0	0	105	305	60	15	485
Nottingham, The University of	0	45	175	200	25	50	495
Sheffield, The University of	20	80	115	285	90	0	585
Strathclyde, The University of	0	5	20	110	20	55	210
Total	55	485	970	1770	670	455	4405

An engineering perspective with a focus on group and project-based work

Table 2. Individual academics interviewed from 11 engineering sections at eight HEIs		
Institution	**Engineering unit**	**Interviewee**
Birmingham	Mechanical Engineering	David Hukins
Coventry	Department of Engineering and Knowledge Management	Chris Smith
Greenwich at Medway	Engineering Systems	Alec Coutroubis
Liverpool	School of Engineering	Tim Bullough
Loughborough	Chemical Engineering	Steve Tarleton
Loughborough	Wolfson School of Mechanical and Manufacturing Engineering	Peter Willmot
Manchester	School of Mechanical, Aerospace and Civil Engineering	Bill Craig
Nottingham	Civil Engineering	Bill Askew
Nottingham	Mechanical, Materials and Manufacturing Engineering	Phil Shipway
Sheffield	Automatic Control and Systems Engineering	Linda Gray
Sheffield	Mechanical Engineering	Elena Rodriguez-Falcon

The HEIs selected were representative of the Russell Group, the 1994 Group and the post-1992 Group of HEIs. The study was undertaken mainly by semi-structured telephone interviews, although some were face-to-face, using a brief questionnaire (see Appendix A). The purpose of this questionnaire was to explore how staff in a number of engineering departments that had been identified from the HESA data as having a significant concentration of international students engaged with those students when undertaking group- and project-based academic study. The presumption was that engineering departments offering accredited degree programmes will almost exclusively be operating group- and project-based modules for all students.

The questionnaire was divided into three parts:

1. to establish the department's background in attracting international students (by level, origin and programme)
2. to explore the department's spectrum of group- and project-based academic study for all of its students
3. to encourage the respondents to reflect on practices that would encourage the engagement of international students with their programme of study, the department and possibly the university.

The questionnaire was sent to participants to allow for preparation in advance of the interview. A verbatim transcript of the interview was made and then returned to the interviewee for comment. The transcripts have formed the basis of brief case studies of academic staff's perspectives (see Appendix 3).

This report presents excerpts from the interviews noted as being of significance to the study. Points of both common and unique practice are noted[6] and presented within each section as examples of practice for others to adopt and/or adapt according to their own circumstances. This treatment also highlights areas for the possible future development of practices that aim to encourage and engender the integration of home and international

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[6] Some points of practice could be more common than may be apparent in the report, either because respondents did not indicate that their unit followed that practice during their interview, or to avoid listing all instances at each occasion. Additionally, all respondents would not necessarily agree with any particular point made.

students whilst respecting the differentiation of their backgrounds and future aspirations[7]. These are presented both as conclusions to this report and as recommendations for future work. Overall, this report provides an insight into the degrees of engagement by international students undertaking group- and project-based work when working jointly with other students from their cohort.

Integration of international students into UK culture, university, department and programme of study

Initial questioning looked at the activities of HEIs that are designed to integrate international students into their degree programme and the wider issues of living in the UK. Most of the staff surveyed indicated that both their university and department provided some form of induction activity, often of a week in duration, for all students.

Information given to students

This typically includes orientation information on the department, the university and the surrounding locality as well as details of what will be expected of the new recruits and specific departmental and university regulations that will need to be observed. Much of this material is presented in student handbooks, hard copy and online. These materials, as well as the induction week activities, highlight the resources available to students, such as the teaching and laboratory spaces and capabilities, technical and administrative support facilities and library materials and services, including virtual learning environments (VLEs) and online resources.

Clubs and societies

There is often an engineering discipline-specific society, usually student-led, that will help to facilitate students' integration into their department. They will also be able to join other clubs and societies that promote integration into the wider university student body.

Several staff indicated that their University had various national and international student societies that would be particularly beneficial to newly arriving international students. For example, at Loughborough University there are the Malaysian and Singapore societies.

In the Department of Engineering and Knowledge Management at Coventry there are large numbers of international students entering the final year of their undergraduate programmes or into the taught Masters programmes. Staff in the department are currently reviewing whether one week's induction is too intensive for these students and whether induction over a four week timescale, comparable with the six week integrative experience for full-time first year students, may facilitate a more effective integration.

Admissions and induction

Smooth entry into a UK university can be promoted at the admissions stage.

At the University of Manchester, the school admissions team makes a point of maintaining regular dialogue with all potential international students over a six to nine month timeframe in order to raise awareness of the issues that may confront them on their arrival in the UK. The admissions team also run 'welcome websites', accessible to students prior to their arrival in the UK, which are packed with information on the school, the university, the city and the country.

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[7] It should be noted that some interviewees reflected on the possibilities of harnessing the attributes of international students for the benefit of the whole cohort and also on the benefits and dangers for UK students in terms of their global competitiveness. These have been included as sections at the ends of both the report and the case studies. There were, however, no specific questions on these aspects in the initial questionnaire used to explore the views of academic staff and consequently most of the case studies have no entries under these headings.

An engineering perspective with a focus on group and project-based work

The greatest difficulties with integration are reported when large groups of students arrive from a single overseas location, particularly when they enter an undergraduate degree programme in the second or third year. Many UK universities now have campuses in other countries or collaborative teaching agreements with pre-existing universities and colleges overseas. Often students study for the early stages of their degree at their home campus or institution and then come to the UK to complete.

This situation was observed at the University of Birmingham in the Mechanical Engineering Department, where groups of students arrive, mainly from China, at the beginning of the second year and then, at the start of the third year, from Taylor's University College in Malaysia and from Amirkabir University of Technology International Branch in Iran where they have been taught the first two years of the Birmingham course under agreement.

The third year cohorts from the latter two overseas institutions benefit from preliminary induction processes in situ at their home institutions. These are often provided by Birmingham staff and are designed to raise the students' awareness of the cultural changes they will experience and to deliver typical orientation information for the University of Birmingham and the city itself.

A similar situation was described for the Department of Mechanical, Materials and Manufacturing Engineering at the University of Nottingham, where there is significant direct entry into the second year from cohorts of students from their campuses in China and Malaysia.

Here the students are taught the same first year course in English, just as students at the Nottingham campus in the UK would receive. The University of Nottingham Malaysia Campus has been sending students to Nottingham for long enough now for some analysis of student performance in the later years to be carried out.

Phil Shipway at Nottingham described analysis which showed that students who undertook the early part of their courses in Malaysia and then transferred to the UK campus obtained grades during their time at Nottingham with a similar distribution to those who had completed their entire course in Nottingham. This clearly shows that, with a similar prior learning experience, levels of student achievement are not diminished by the move to a UK learning environment. The university also recruits a second year cohort from a partner institution in Thailand. The students study on courses tailored to the Nottingham courses up to the end of year 1.

When such large cohorts of international students arrive from a single source then it may help the integration process if they can be distributed evenly across the university's accommodation facilities and across project groups within their degree programme.

This was expressed in the views from Civil Engineering at Nottingham, where the applications from large cohorts coming from a single overseas location would often arrive in a batch. Those students tended to be assigned to the same accommodation area and did not usually integrate well. Subsequently, students from these overseas locations have requested to be spread around the campus, giving themselves a greater opportunity to mingle with other students in the university.

An area where rapid integration of international students is of particular importance is taught postgraduate Masters programmes. These tend to have high proportions of international students and are typically one year, highly intensive courses.

In the Department of Mechanical Engineering at the University of Sheffield, the induction process for their MSc students is very bold and intense, providing the students with all the skills and tools necessary to tackle any challenge. This is designed to get them over the 'culture shock' as quickly as possible so that their academic work does not suffer.

Teaching/pastoral activities that benefit all students

Personal tutoring

All engineering units surveyed indicated that their undergraduates were allocated a personal tutor responsible for monitoring the academic and pastoral well-being of their tutees. Two interviewees (at Sheffield and Loughborough) indicated that their personal tutorials were conducted as group sessions comprising four to six students.

In the Department of Mechanical Engineering at the University of Sheffield these tutorial groups are deliberately mixed to try to provide a balance of UK and international students and also to include female representation. As well as having multiple nationalities amongst their undergraduates, they also have a diverse range of nationalities within the staff and the department values and takes advantage of the 'cultural capital' available within these two populations.

Another suggestion was that, if they had international experience, academic staff would be better placed to work with international students:

> *"maybe you need the people who are in contact with international students, teach them, support them, provide the pastoral sort of help, maybe they should themselves have some kind of an international exposure, familiarisation."*
>
> Alec Coutroubis, Greenwich University

Other tutor support

As well as personal tutoring, most of the staff interviewed indicated that taught modules also had *academic* tutorial support. Loughborough also mentioned that postgraduate students on taught Masters programmes had access to their programme's postgraduate tutor or their project tutor. The latter could also provide pastoral support as necessary.

In the Mechanical Engineering Department at the University of Birmingham, in addition to personal tutors, they also have a 'welfare tutor' who can be approached by students if they require specialist help with issues that cannot be resolved by their personal tutor.

Administrative support

Several respondents also indicated that administrative staff often dealt with certain student matters. At the University of Liverpool, the School of Engineering has a 'student support office' (consisting of six administrative staff) that handles the administration of the educational programmes and routine student matters. The School also has a 'personal development planning system' which monitors the progress of all first year students. It was also mentioned that other areas of the university have drop-in centres that can provide support in areas such as mathematics and study skills and so forth.

Placement support

At Loughborough University there is a long history of students opting to take a year out in industry, usually after the second or third year of study (for some MEng students). All students on these industrial placements are allocated a 'placement tutor' who maintains contact with students throughout the year and visits them at their place of work at least twice.

Other support from academic staff

In the Chemical Engineering department at Loughborough, students are advised to discuss any serious issues they may have with members of academic staff, the Director of Studies and/or the Head of Department.

However, it has become apparent that, while academic staff are receptive to any such approaches, some international students can still be reluctant to talk to them. It is thought this may reflect cultural differences in the way in which academic staff are regarded in their native countries.

Students contribute to the staff/student liaison committee and there is also a student representative on the Courses and Teaching Committee. Mention was made that students were encouraged to participate in the Chemical Engineering Society and that this could provide academic and social support. Similar student-run, discipline related societies exist at the other engineering units.

It is routine practice nowadays for academic staff to place lecture material onto virtual learning environments (VLEs) for students to revisit the material.

In the Department of Mechanical, Materials and Manufacturing Engineering at Nottingham, some staff are adding audio to their PowerPoint lecture presentations. This will benefit all students but may be particularly helpful for those international students that struggle with lecturers' pace of delivery.

Group and project-based work activities – that benefit all students

Activities

Timing of project work

Engineering departments vary in their use of group and project-based working. Some, particularly those that utilise a *conceive, design, implement and operate* (CDIO) educational framework or who have been heavily influenced by the CDIO[8] approach (e.g. Liverpool and Coventry respectively), consider it important to introduce group and project-based working from the very first day of undergraduate study. These are usually intensive, single or multiple projects that serve to introduce the students to each other, the academic and support staff and the facilities available to them. They tend to be 'design, build and test' type projects, often with a competitive element, and may not be assessed. A possible negative aspect of having these intensive projects at such an early stage in a degree programme is that the more traditional teaching processes may seem mundane in comparison.

> *"We'll have this great experience and then we're going back to our normal way of teaching."*
>
> Chris Smith, Coventry University

That said, the faculty at Coventry is looking to extend the group project experiences beyond this initial period.

Other engineering sections may use project work early on in the course as a means of introduction.

For example, in the Department of Mechanical Engineering at Sheffield there is a group design project run during induction week as well as a first year group working activity ('Engineering

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[8] The CDIO™ INITIATIVE is an innovative educational framework for producing the next generation of engineers. The framework provides students with an education stressing engineering fundamentals set in the context of Conceiving — Designing — Implementing — Operating real-world systems and products. Throughout the world, CDIO Initiative collaborators have adopted CDIO as the framework of their curricular planning and outcome-based assessment. www.cdio.org

Applications Week'), required for accreditation by the Institution of Mechanical Engineers (IMechE), where groups of students learn from mentors how to use the workshop equipment.

The amount of group and project-based work usually increases during the course of the degree programme but in the Automatic Control and Systems Engineering department at Sheffield there is a gradual reduction throughout the degree, with group work in three modules of the first year, two modules of the second year, one module of the third year and none in the MEng fourth year and taught MSc programmes.

In Mechanical Engineering at Birmingham project work is not introduced until the third year, when students do a group design project. There are also individual research projects in the final year worth 30 credits (BEng) or 60 credits (MEng).

Working with industry

Most of the people surveyed indicated that an industrial focus was placed on some of their group project work. For example, first year students at Liverpool are taught about how design groups would function in industry, about conflict resolution and team roles. In the second year, students are given formal management teaching about models of team work and are given semester- or year-long discipline-specific design group activities. Group selection is based on the inclusion of a spread of abilities in each team. Groups have to nominate leaders and different roles and the students reflect on their performance at the end of the project. In the third year the students organise their own groups, as they would in an industrial setting. 'Visiting Professors' from industry provide realism for these projects through, for example, discussions on group dynamics and relevance to industry.

At Loughborough, students are encouraged to take the opportunity of a placement year out in industry and are thus exposed to group and project-based working in an industrial setting. In the majority of cases the experience gained is so stimulating and rewarding that the students become much more mature, competent, dynamic and enthusiastic.

In the Chemical Engineering department, these students will often take the lead in subsequent group projects back on campus. The MEng within this department also includes an individual 'Research and Development' project, carried out over a whole semester.

Some students go abroad to do the 'Research and Development' project and work within a research team. There is also a 13 week design project for the MEng students which is done in groups of up to five, worth 25 credits out of 120 for the year and a full module individual design project. At postgraduate level there is an individual project component to the MSc.

Assessment of group and project-based work

Assessment of group and project-based work usually involves written and oral reporting. Increasingly varying degrees of peer assessment and/or peer moderation of marks are being introduced. These processes are useful as they can provide quick feedback to students, who often complain about feedback delay with traditional marking procedures, and it can also be time-liberating for academics. Additionally, many of the project activities described include competitive elements and the opportunity to win prizes, often industrially sponsored.

It is interesting to note that courses are constantly evolving and many of the interviewees highlighted changes that were being introduced, often involving enhanced group and project-based activities.

Liverpool and Coventry are introducing wholesale curriculum changes that both involve far greater involvement of project work, described as 'activity learning' or 'activity-led learning'.

Group selection

There is a good deal of variability in the choice of approach to group selection. Initially, some use an alphabetical basis, others utilise personal tutor groupings (which may also have been alphabetically derived)[9]. Where deliberate selection is employed at first year level then the majority indicate that they try to select groups with a reasonable spread of international and female students. This is so that:

> *"they learn to work together and make use of the cultural capital in their backgrounds."*
>
> Elena Rodriguez-Falcon, University of Sheffield

One interviewee indicated that he deliberately identified students with project group working experience to nucleate the groups:

> *"I try to seek out those students who have some previous relevant project experience and I simply ask the rest of the students to attach themselves to those experienced ones in teams. This process makes sure that each group has got a fighting chance in the competitive work."*
>
> Peter Willmot, Loughborough University

In subsequent years, selection can be by the students themselves (self-selection) or imposed by staff. In the latter case selection can vary from being based on sophisticated analysis of previous academic performance to simplistic processes such as grouping students who happen to be sitting together.

Groups that are based on previous performance can deliberately be mixed according to ability, as is the case at Liverpool. Alternatively, in Mechanical Engineering at Sheffield some projects have used groupings of similar ability based on grade point averages as well as mixed ability groups. These trials have generated surprisingly counter-intuitive results. The academically superior groups tend not to perform to their ability, while the least able groups tend to perform better than expected. It is possible that the better students might be too competitive, leading to a poorly functioning group, while the academically least able students may benefit from working together without the pressure of having high performing individuals monopolising the process. The department has been trialling this approach for three years and now intends to evaluate it in order to assess the underlying reasons.

The same approach has been used for final year 'capstone' projects in the Wolfson School of Mechanical and Manufacturing Engineering at Loughborough University. Here the students themselves requested groups of similar academic ability. These similar ability groupings have now been introduced with additional alignment to the other modules being taken by the students.

Peter Willmot said that he had been initially sceptical of this approach to group selection but that it does seem to work.

Often linked with an industrial focus to group work projects, some have described how various roles within the group may be assigned. The crucial role would seem to be group leader and this can be selected by staff or self selected by the students.
In the second year project work in Chemical Engineering at Loughborough there is the opportunity to self select, particularly with respect to the group leader. The leadership is then swapped around within the team at a midway point, so essentially there are two team exercises within a single project.

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[9] It should be noted that alphabetical allocation can lead to unbalanced groups as a consequence of alphabetical clustering of surnames from some nationalities.

Profiling assessments, such as Myers-Briggs type[10] psychological profiles or Belbin-type[11] team role determinations, may occasionally be used.

In the final year design projects in Chemical Engineering at Loughborough, staff try to spread experience through the teams to give all students the best learning opportunity, derived from exposure to working in varied groups as would be the case in industry.

Another method for selecting groups, used in the Mechanical Engineering department at Sheffield, is to get the students to apply for specific jobs within a team. A range of project topics is provided and students then apply to be part of the team that is tackling a topic that interests them.

They submit an application that shows how they propose to address an aspect of the topic and highlights their interest and their skills. Staff select the groups based on these applications. Self selection is allowed for some projects in the final year. In one example, students are asked to recruit their own team to tackle particular project briefs. Apparently, some groups coalesce simply because they are friends but the more dynamic and competitive students (those looking to gain higher marks) will try to recruit students with the skill sets they need to tackle the project in the most efficient way.

Support

In the majority of cases support is provided by project supervisors, tutors and mentors (the latter can be academic staff, although in some cases external mentors may be available, usually for projects at later stages of the course). For laboratory based group work, and for some projects, PhD students and occasionally post-doctoral researchers may provide demonstrator roles.

At Greenwich, PhD students and post-docs are engaged in a supervisory capacity but they have to complete a training programme before they are permitted to fulfil these roles.

In the Department of Mechanical, Materials and Manufacturing Engineering at the University of Nottingham, support for group design projects is provided using, for example, step by step videos for the design software package 'Pro/Engineer'. This is helpful for all students but particularly so for some international students.

Skills training/development

Several interviewees indicated that some basic skills training was provided. In Chemical Engineering at Loughborough this training covers report writing and presentation skills, as well as how to obtain information and avoid plagiarism. This training has been introduced in recent years, as it was felt that recruits were less experienced in these areas than previous cohorts. The training also looks at teamwork and offers advice on how to work in teams.

As is the case with all other engineering units, students at Loughborough meet the module organisers and are made aware of the associated module specifications. The projects all include introductory lectures and materials that outline what is expected so that students can gain an understanding of the information and activities to which they will be exposed.

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[10] www.myersbriggs.org/ The website of the Myers-Briggs Foundation, and its work on personality types and their significance in team formation and role adoption.

[11] www.belbin.com/ The website of Belbin Team Roles, which aims to help individuals and organisations build productive working relationships, select and develop high performing teams, raise self awareness and personal effectiveness and build mutual trust and understanding.

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At Sheffield in the Automatic Control and Systems Engineering department, Linda Gray gives the first year students a talk on working in groups. There are also electronic resources that support group work on the university's VLE and within The Academic Skills Hub (TASH). Linda thinks that it is a departmental weakness that students are not given more formal support for enquiry-based learning. This view may apply universally.

WebPA[12]

In the last academic year at Liverpool, WebPA has been introduced for staff and students to use in group projects as a means of providing efficient peer-moderation and feedback to students. These pilots have been successful and WebPA is likely to be adopted for all group work projects. In the Wolfson School of Mechanical and Manufacturing Engineering at Loughborough University, WebPA has been used for some time and there is a body of data available that could now be used for analysis of student performance. Peter Willmot believes that these data could confirm that international students fare less well than their UK peers in mechanical engineering projects at the start of their first year course.

Students as mentors

In Engineering Systems at the University of Greenwich at Medway, Alec Coutroubis uses the students themselves as informational conduits to support the rest of the group. He identifies four or five good students from a group size of around 100 and uses these 'ministers' to relay information. This approach can be particularly helpful for supporting diffident students who might not want to approach Alec themselves.

Activities tailored to the needs of international students – for general engineering education

The prevailing view amongst the academic staff surveyed was that all students should be treated equally and fairly. Consequently, there were few examples given of activities specifically targeted at international students.

The School of Engineering at the University of Liverpool has an 'International Tutor' that international students can approach and who plays a mediation role. There is also international student representation on the staff/student liaison committee.

A recurring theme has been the adoption of practices that benefit all students but which may be particularly helpful to international students. An example given here was the relaxation of strict rules about spelling and grammar in written reports. As long as the intended meaning was clear, students would not be penalised for incorrect English.

For the taught postgraduate MSc in Chemical Engineering at Loughborough University there is a three week course in laboratory procedure and safety. This is particularly useful for the high proportion of international students on the course that come from various backgrounds and who may not have received this training during their undergraduate programmes.

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12 WebPA is an online peer assessment tool developed by the Engineering Centre for Excellence in Teaching and Learning (EngCETL) at Loughborough University – see www.engsc.ac.uk/downloads/scholarart/ee2008/w005-loddington.pdf.

Activities tailored to the needs of international students – specifically for group and project-based work

Here again correspondents stressed the importance of the perceived equality in the treatment of all their students. There is, though, an almost universal belief among academics within engineering in the UK that students from some countries, particularly Asiatic countries, have little prior exposure to group and project-based ways of working. This is particularly noticeable in projects that are not fully defined but can be considered open-ended. Interestingly, it is now emerging that some international students are keen to obtain experience in tackling open-ended problems and have deliberately chosen to receive tertiary-level education in the UK specifically to gain exposure to these pedagogical approaches.

In October 2012, the University of Liverpool is anticipating the arrival of a cohort of 50 students from its counterpart university in China at the start of the second year of their civil engineering programme.

These students will be introduced to group work projects and given the opportunity to criticise their performance during their first year in China. This will be a novel introduction to their traditional first year programme in China and should help these students to assimilate more easily into the second year at Liverpool.

It has been argued that deliberately mixing different nationalities in project groups and teams is a good way for students to learn how to perform in group work projects, therefore 'tailoring' to the needs of those students.

Linda Gray at the University of Sheffield prefers to think of these mixed groups as being 'global' and encourages all students to appreciate the benefits of 'global grouping'. Alec Coutroubis at Greenwich University has similar views.

Issues for effective group and project work involving international students

Cultural differences

Cultural differences and associated fears can be a serious issue which is sometimes not recognised or appreciated by academic staff. International staff within a department can raise awareness but it may be necessary to provide developmental support for staff.

At Manchester academic staff are encouraged to take an 'Equality and Diversity' training programme and there is an online training course for all students on entry to the university.

The appreciation of cultural differences must be a reciprocal process. Without this appreciation, students of all types may divide into cliques and international students will often assort with their national groups or with those that share a common or similar language (e.g. Arabic). This can lead to 'ghettos' within the university. Efforts may need to be made to disrupt cliques and ghettos or, preferably, prevent them from forming in the first place.

Elena Rodriguez-Falcon encourages the international students at Masters level to try to integrate with home students and not wait for the UK students to make the first move.

Linda Gray is studying how different cultural groups approach critical thinking and this may provide some insight into some of the underlying cultural variables. Linda will feed back the

results of this study into the Automatic Control and Systems Engineering department at Sheffield. This may influence future curriculum design and help the awareness of other staff.

As an aside, there are some issues that international students may have that can be cultural and can have profound effects on performance. Issues highlighted by Alec Coutroubis include difficulties surrounding arranged marriages, the need to return home for family bereavements and the associated difficulty and cost of obtaining re-entry visas at short notice. These problems can be difficult to deal with and there may need to be adequate university processes in place to support staff.

Language and communication skills

Language and communication skills seem to be the major issues for international students. At Manchester the School of Mechanical, Aerospace and Civil Engineering uses International English Language Testing System (IELTS) scores of 6.5 for undergraduate entry and 7.5 for postgraduate entry but still maintain that the English language skills of some of their international students is inadequate.

On arrival, all overseas students (or all students for whom English is not their first language) are required to attend a language assessment exercise. Any students with problems are offered free language tuition, although not all students take up the offer and it is not enforced.

A few years ago it became apparent that some students arriving from mainland China had difficulties with English comprehension so they had parts of their School handbook translated into Chinese. This has proved beneficial for this group of students but could be construed as discriminatory as the same service has not been provided for other languages:

> *"Now you could argue that that's slightly discriminatory because we don't do that for students who come with Farsi or other languages from other parts of the world, but we have identified a problem with an increasing number of mainland Chinese […] who had serious problems."*
>
> Bill Craig, University of Manchester

While all respondents indicated that their institutions provided English language support (either formally or through 'drop-in' centres) several hinted that this was not necessarily appropriate or sufficient for the needs of their international students. At the University of Nottingham, however, the Language Centre was described as excellent.

In Civil Engineering at Nottingham they recognise that some international students will struggle with language, as English would not be their first language. Even so, they would not assume that international students would be in this category and provide appropriate support for all students as necessary, whether it be for language, cultural integration or conditions such as dyslexia.

In this department, staff believe that good English language entrance requirements are important. In this respect they have involved the parents at one of their overseas partner institutions to help with improving the English language abilities of students who were intending to take direct entry into the second year at Nottingham. These students found it easier to attain the required IELTS scores and, ultimately, integrated quicker on arrival at Nottingham. Consequently, Bill Askew believes strongly that the language issue is the main thing to overcome.

Bi-directional poor communication

Poor communication can be bi-directional, as UK students may be reluctant to interact with international students. Several contributors, but not all, said that communication issues were identified as a major cause of tension in group work situations, particularly in the first year, and that this was difficult to manage. They said that some UK students believed that the international students in their group were not contributing sufficiently and that they were being 'carried' by the home students. Others stated that they felt international students initially opted for, or were relegated to, more passive or mundane roles, rather than taking on leadership roles, and that this was probably due to communication issues.

> *"They tend to often be keen to take on the more 'information gathering' roles and do mathematical modelling or background research on the internet or something rather than lead the group."*
>
> Tim Bullough, University of Liverpool

Supervisors, mentors and tutors therefore tend to play a crucial role here to mediate and facilitate between student groups. To counteract the issue of international students adopting passive roles in year one project groups, Linda Gray at Sheffield is intending to introduce the deliberate exposure of non-UK students to leadership roles or at least rotating these roles around the whole group. At Liverpool it was also noted that international students did not take on leadership roles early in the course but had, however, developed the necessary skills by the third year.

Staff (non)-awareness

Staff may be oblivious to the tensions and frictions that are building up within groups. David Hukins at Birmingham thinks it is very important to make sure that groups are working cohesively and that international students are not being marginalised. He feels that this can only be addressed by discussing with the groups how they are working together and assessing their responses. If these difficulties emerge at the end of the project (through peer assessment, for example) then it will be too late to rectify or ameliorate them.

> *"So if students don't mention it then they can go unnoticed completely by the mentors and supervisors and that's where the mentorship scheme doesn't particularly work well. If students don't bring it up and you are not clued up well enough, you might miss those conflicts and those frictions. And right at the end when you have the peer review, then it's a bit too late I think."*
>
> Elena Rodriguez-Falcon, University of Sheffield

Where project work uses peer assessment, Elena is considering the introduction of an intermediate assessment so that any issues have the opportunity to be addressed before the end of the project.

Conducting a project

Elena Rodriguez-Falcon has the view that many international students, particularly those from Asia, have no prior experience of how to conduct engineering projects. She finds that sometimes it is not until their individual final year projects that this deficiency becomes apparent. These students often have high grade point averages, indicating that they are proficient at examinations and must somehow have passed through the earlier group projects unnoticed.

Other interviewees support the view that international students can experience difficulties in tackling projects, particularly those that are of an open-ended nature. Elena

thinks that all international students should receive training in tackling project work, something which would also benefit UK students because, although they are familiar with project work, they tend not to have a clear understanding of enquiry-based learning.

Entry after first year

The issues surrounding project-tackling capability are particularly relevant to international student groups with direct entry into subsequent years of degree programmes. This is because the students that started in year one have already gained familiarity with group and project working and an appreciation of project problem briefs that have no single correct answer.

At Liverpool, as previously mentioned, they are anticipating an entry of 50 civil engineering students from China directly into the second year at the start of the 2012/13 academic year. Ongoing discussions with Chinese and other international students already at Liverpool have revealed that they consider that these large cohorts of Chinese students do not integrate well:

> *"All the international students we've surveyed tell us that generally international students all mix reasonably well with each other except for these cohorts who come en masse from China."*
>
> Tim Bullough, University of Liverpool

The pre-existing Chinese students suggest that the difficulty can be down to the size of the cohort, leading to possible clique and ghetto formations, but also to the fact that these students are likely to come from relatively wealthy single-child families. The implication is that these students have not been 'socialised' to group working. Tim Bullough at Liverpool recognises that there is a need to be cautious about interpreting this information, but there may be a 'single-child syndrome' that may have a bearing on their capability for contributing effectively in group work.

Liverpool staff are hoping to address these issues by the novel introduction of group project work into the first year course in China, preparing them for the second year in the UK. When they arrive at Liverpool they will also be distributed throughout the accommodation areas to try to minimise the tendency for them to form ghettos.

Tim also recognises that support will need to be provided to the civil engineering first years at Liverpool so that they can be best placed to receive the incoming Chinese cohort. The nature of this support has not yet been determined.

Integrated working – or not

Most staff distribute international students across groups as the best means for facilitating integrated working. In Mechanical Engineering at Birmingham, David Hukins finds that their cohorts of students from Iran tend not to work well in distributed groups and so has resorted to placing these students in their own groups.

In Mechanical Engineering at Loughborough they had a large influx from Brunei in one year and Peter Willmot suggested that it was best when these students were at least in pairs within small groups of five students.

In the Automatic Control and Systems Engineering department at Sheffield, where they permit group self selection, the Chinese students still tend to cluster in groups, even towards the end of the first year.

Issues of work ethic, plagiarism and prior skills

While some international students may struggle initially with group work projects, they can often have a better grasp of mathematical principles and may be highly motivated. Sometimes they may even question the work ethic of UK students. This can cause friction and is likely to involve underlying cultural differences in the way they have been taught and the way they are expected to learn.

This can even extend to differing cultural viewpoints on the nature of plagiarism.

Steve Tarleton at Loughborough feels that all students need to be fully informed about acceptable methods of reporting the work of others and uses the detection system 'Turnitin' to promote academic integrity, particularly at the early stages of the chemical engineering course.

Bill Askew at Nottingham thinks that a tendency towards plagiarism could be linked, in an inverse way, with English language ability. Once students gain proficiency in English they may be better able to rephrase material and write in their own words.

In a different approach, Alec Coutroubis at Greenwich avoids issues of plagiarism altogether by using a group work reporting process which is based on analysis of case studies, minutes of meetings and the log books of intra-team discussions.

A further issue in Chemical Engineering at Loughborough concerns the international students that enter at postgraduate level. It is recognised that some of them have not gained adequate experience in laboratory techniques, workshop skills or safety appreciation during their undergraduate training. These skills must be taught at the outset of their postgraduate course.

Assessment

Some international students may struggle to understand the traditional marking range used by academics in the UK for the assessment of, for example, project reports. This is particularly the case with students who have come from mathematical backgrounds and are used to receiving marks in the 90% range.

> "When we award 70 [%] we mean: 'This was a good piece of work – room for improvement, but first class', whereas, when they see 70 they say 'My goodness me, what have I done wrong, I've never had a mark so low'. And that's a difficulty for them that needs addressing by explaining the system and managing their expectations."
>
> Phil Shipway, University of Nottingham

Consequently, it may be necessary to explain the marking systems being used.

Returning again to cultural differences, Bill Craig highlighted a problem that can arise in project groups where group meetings are arranged by group leaders in places such as a local pub, something that might be unacceptable to some cultures. Awareness of problems like this is raised during tutorial groups in the first year at Manchester.

Use of international students as a resource

Interviewees were not formally questioned about this concept, but it did emerge from several of the discussions, particularly at the University of Sheffield. International students can be a valuable resource on cultural diversity, particularly the socio-political aspects of working, running engineering projects and conducting business in their home nations or with their representatives abroad. Learning with and from various nationalities would give

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all of the students a global perspective on engineering and may equip them with the skills to compete more effectively in the global economy.

This is highlighted by an example of effective practice from Elena Rodriguez-Falcon at Sheffield, who provides some teaching on 'Managing International Projects' to third year students from across the Faculty of Engineering.

Elena gets the students to write down their perceptions of what you need to do and how to behave in order to be able to run a successful engineering project in your home country. The students are asked to stipulate one thing you *should* do and one thing you *shouldn't* do. These subjective responses are compiled into a guide that is distributed back to the students. The guides produced in this way have been very favourably received by the students, who indicate that they are such a valuable resource that the preparation exercise should be done earlier in the degree programme. Elena has tried doing the exercise with first year students but it has not proved so successful. This is possibly a reflection of the maturity level of students when dealing with certain cultural issues but may also reflect underlying drivers, such as the need to obtain employment in a global marketplace that may not be so urgent in first year undergraduates.

As mentioned already, several contributors indicated that some international students have questioned the work ethic of UK students and this can sometimes cause tensions in group or team working situations. While being quick to counter that varying levels of working integrity and enthusiasm can be encountered with all nationalities, if international students were spread around groups then UK students may benefit from and be positively influenced by observing the working intensity of others.

Benefits, opportunities, future issues for home students

Linked with the global perspective in the previous section is the perception that UK students may be less globally aware than their international student counterparts. This view may be biased because, by definition, international students are those that have already been motivated to travel abroad for their engineering education and presumably believe that this will be beneficial to their future careers. Conversely, the global awareness perception could be warped by potential arrogance or complacency among UK students stemming from the adoption of English as the international language, particularly for science and engineering.

The perceived lack of global awareness may mean that UK students are starting to lose out in the competition for global jobs and contracts. Additionally, those UK students that continue their careers in engineering within the UK may still be at a disadvantage as they fail to appreciate fully the cultural implications of the international dimensions to their work (for example, when procuring materials and parts etc).

As a consequence, UK students should be actively encouraged to learn from their international peers and the potential benefits of engaging with the 'international experience' (particularly in terms of future employment) should be stressed.

The process for the effective integration of international students into UK engineering higher educational settings needs to be bi-directional. This is of particular importance when large cohorts of international students come from a single geographical source and enter degree programmes in subsequent years.

Not only is it crucial to have effective induction processes in place for the incoming international students (either before and/or after arrival in the UK) but it is also important that the UK students are also prepared for the cultural issues they will face.

All students need to be provided with support processes that can generate the levels of understanding and skills necessary to promote integration and reciprocal learning.

Conclusions and recommendations for further work

This report collates both commentaries and reflective views given by interviewees, together with illustrative examples of practice, under a number of headings that look at the integration of international students and issues in group- and project-based working.

Conclusions are presented here from both staff and student perspectives, together with items that are of significance to the receiving institution. Each conclusion is complemented by appropriate recommendations that aim to indicate scope for further work in supporting staff, students and institutions in the enhanced engagement of international students when undertaking group- and project-based work with other students from their cohort.

Relating to staff:

International students on arrival

- Staff may not be fully aware of the intensity of the culture shock experienced by international students. International staff themselves can help with this but academic staff overall may need more specific support to increase their awareness of issues and access to available tools in order to cope more effectively.
- Language and communication difficulties may initially be prevalent among international students, occasionally compounded by UK regional accents, leading to clique formation by students along national or common language lines. This can become a challenge to both staff and peer students and requires prompt intervention. Academic staff practices should therefore be all-inclusive and should endeavour to treat all students within a peer group on an equal basis.
- The biggest problems for cultural integration for pre-existing students, including other international students, is when there is direct entry of large cohorts of international students from a single geographical source into subsequent years of a degree programme. Efforts need to be made to support both the incoming cohort and the pre-existing students in these situations.
- The appreciation of cultural differences needs to be reciprocal from the outset and, if adopted, can form a basis for the benefit of all. Efforts should therefore be made to capture this from the cultural capital that is available in international classes where all students are encouraged to learn with and from each other.

Group and project-based working

- Group formation can be challenging and can give rise to unforeseen issues in the cultural and intellectual perceptions of the students. Carefully considered methods of group and leadership selection that are inclusive and seen as fair to all, as well as the use of peer assessment, can be beneficial in anticipating and addressing such issues.
- International students may not have had prior exposure to group and project-based working and may have difficulties appreciating and tackling open-ended problems, particularly in the areas of design, enterprise and entrepreneurship and in engaging in role-plays. [Note: Some international students understand this deficiency and have deliberately chosen tertiary education in the UK to gain this experience].
- Problems with communication can lead to initial tensions in group work situations. For example, international students may be reticent and relegated to mundane tasks; UK students may interpret this as parasitism while, at the same time, international students may be dismissive of the mathematical ability and work ethic of UK students.

These problems are often the hardest to manage and staff would benefit from more informed guidance and support on group formation, as well as ongoing student mentoring and group supervision.

- Group and project-based working highlights the need for specific study skills in critical thinking, enquiry-based learning and understanding of unfamiliar marking schemes, Whilst applicable to all students, staff may need to gain a fuller understanding of:

    o the different ways that critical thinking is understood and used in different cultures
    o the need to provide instruction in approaches to tackling enquiry-based learning
    o the need to provide fuller explanations of marking practices
    o the differential understanding for the submission of one's own work and related issues of plagiarism.

- All of these considerations may influence curriculum design in the future, hopefully towards a more inclusive and student-supportive curriculum.

Ongoing support

- Group- and project-based working is challenging for all students and requires ongoing support from staff throughout. The detection of issues needs to be soon enough to allow for effective remediation and project working difficulties need to be uncovered at an early stage. Consideration should therefore be given to introducing peer assessment at an intermediate point in projects, along with practice and formative assessment opportunities.

Relating to students:

In-course

- Student-led sports clubs and societies can help with cultural integration. Discipline specific societies and staff/student liaison committees can help with academic integration.

On graduation

- Group and project-based working are an important aspect of engineering pedagogy - increasingly so. This is often seen as necessary for enhancing industrial readiness.
- In terms of their global competitiveness, international students may ultimately be at an advantage as they have already made their first global step. They may also feel and be more enabled to engage with global groupings such as 'Engineers Without Borders' [13].

Relating to institutions:

Pre-arrival

- Universities recruit from around the globe, with differing engagements in each country (by agencies, local offices and staff visits) which can result in varied student perceptions of the institution prior to and immediately upon arrival.
- Universities may need to take a more active role in helping students with difficulties prior to arrival that can lead to a delay in commencement of study (such as obtaining visas and satisfying entry requirements).

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[13] EWB-UK is an international development organisation that offers programmes which provide opportunities for young people to learn about technology's role in tackling poverty. Supported by the EWB-UK community, student members work on projects around the globe – see www.ewb-uk.org/.

Ongoing support

- International student support systems at universities are experiencing higher demands from students, from accommodation arrangements through to travel and making visits home and pastoral care during their studies.
- Despite higher English language expectations, language support systems in some universities may need to be better resourced, enhanced and improved.
- Universities may need to have improved support systems in place for international students who are experiencing difficulties (such as family bereavement, political unrest and civil disturbance, climatic and natural disaster issues) that require a level of support beyond the pastoral care role of academic staff.

Bibliography

Readers are encouraged to read the 11 case studies in Appendix 3[14]. The following are some additional reading resources, both publications and web links:

Publications

Belbin, R.M. (1981) *Management teams: why they succeed or fail*. Oxford: Butterworth-Heinemann.

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Pitt, M.J. (2010) Internationalization of undergraduate group projects. *EE2010 Inspiring the next generation of Engineers*, 6-8 July 2010, Birmingham, UK.

Ryan, J. (2000) *A guide to teaching international students*. Oxford: Oxford Centre for Staff and Learning Development. *Although it is now 10 years old, this readable guide offers relevant strategies to include international students in a range of teaching contexts, with insights into the nature of cultural difference and the student experience of learning and prompts for reflection on practice.*

Ryan, J. and Louie, K. (2007) False dichotomy? 'Western' and 'Confucian' concepts of scholarship and learning. *Educational Philosophy and Theory*, 39 (4), 404-417. This paper reconsiders the complexities of culture and the dangers of using simplistic notions to inform teaching practice.

Signorini, P., Wiesemes, R. and Murphy, R. (2009) Developing alternative frameworks for exploring intercultural learning: a critique of Hofstede's cultural difference model. *Teaching in Higher Education*, 14, (3), 253-264. *The authors re-examine Hofstede's much-used dimensions of culture and find they have limited value in informing practice in higher education due to oversimplification of cultural differences and a lack of data from relevant contexts.*

Weblinks (all accessed 27th April 2011)

www.engsc.ac.uk/guides/working-with-international-students
This is the online version of the Centre's Teaching Guide, which is complemented by both the event held at Nottingham (June 2010) and online Seminar (March 2011):
www.engsc.ac.uk/events/working-with-international-students and
www.engsc.ac.uk/events/working-with-international-students-a-guide-for-staff-in-engineering

www.heacademy.ac.uk/ourwork/teachingandlearning/internationalisation/internationalstudents
The Academy's TIS Project website, which focuses on the ways that lecturers and other teaching staff can maintain and improve the quality of teaching and learning for international students. This is done through providing guidance and information about how to meet the diverse learning needs of international students.

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14 Appendices 1 to 3 are available as a download at www.engsc.ac.uk/downloads/scholarart/TISresearchreport.pdf

www.engsc.ac.uk/international-students
The Centre's own webpage on the teaching of international students with related links and content.
www.heacademy.ac.uk/resources/detail/ourwork/internationalisation/case_story_movies_to_help_transition

www.engsc.ac.uk/global-dimension
The website of the Global Dimensions Project – a three-year project (July 2009–June 2012) – is co-ordinated by Engineers Against Poverty and supported by UK aid from the Department for International Development (www.dfid.gov.uk/).The project aims are to build the knowledge and understanding of the challenges and prospects for development amongst academic staff and enable them, through embedding global issues in the curriculum, to impart this knowledge and understanding to engineering undergraduates.The project has generated a repository of resources – see www.engsc.ac.uk/global-dimension/resources

www.belbin.com/
The website of Belbin Team Roles, which aims to help individuals and organisations build productive working relationships, select and develop high performing teams, raise self awareness and personal effectiveness and build mutual trust and understanding.

www.myersbriggs.org/
The website of the Myers-Briggs Foundation, and its work on personality types and their significance in team formation and role adoption.

An engineering perspective with a focus on group and project-based work

Appendix A: Interview questionnaire template

The questionnaire is structured into three parts: a background, a resumé of group- and project-based working, and a reflection on current practice. Participants engaging in the questionnaire will also be offered the opportunity to write-up their discussions as a Case Story, for inclusion into the Teaching Guide and/or the TIS Project repository of resources.

A. Background

1. Describe your course(s)
    [discipline, award, student numbers/mix (origin, ethnicity, gender, age), accredited?, teaching approach(es), assessment practice(s)]

2. What do you provide (if anything) which is intended or customised toward international students?

3. What do you provide (for all students) in terms of academic and pastoral support?

B. Group and project working

1. Do your students undertake:
    a. Group work
    b. Project work
    c. Project-based group work?
    [overview of practice]

2. From 1, what is your policy on the formation of groups?
    [self-select, allocated randomly/alphabetically…]

3. What practices do you have in place to support students in group- and project-based working?

4. For Q1-3 above, what do you do (if anything) which is intended or customised toward international students?

5. Give anecdotal experiences (positive and negative) of working with international students in group- and project-based working

C. Reflection

Reflect on your response(s) to Q5 above, and indicate your recommendations which you have either adopted or plan to adopt to accommodate your experiences:

1.

2.

3.

Would you be willing to write-up your experiences as a Case Story, for possible inclusion in the Centre's pending Teaching Guide and/or the TIS Project repository of resources on Teaching International Students? [please tick one or the other]

☐ Yes

☐ No

Thank you for your time in completing this questionnaire. A transcript of your responses will be made available in the near future.

Simon Steiner – Academic Advisor
Andrew McLaren – Centre Associate

Teaching International Students (TIS)

Appendices 1 - 3

TIS: An engineering perspective with a focus on group and project-based work.

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Appendices

Appendix 1: International student demographics

The graphical summaries below show the major country of domicile groupings for each engineering subject area at undergraduate and postgraduate level for each institution studied. It should be noted that these histograms have been derived from the subject area classifications used by the Higher Education Statistics Agency (HESA) and that these do not necessarily correspond with the departmental configurations at the institutions reviewed.

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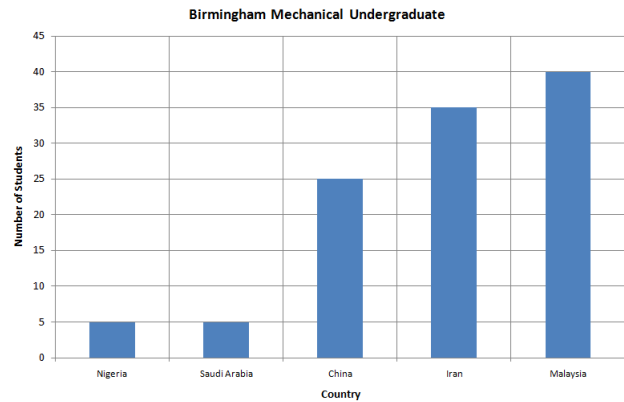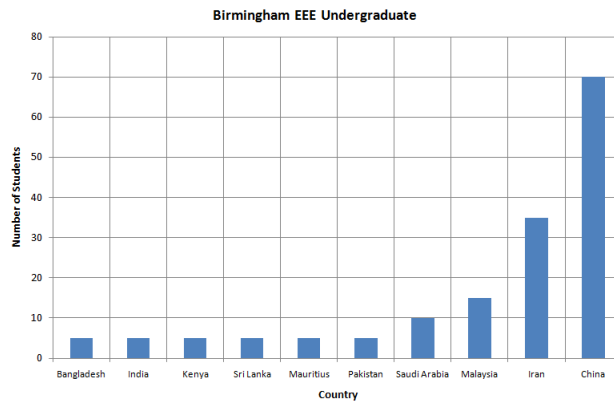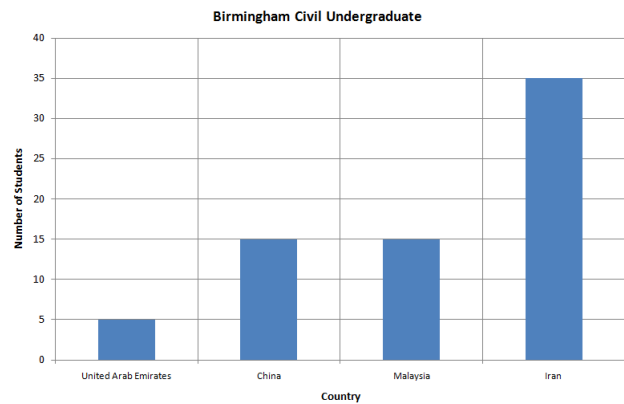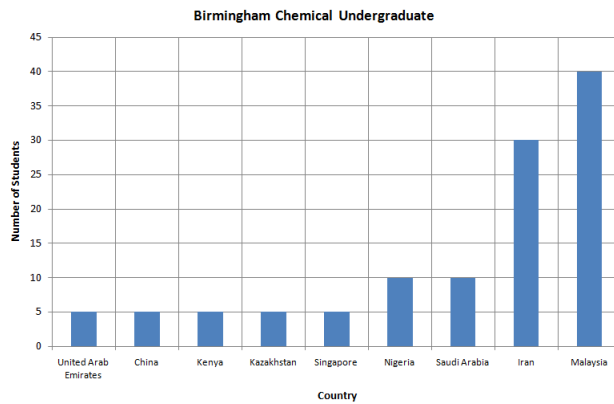
The University of Birmingham: Postgraduate

Birmingham Chemical Postgraduate

Birmingham Civil Postgraduate

Birmingham EEE Postgraduate

Birmingham Production Postgraduate
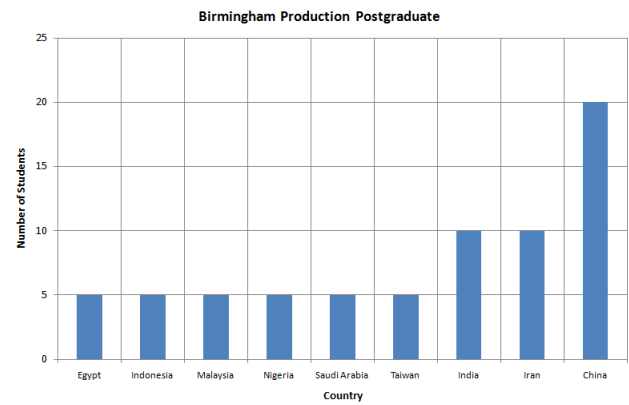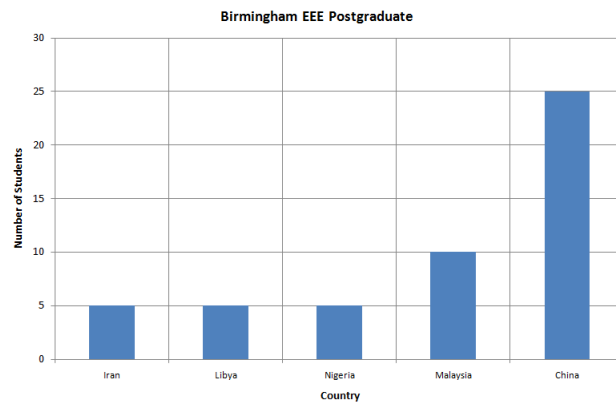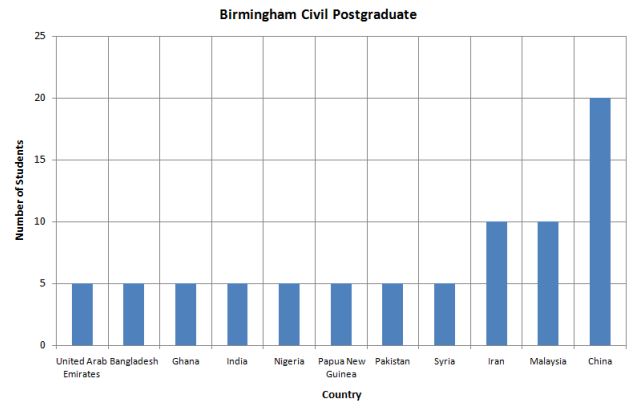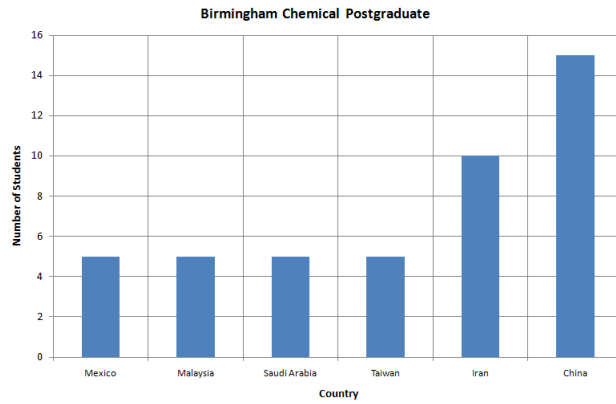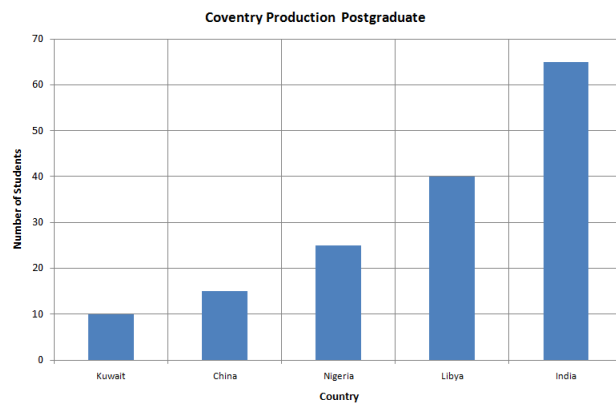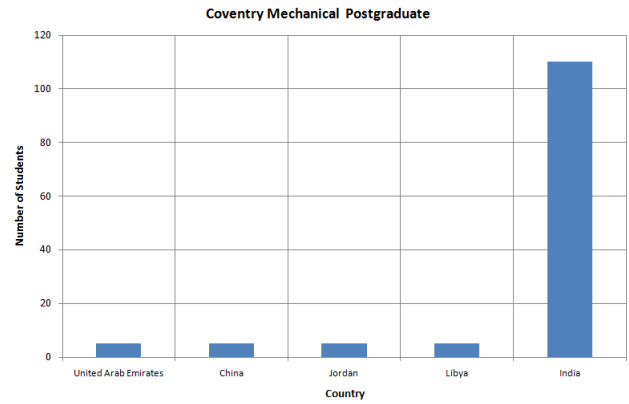
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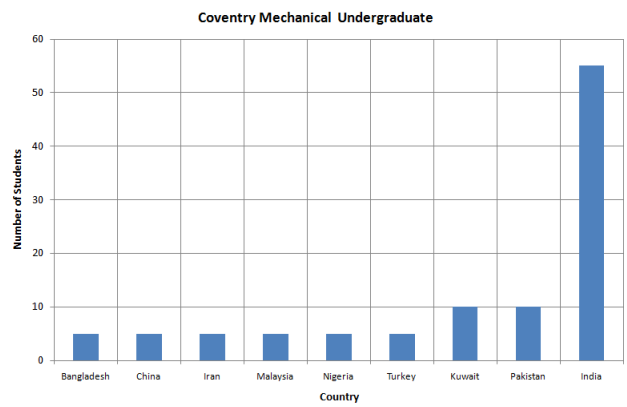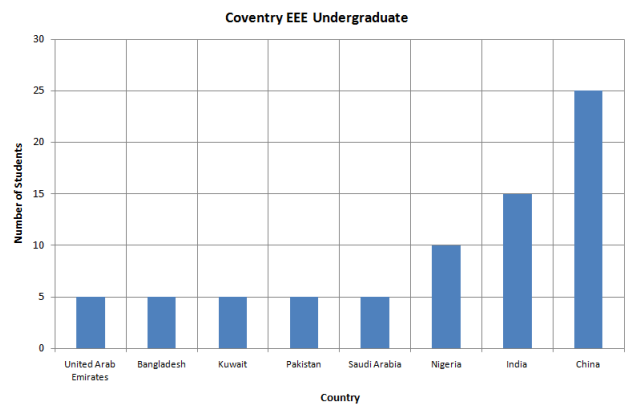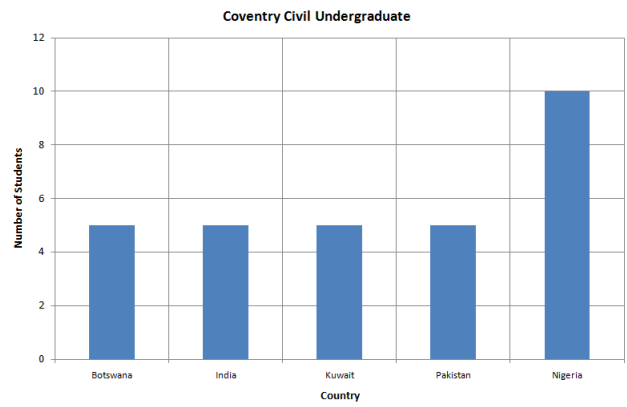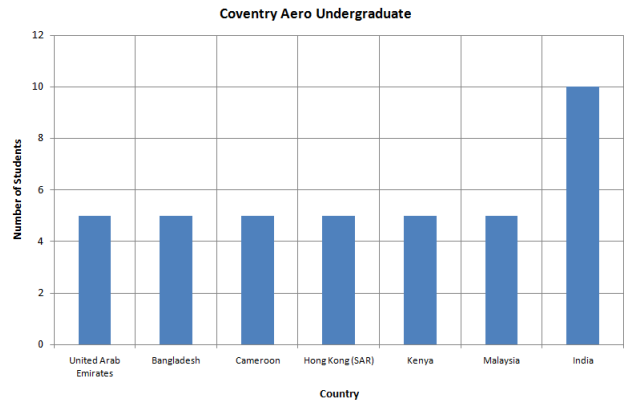
Coventry Aero Undergraduate

Coventry Civil Undergraduate

Coventry EEE Undergraduate
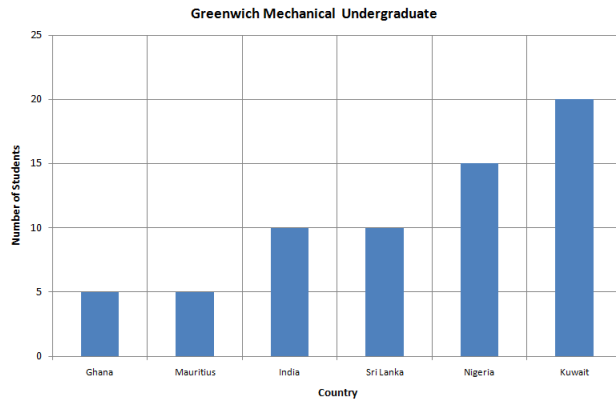

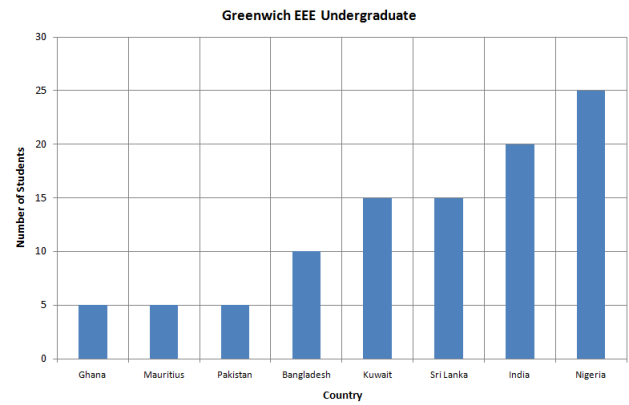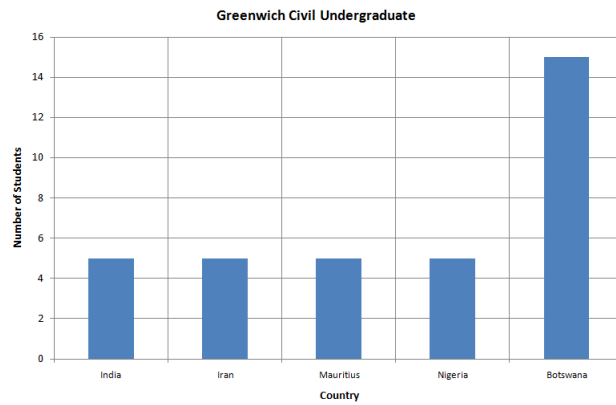Coventry Mechanical Undergraduate

TIS: An engineering perspective with a focus on group and project-based work.

The University of Coventry: Postgraduate

Coventry Civil Postgraduate

Coventry Mechanical Postgraduate

Coventry Production Postgraduate
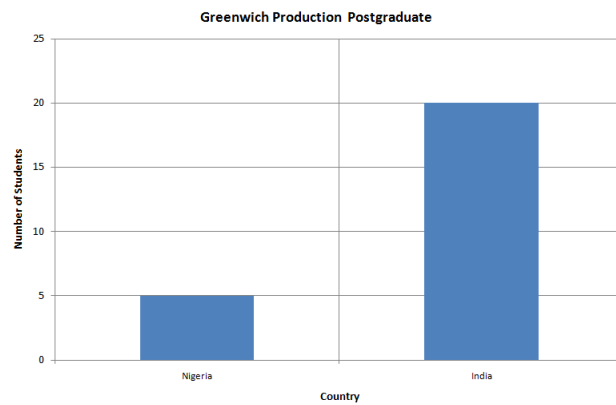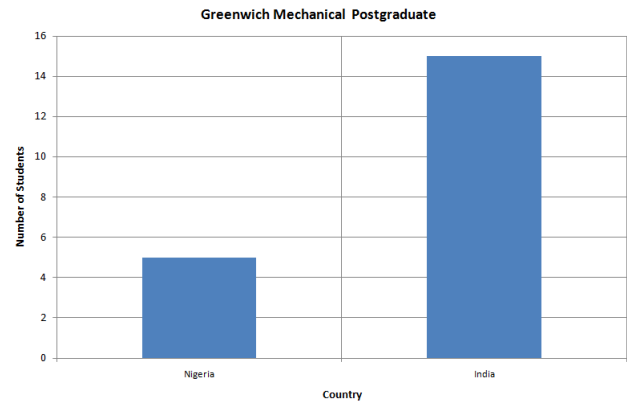
TIS: An engineering perspective with a focus on group and project-based work.

- 7 -
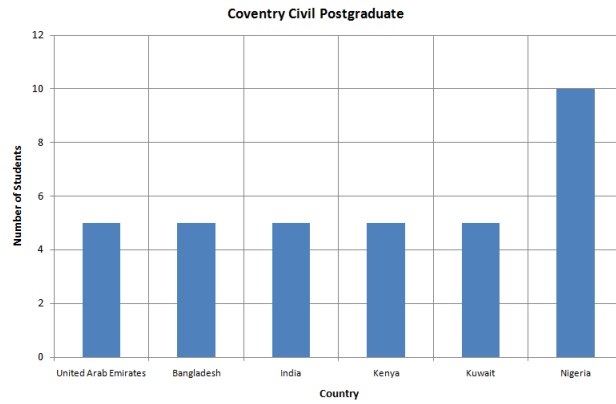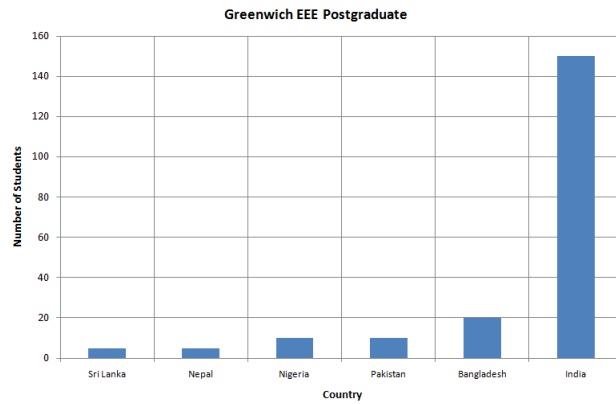
The University of Greenwich: Undergraduate

Greenwich Civil Undergraduate

Greenwich EEE Undergraduate

Greenwich Mechanical Undergraduate

TIS: An engineering perspective with a focus on group and project-based work.

The University of Greenwich: Postgraduate

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Imperial Chemical Undergraduate

Imperial Civil Undergraduate

Imperial EEE Undergraduate

Imperial Mechanical Undergraduate
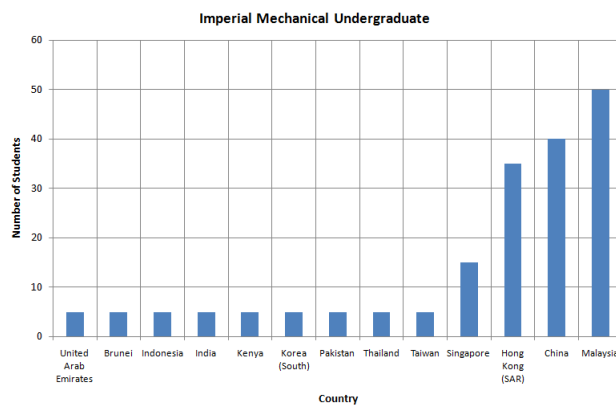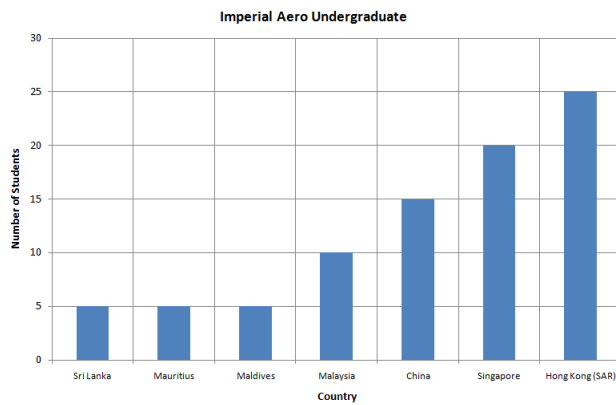
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Imperial Chemical Postgraduate

Imperial Civil Postgraduate

Imperial EEE Postgraduate

Imperial Mechanical Postgraduate
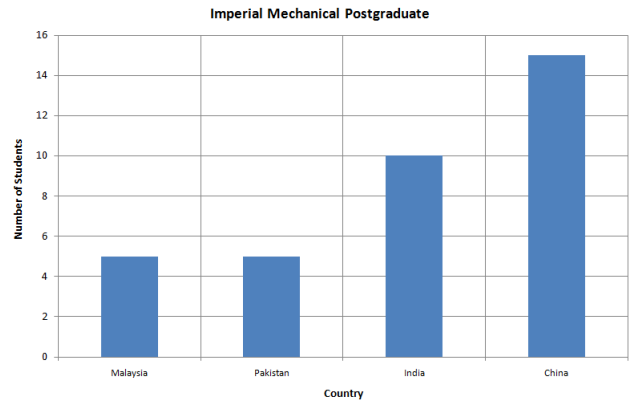
The University of Liverpool: Undergraduate

Liverpool Aero Undergraduate

Liverpool Civil Undergraduate

Liverpool EEE Undergraduate

Liverpool Mechanical Undergraduate
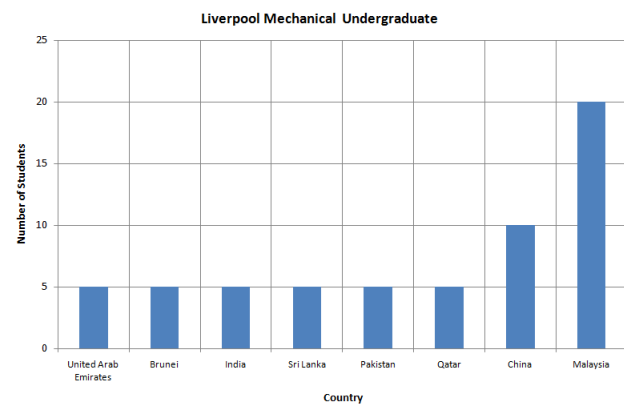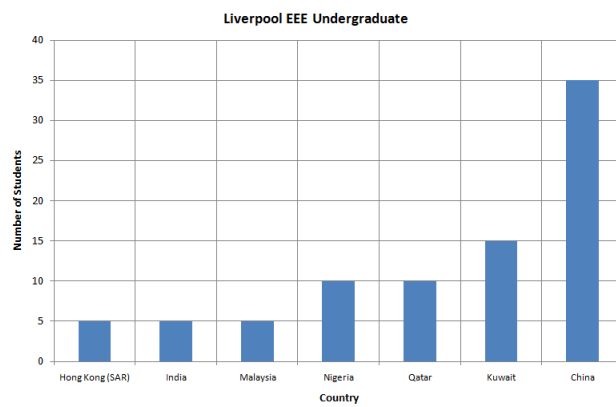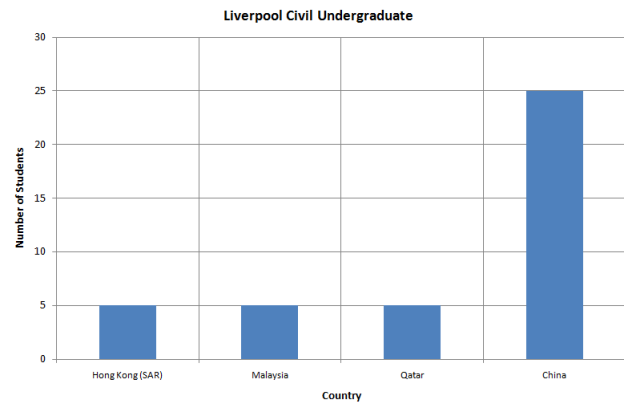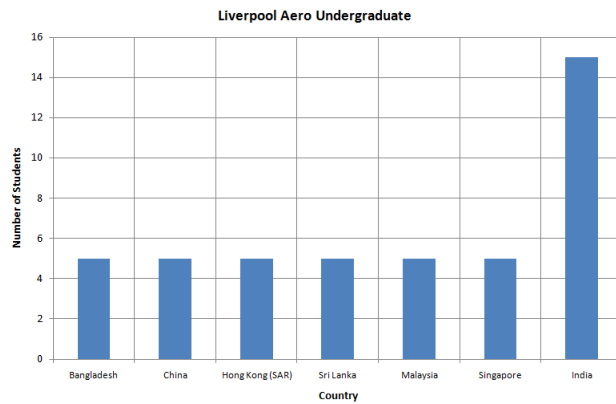
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Liverpool EEE Postgraduate
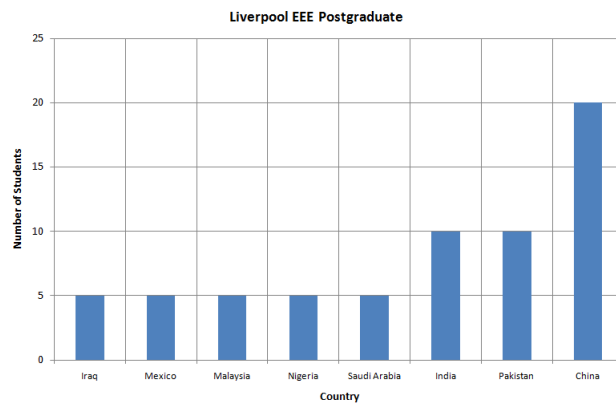
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Loughborough Chemical Undergraduate

Loughborough Civil Undergraduate

Loughborough EEE Undergraduate

Loughborough Mechanical Undergraduate
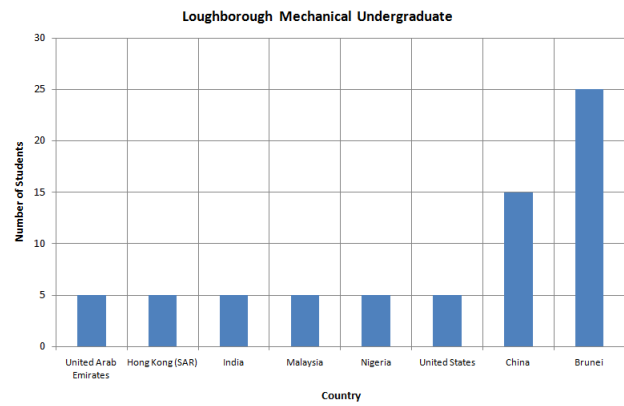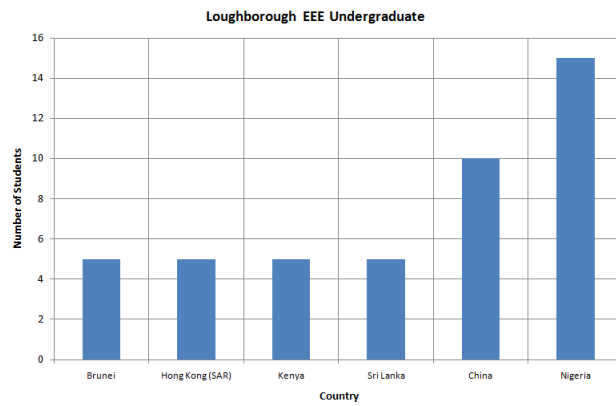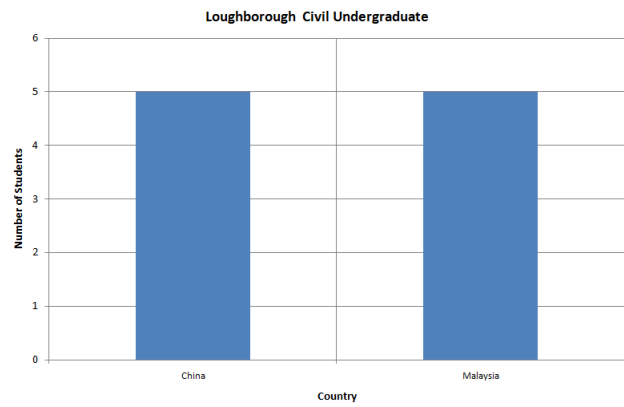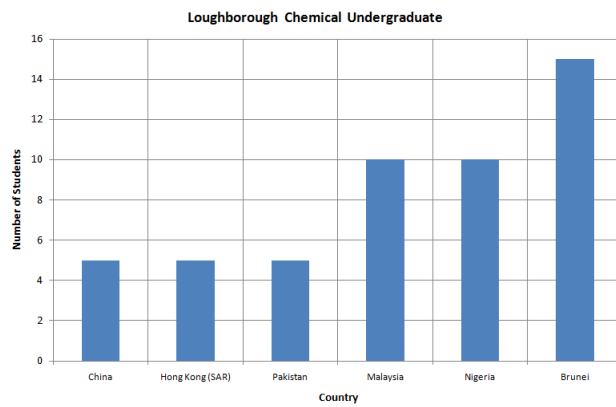
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Loughborough Chemical Postgraduate

Loughborough Civil Postgraduate

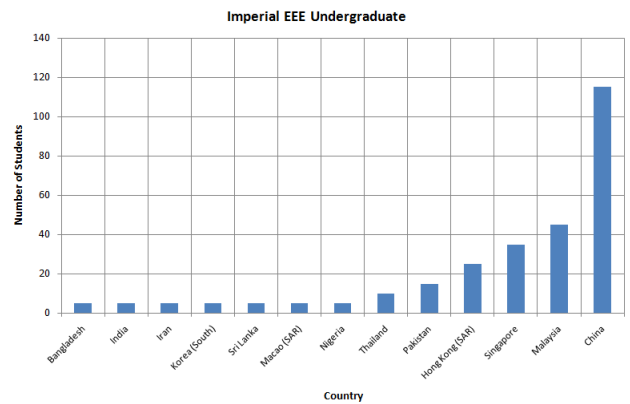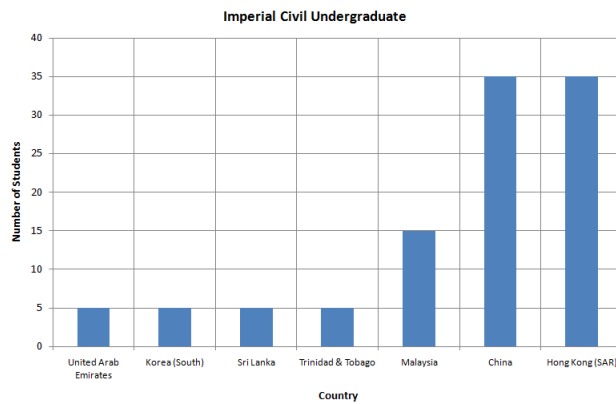**Loughborough EEE Postgraduate**
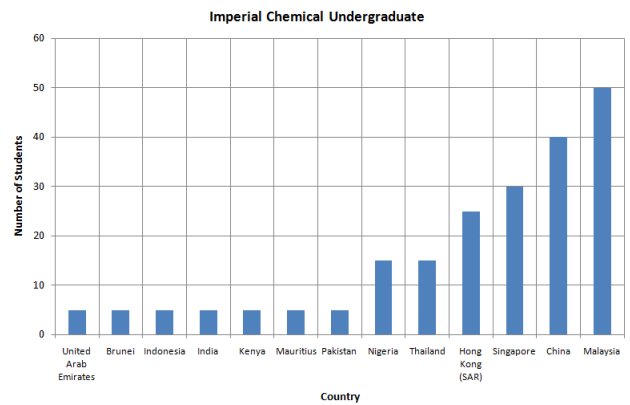
Loughborough Mechanical Postgraduate

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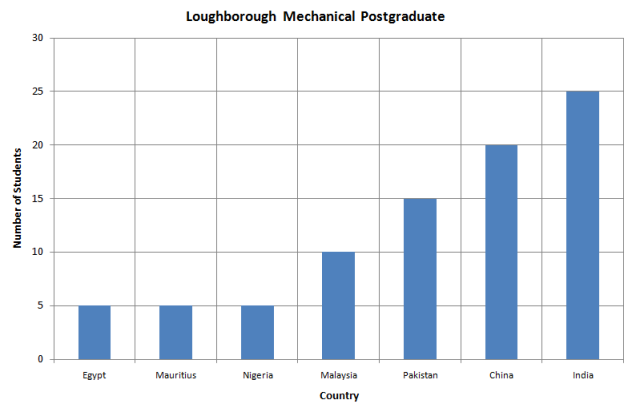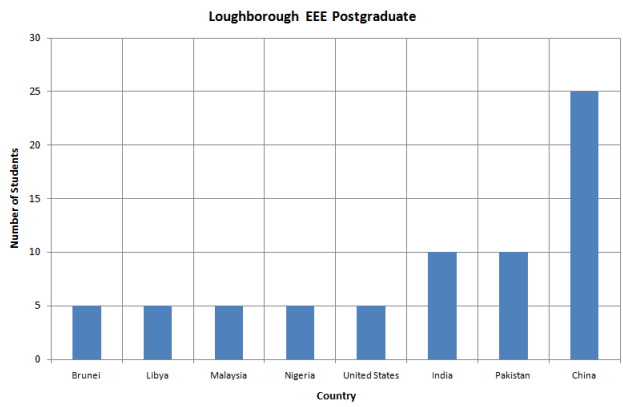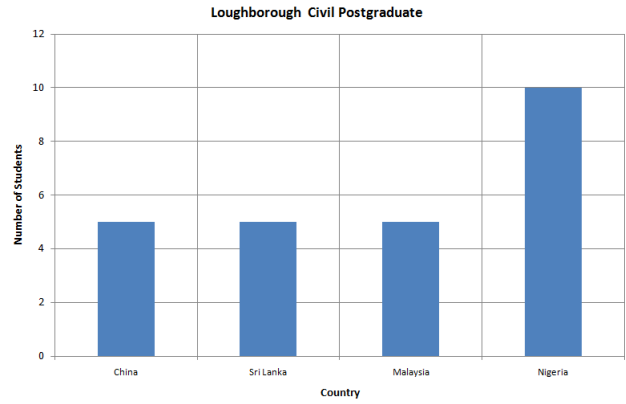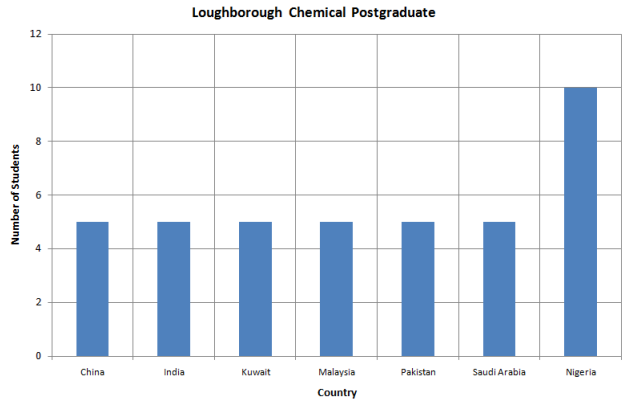
The University of Manchester: Undergraduate

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Manchester Chemical Undergraduate

Manchester Civil Undergraduate

Manchester EEE Undergraduate

Manchester Mechanical Undergraduate
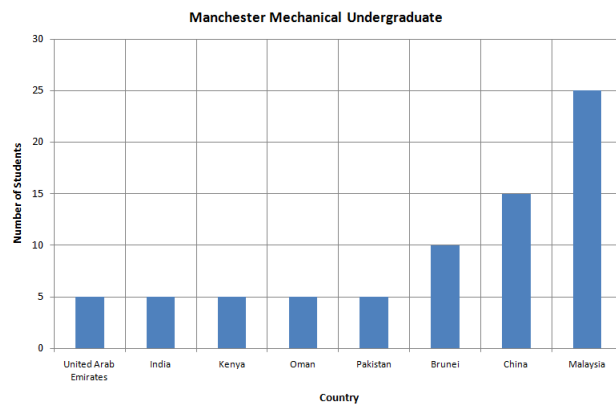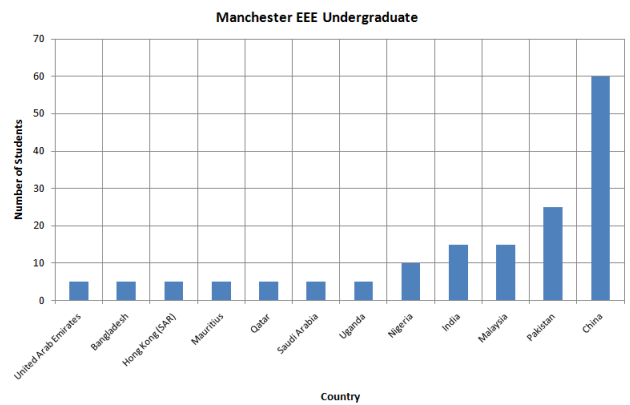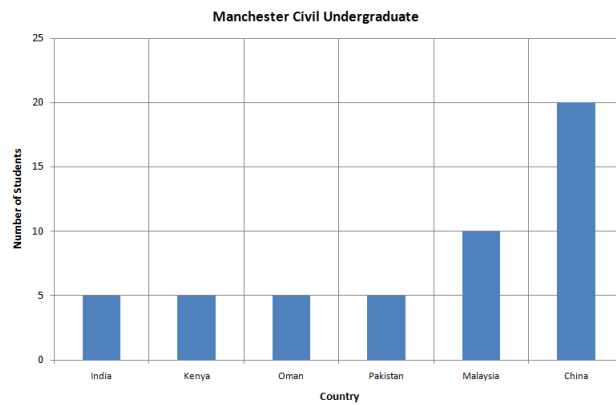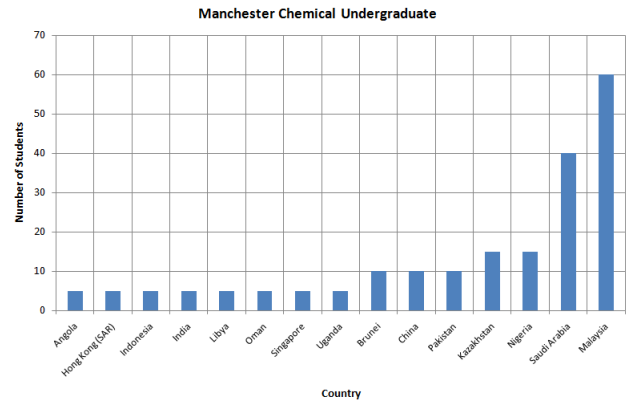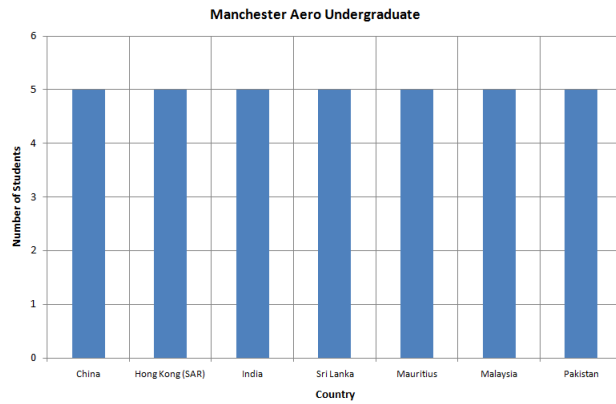
The University of Manchester: Postgraduate

Manchester Chemical Postgraduate

Manchester Civil Postgraduate

Manchester EEE Postgraduate

Manchester Mechanical Postgraduate

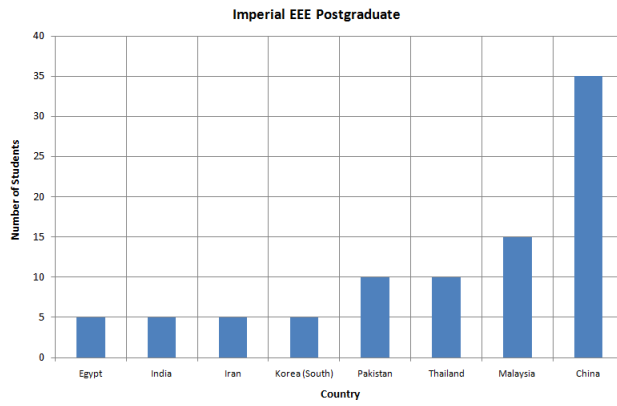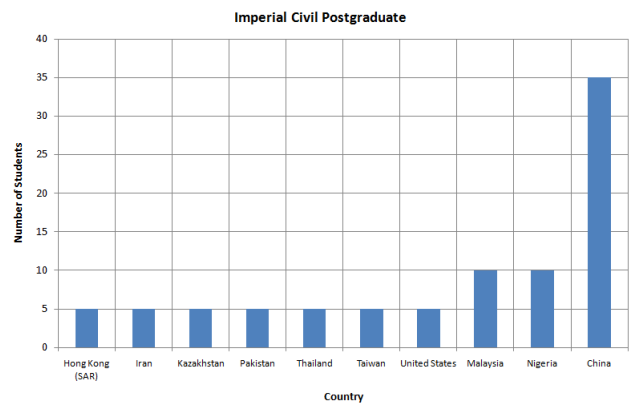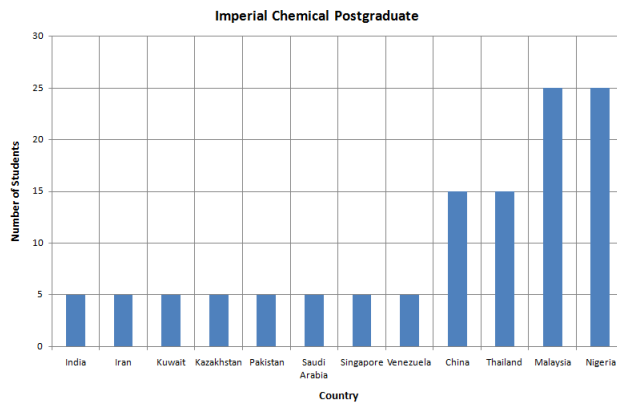TIS: An engineering perspective with a focus on group and project-based work.
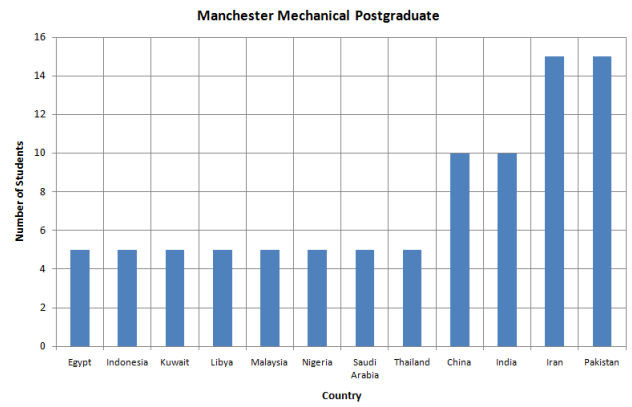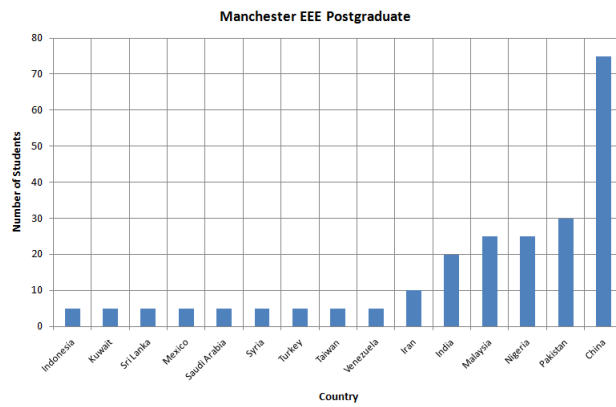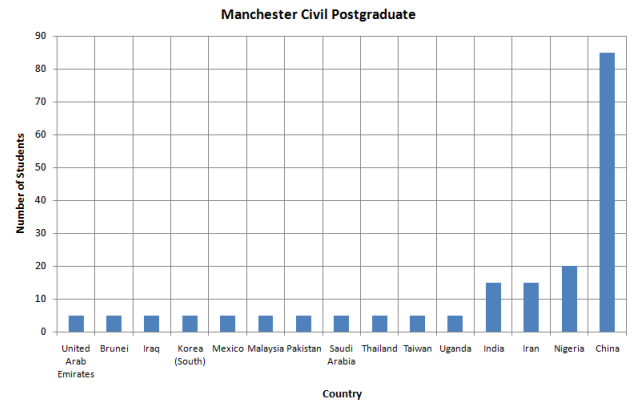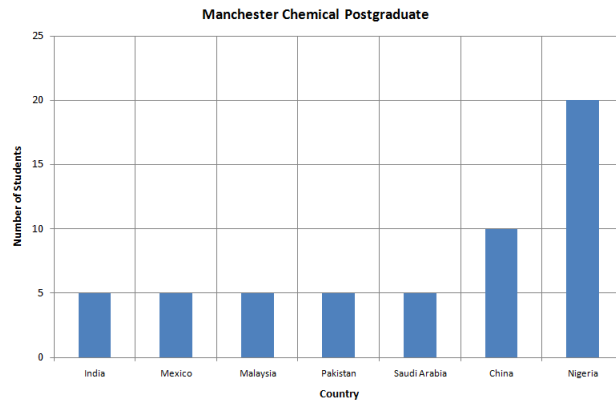
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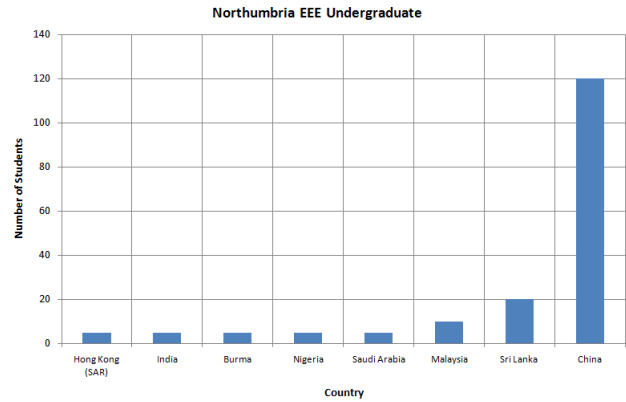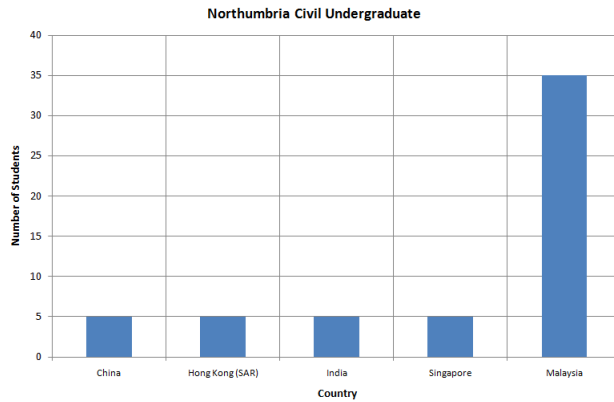
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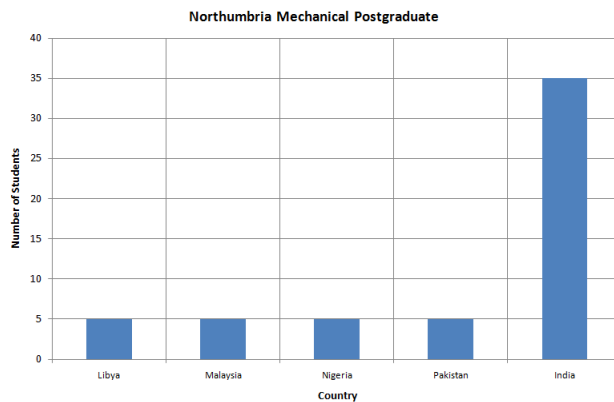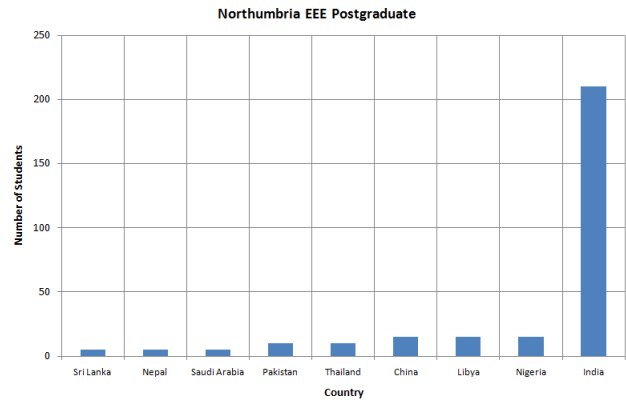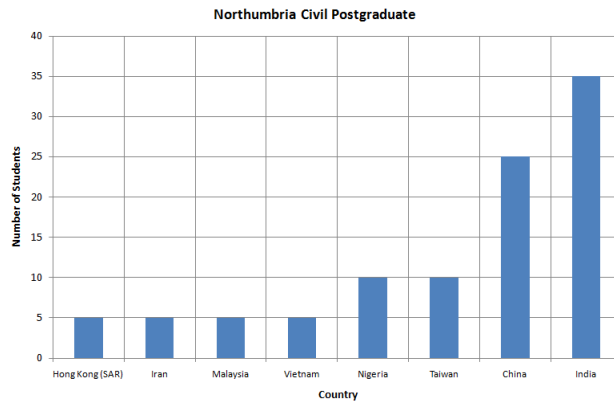
The University of Nottingham: Undergraduate

Nottingham Chemical Undergraduate

Nottingham Civil Undergraduate

Nottingham EEE Undergraduate

Nottingham Mechanical Undergraduate

Nottingham Production Undergraduate

TIS: An engineering perspective with a focus on group and project-based work.
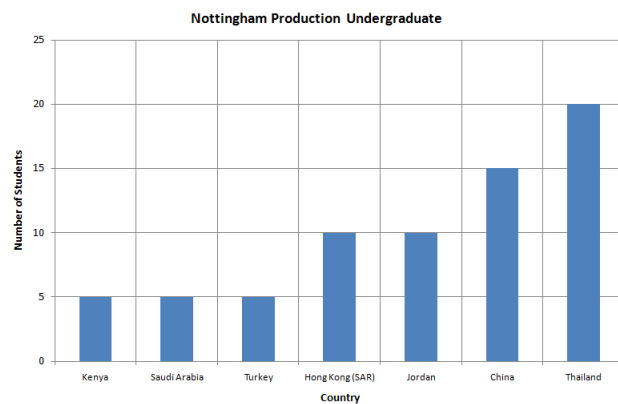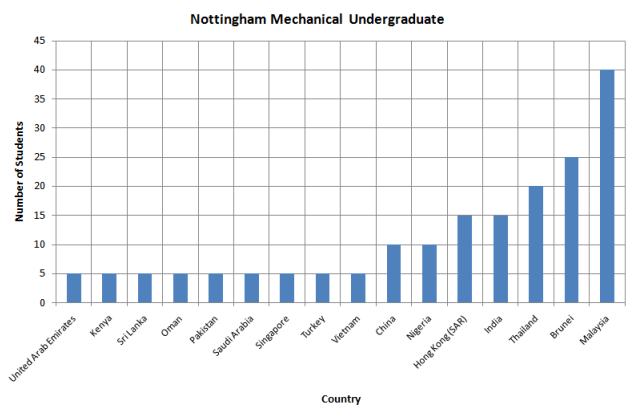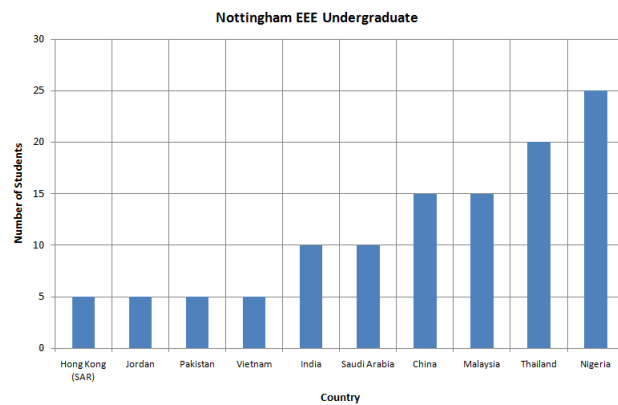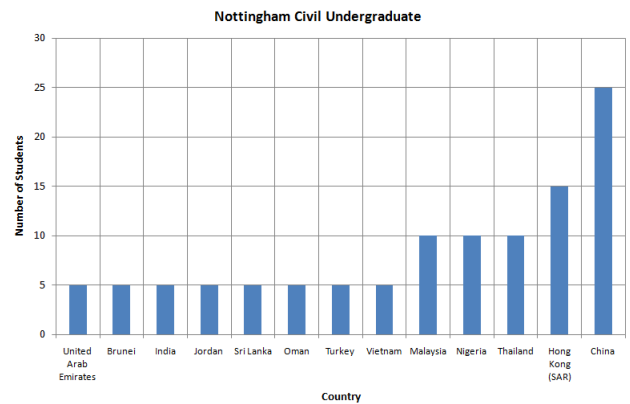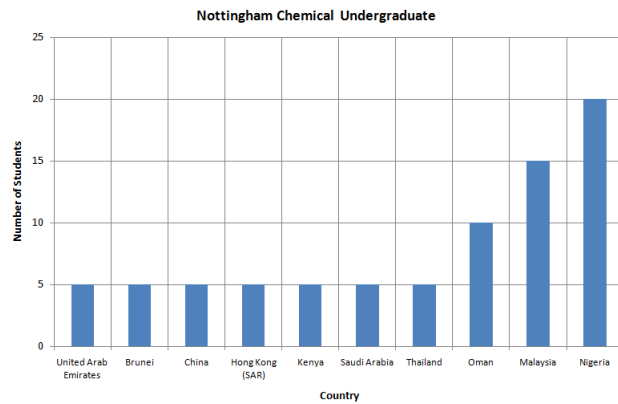
The University of Nottingham: Postgraduate

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Nottingham Civil Postgraduate

Nottingham EEE Postgraduate

Nottingham Mechanical Postgraduate

Nottingham Production Postgraduate

TIS: An engineering perspective with a focus on group and project-based work.
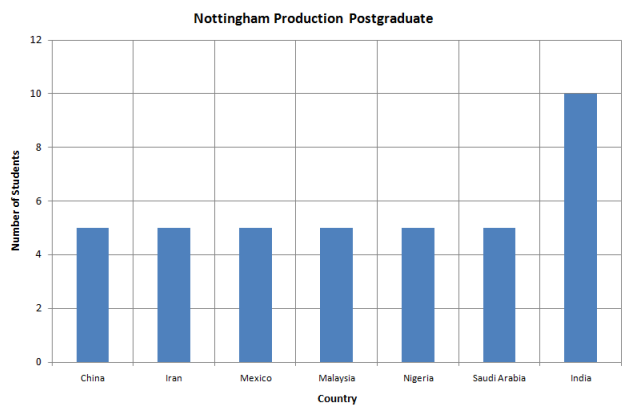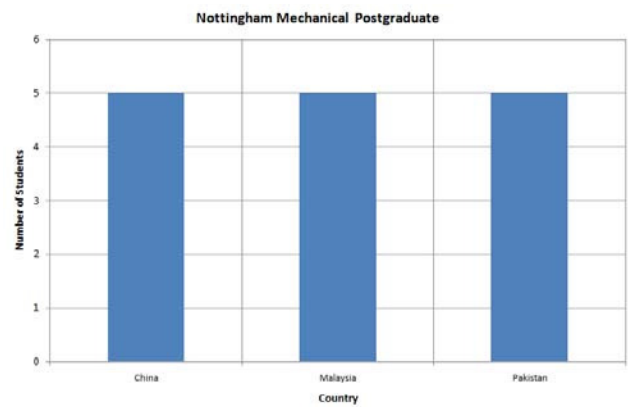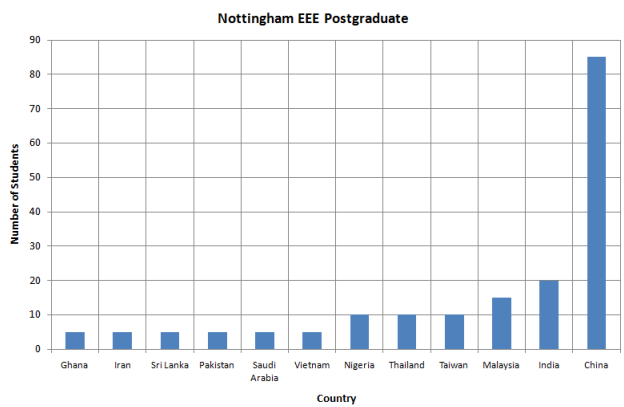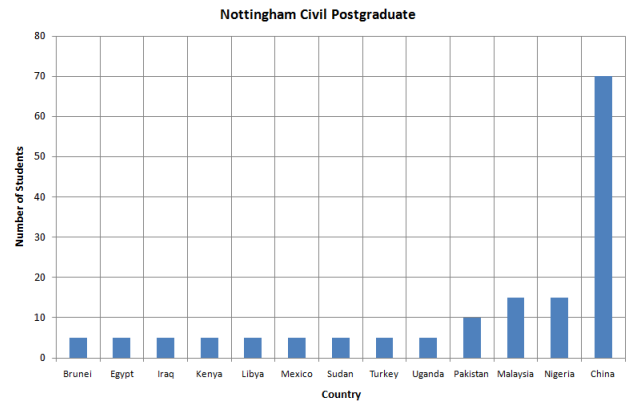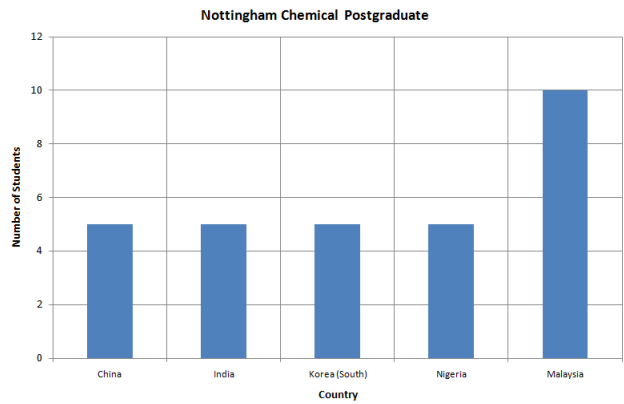
The University of Sheffield: Undergraduate

Sheffield Aero Undergraduate

Sheffield Chemical Undergraduate

Sheffield Civil Undergraduate

Sheffield EEE Undergraduate

Sheffield Mechanical Undergraduate

Sheffield Production Undergraduate

TIS: An engineering perspective with a focus on group and project-based work.
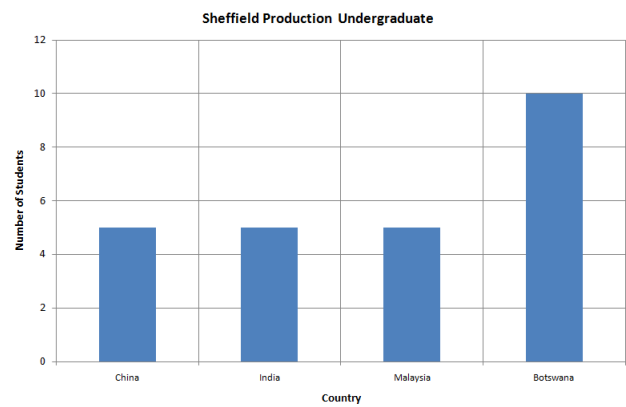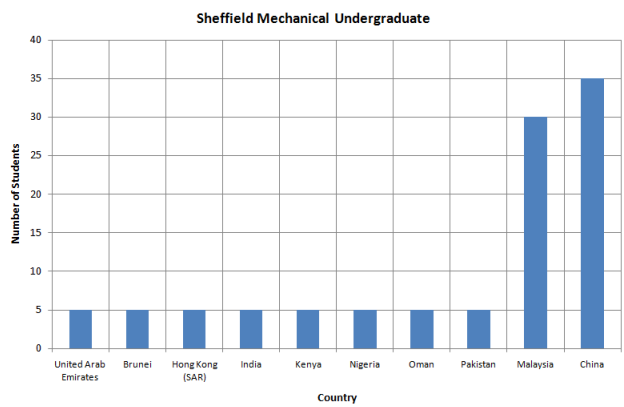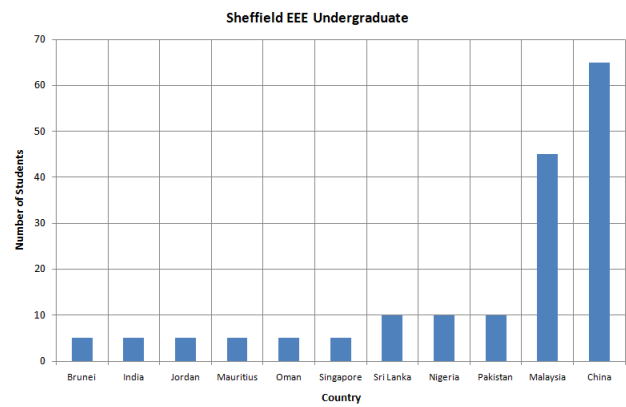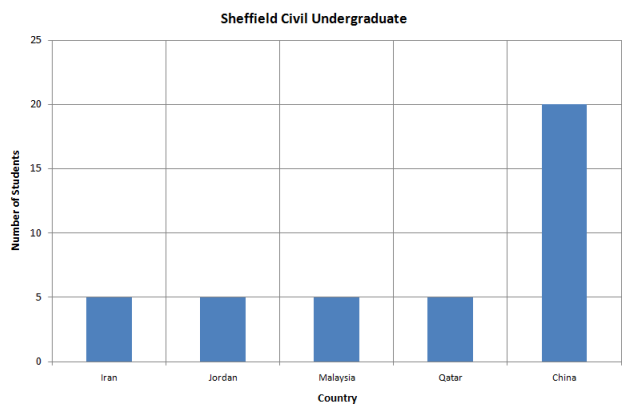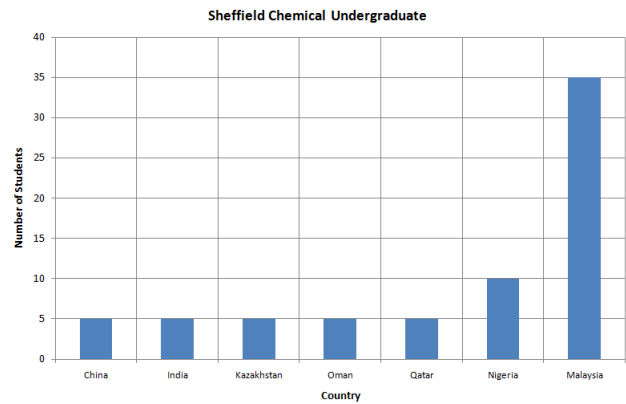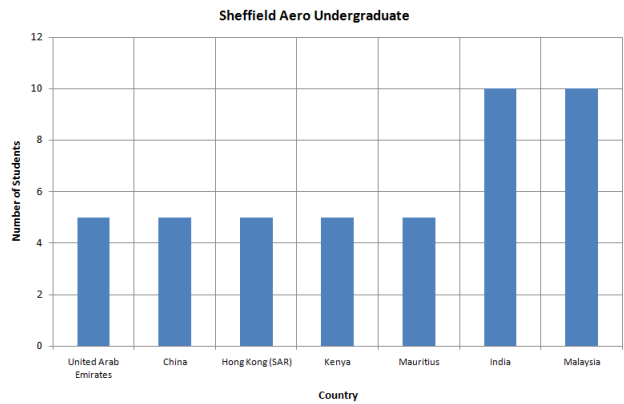
The University of Sheffield: Postgraduate

TIS: An engineering perspective with a focus on group and project-based work.
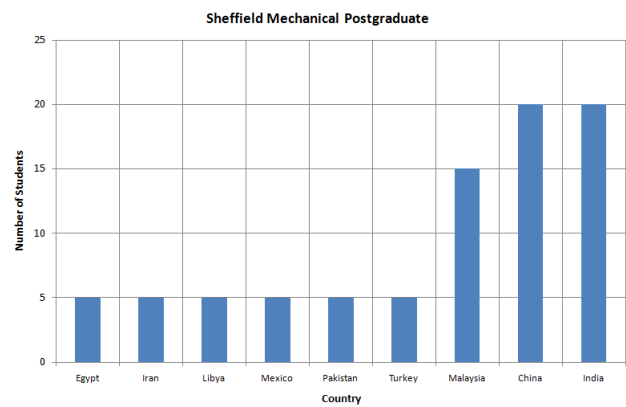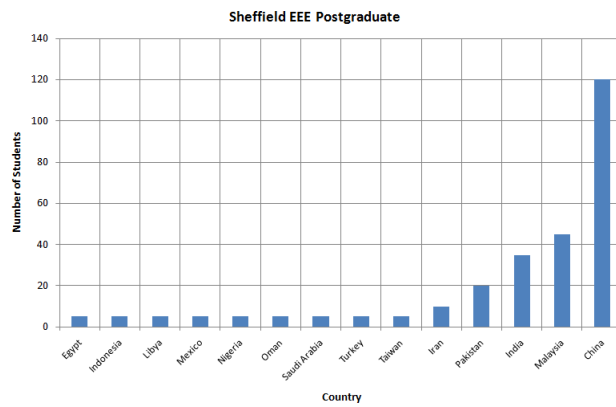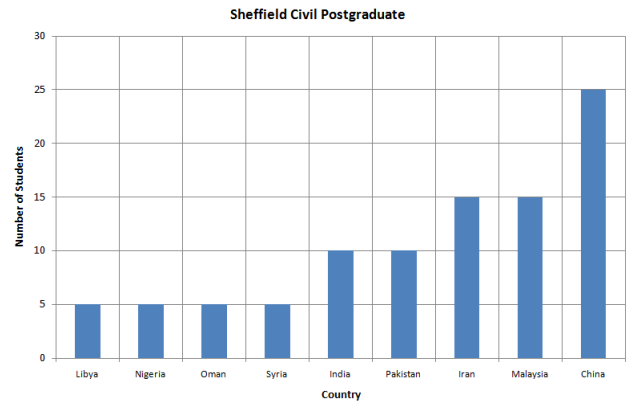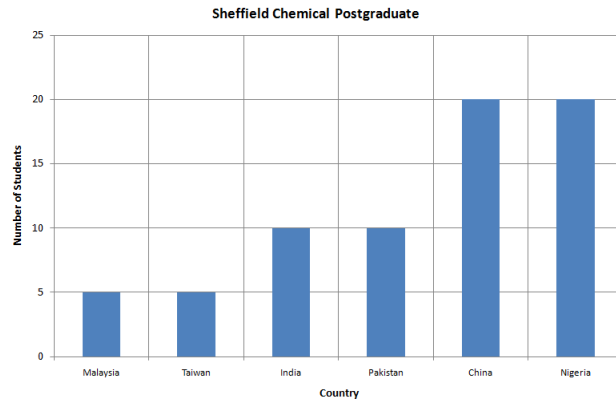
The University of Strathclyde: Undergraduate

Strathclyde EEE Undergraduate
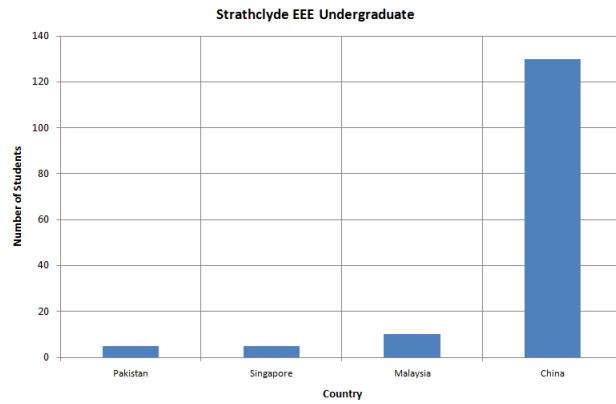
The University of Strathclyde: Postgraduate

Strathclyde EEE Postgraduate

Strathclyde Production Postgraduate
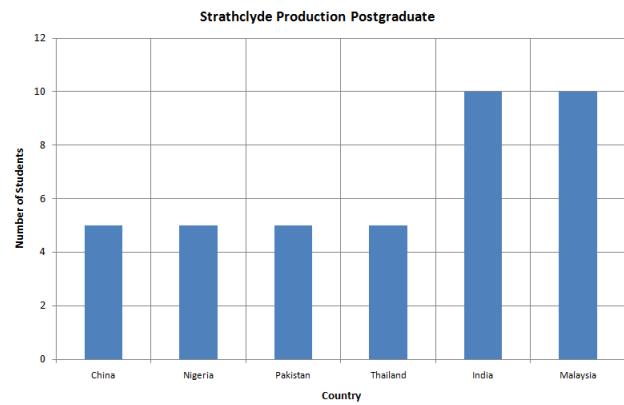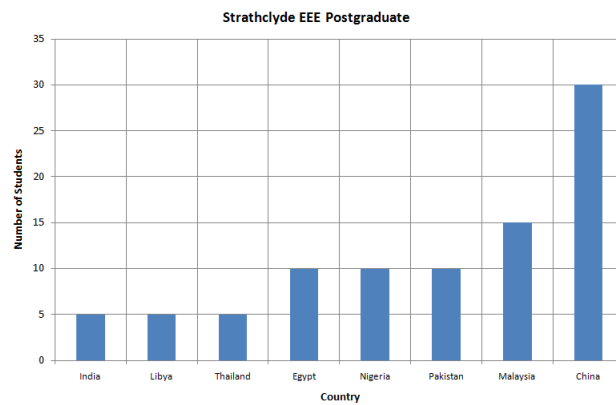
University College London: Undergraduate

UCL Chemical Undergraduate

UCL Civil Undergraduate

UCL EEE Undergraduate

UCL Mechanical Undergraduate
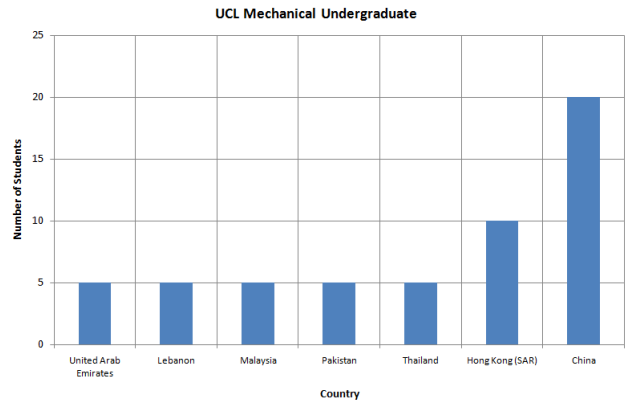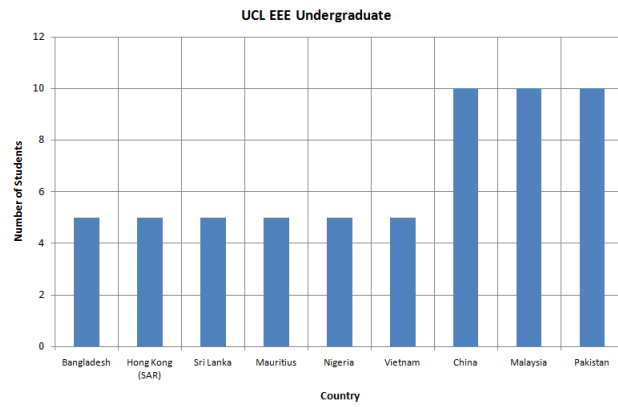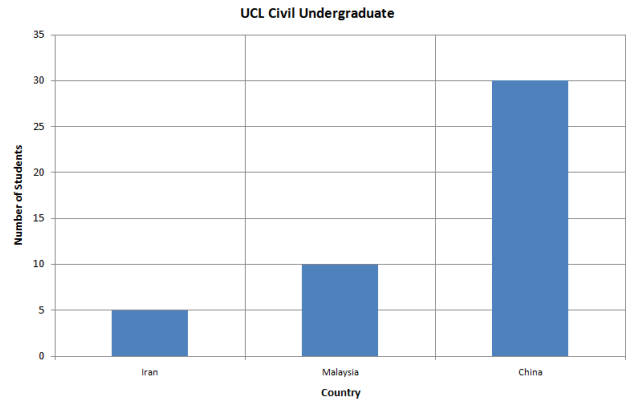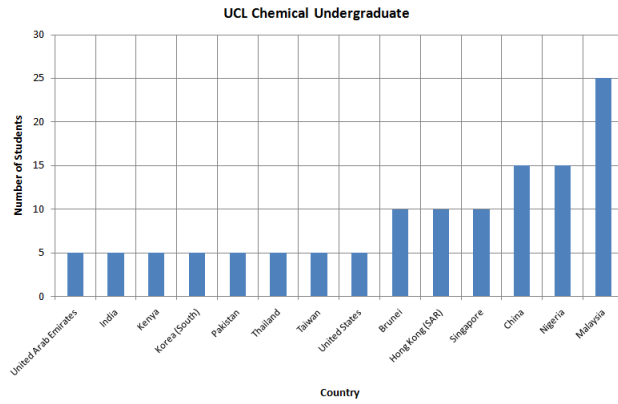
University College London: Postgraduate
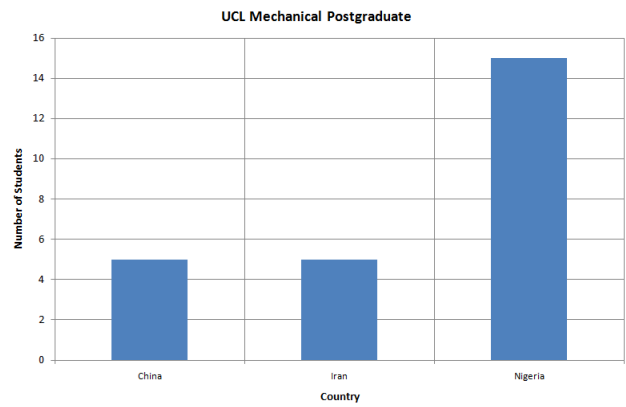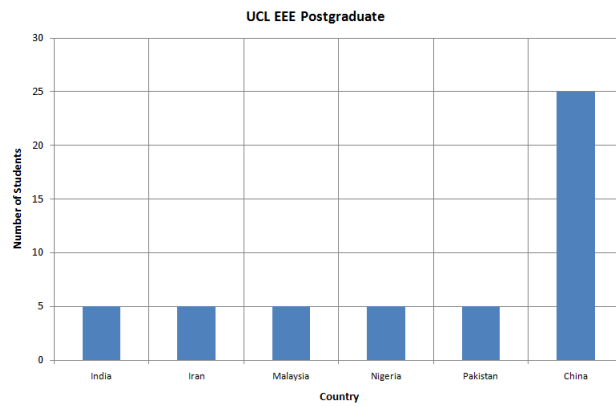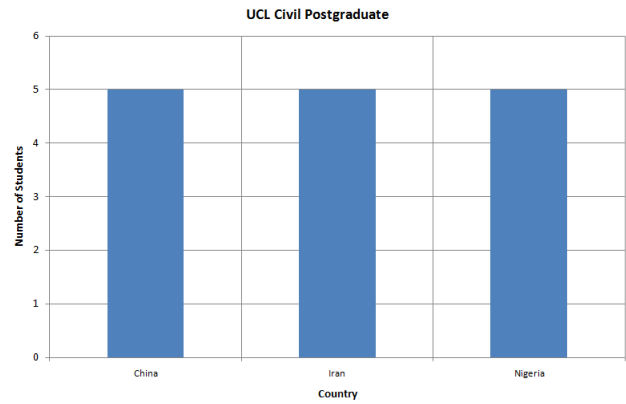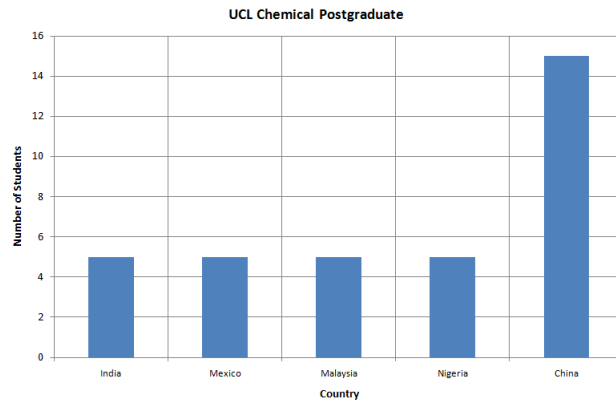
UCL Chemical Postgraduate

UCL Civil Postgraduate

UCL EEE Postgraduate

UCL Mechanical Postgraduate

Appendix 2: Interview questionnaire template

The questionnaire is structured into three parts: a background, a resumé of group- and project-based working, and a reflection on current practice. Participants engaging in the questionnaire will also be offered the opportunity to write-up their discussions as a Case Story, for inclusion into the Teaching Guide and/or the TIS Project repository of resources.

A. Background
1. Describe your course(s)
[discipline, award, student numbers/mix (origin, ethnicity, gender, age), accredited?, teaching approach(es), assessment practice(s)]

2. What do you provide (if anything) which is intended or customised toward international students?

3. What do you provide (for all students) in terms of academic and pastoral support?

B. Group and Project Working
1. Do your students undertake:
      a. Group work
      b. Project work
      c. Project-based group work?
[overview of practice]

2. From 1, what is your policy on the formation of groups?
[self-select, allocated randomly/alphabetically…]

3. What practices do you have in place to support students in group- and project-based working?

4. For Q1-3 above, what do you do (if anything) which is intended or customised toward international students?

5. Give anecdotal experiences (+ve and –ve) of working with international students in group- and project-based working

C. Reflection
Reflect on your response(s) to Q5 above, and indicate your recommendations which you have either adopted or plan to adopt to accommodate your experiences:

1.

2.

3.

Would you be willing to write-up your experiences as a Case Story, for possible inclusion in the Centre's pending Teaching Guide and/or the TIS Project repository of resources on Teaching International Students? [please tick one or the other]

TIS: An engineering perspective with a focus on group and project-based work.

□   Yes

□   No

Thank you for your time in completing this questionnaire. A transcript of your responses will be made available in the near future.

Simon Steiner – Academic Advisor
Andrew McLaren – Centre Associate

Appendix 3: Case Studies

1. University of Birmingham, Mechanical Engineering. David Hukins

Context

Approximately, 50 home students and 10 international students are recruited to the BEng and MEng courses in Mechanical Engineering at the start of the first year. Further cohorts of international students are recruited at the start of the second and third years. The international students joining for the start of the second year (~10 – 20 students) are mainly from Chinese Universities. These students mainly register for the BEng degree, so remain at Birmingham for two years. The cohort of international students that join in the third year are from Taylor's University College in Malaysia and from Amirkabir University of Technology International Branch in Iran, where they have been taught the first two years of the Birmingham course under agreement. These students tend to be registered for the MEng programme.
There is the usual mix of lectures, group work, enquiry-based learning etc.

Integration of international students into UK culture, University and Department

There is a thorough induction week. Staff make regular visits to Taylor's University College in Malaysia and to Amirkabir University of Technology International Branch in Iran to enable the local staff to prepare their students for coming to the UK. When David visited Taylor's he gave a presentation on Birmingham to their students.
Very little is done specifically for the Chinese students as these tend to be highly motivated and increasingly with good English language skills. The Iranian students tend to be the ones who need additional English coaching despite having the 'International English Language Testing System' (IELTS) requirement of seven. For these students there is a standard University course but this may not be ideal.

Teaching/pastoral activities that benefit all students

All students have a personal tutor and access to a 'welfare tutor', if they need specialist help for any issues and problems that are beyond the compass of the personal tutor.

Group and project-based work activities (that benefit all students)

Third year students do a group design project of their own choosing. Students also do individual final year research projects. These are worth 30 credits for BEng students and 60 credits for MEng students.
Group selection: This is fairly random but they ensure that overseas students are evenly distributed among the groups. The students from Iran tend not to work well in distributed groups, so last year these were placed in their own groups: *"The only exception to that last year was a group from Amirkabir University, the Iranian university, who tend not to really co-operate very well, so we actually put them in groups of their own, to force them to actually work together, do something as a group."*

Support: The third year design project groups have a group supervisor that they see typically once each week to review progress. As far as possible they try to treat all students equally: *"...our policy is to treat everybody exactly the same as far as possible, irrespective of where they come from."*

Activities tailored to the needs of international students for general engineering education

Nothing described.

Activities tailored to the needs of international students specifically for group and project-based work

None. All students receive the same support.

Issues with or for the education of international students that need to be addressed

Overseas students, not only from Asia but also from Europe can often experience difficulties in tackling and solving open-ended problems. *"...they actually find the whole idea of working on something which is not that clearly defined very difficult and they often need a lot of help and advice and suggestions and quite a lot of hand holding."*
David thinks it is very important to make sure that groups are working cohesively and that international students whose first language is not English are not being marginalised. He feels this can only be addressed by discussing with the groups how they are working together and assessing their responses. It is important to do this at a stage when it is still possible to do something about any issues that arise.

Use of international students as a resource

Nothing mentioned.

Benefits, opportunities, future issues for home students

Nothing mentioned.

2. Coventry University, Department of Engineering and Knowledge Management. Christopher Smith.

Context

There are a wide range of courses and student types involved from foundation degree courses, through undergraduate to postgraduate programmes. There are a number of 'top up' courses based around the European market, where students come from France, Spain, Germany etc directly into the final year of courses. There are a substantial number of these students each year and they form one of the biggest challenges that the department faces: *"it's around that issue of you haven't had these students for two years and making them aware of what we expect in the UK, what we expect here at Coventry University and in the department. And also you have a variety of English skills."*
Not only are students coming in from different country backgrounds but also from different disciplines, such as aerospace engineering, innovation and entrepreneurship type courses, marketing or economics type backgrounds. They tend to be coming in to learn the technological aspects but also to develop their proficiency and fluency in English. In the European Engineering Business Management (EEBM) course there are 260 students in the final year this year, all of which are non-UK students. The four final year mandatory modules on this course are: Project Management; English; Manufacturing Business Organisations, which is looking at business strategy and the functional strategy of an engineering or technological organisation; and a group project module. The compulsory English module is taught by the Business School and is done in association with direct entry students to the final year of the Business School programmes. Discussions are currently taking place amongst the leaders of these compulsory modules to see whether they can be better integrated. To this end it has been suggested that the compulsory English module may need to be targeted specifically for engineers in the future. Apart from the four compulsory modules, there are a range of electives from which students have to take two. These include Industrial Marketing; Total Quality Management; Financial Management of Manufacturing Systems; and Entrepreneurship.

Students are assessed in a variety of ways. The Project Management module was assessed totally using coursework this year. A part of this coursework was assessing basic knowledge and then there was a groupwork project. This was because project management is by its very nature a groupwork activity. Finally, there was an individual critical reflection on the project. The group project module is year long with the students having to develop a business plan and a new product. The English module is assessed using various types of coursework: presentation skills, writing skills, summarisation skills: *"trying to assess the underpinning skills that hopefully will support the students in the future but also what they do with us."*

Integration of international students into UK culture, University and Department

A lot of the courses are predominantly international and there is an ongoing process of discussion towards ensuring that these students settle into the University. Currently, there is a week long induction process in which a lot of information is provided. Chris feels that this may be too much like throwing the international students in at the deep end and seeing whether they sink or swim. There are discussions as to whether the induction process should perhaps be extended, particularly for the international students, to three or four weeks to give these students a gentler introduction to the working processes at Coventry.

At Masters level there is work in progress to make information on study skills and working expectations available to potential international Masters students before they come to Coventry. *"So trying to show them the types of things we're going to ask them to do."* It is not yet clear how this is going to be achieved technically. It could be particularly functional if this were to be provided via the University's virtual learning environment (VLE) but it is appreciated that some countries may not have the appropriate infrastructure to enable feasible or sufficient access to the internet. It is felt that this advanced support could help those students that struggle with the different requirement that is made on students taking the 'Research Methods and Study Skills' course at Masters level. Here they will be working towards a Masters dissertation and so will be asked to define what it is they intend to do and how they are going to tackle it. This approach may differ markedly from some student's expectations of receiving knowledge within a framework where learning outcomes are tightly defined.

At Foundation degree level students come from a wide range of countries, with the examples of India and Bulgaria mentioned from last year's intake. At this level, groupwork was used to try to help these students integrate with UK students and to familiarise them with expectations at Coventry.

Teaching/pastoral activities that benefit all students

Courses all have dedicated programme managers that have a responsibility for their student group. Additionally, in those modules that have project work there will be academic support providing a mentoring role. There are also course tutors allocated to groups of students who meet on a regular basis.

Group and project-based work activities (that benefit all students)

On the EEBM course there is the compulsory group project module. This project involves developing a business plan and the assessment is based on seven small reports and an oral presentation. There are proposals though to break the process down into ~7 smaller logical stages for next year, so that students receive more regular feedback.

In the first year of the undergraduate programmes, Coventry has introduced 'activity-led learning' as the initial stage in a major move towards Activity Led Learning. The first six weeks of the year are entirely devoted to group project activities. The students find this very intensive and demanding with the students providing positive feedback. The danger may come from the subsequent emotional trough after such a highly intensive activity, for both staff and students alike: *"We'll have this great experience and then we're going back to our normal way of teaching."* Despite this, the intention is to roll out this type of learning approach to subsequent years in the degree programme. Also, the intention is for this integrative, activity-based approach to extend further across the year.

Group selection:
This varies for different projects. In the EEBM with the group project module the large cohort is broken down into subsets so that there is interaction between the various nationalities and that students come from a variety of subject backgrounds. These subsets may then have some self selection in forming the final groupings.

At Masters level a variety of methods are used. In some cases structured techniques are used, sometimes using personality traits, such as Belbin-type team roles or Myers-Briggs, in other cases students are just allocated into groups based on where they happen to be sitting in the

room. This is often a reflection that national groups sit together so tutors encourage students to meet those from different countries through group work with the aim that they develop a more rounded, international perspective.

<u>Support</u>:
There is Faculty guidance available for groupwork aimed at both staff and students. This is available to both groups on the University's intranet and the version for students can be distributed in hard copy format at the start of group project work.

Within the Masters programme, there is groupwork in many of the modules. This has presented time management problems for students needing to meet with the different project groups. To facilitate this, the courses have time-tabled slots for when their project groups can meet.

<u>Activities tailored to the needs of international students for general engineering education</u>

The high proportion of international students on the courses described means that virtually everything is targeted to the needs of international students.

<u>Activities tailored to the needs of international students specifically for group and project-based work</u>

More group work has been introduced into courses over the last year, particularly at Masters level. The experience has been that a lot of the international students have taken time to adjust to this way of working. Reflection on this has led to the conclusion that perhaps things need to be approached differently. There needs to be more explanation on what effective groupwork is and why it is being used. There needs to be an introduction to the department's teaching and learning strategy and the requirement for students to employ critical analysis and evaluation processes and what these mean: *"Trying to … get them to see that means moving beyond regurgitation. It means that you have to … personalise this [knowledge] and part of the way … of personalising that is to, within a group, which should be relatively risk-free if it works well, is exchanging ideas, engaging in a dialogue with fellow students about ideas and debating them and trying to come to a better understanding."*

The student groups can still thwart the intentions of the academic who is introducing groupwork for developing a learning community. The students may find it more expedient to divide the task into separate components that individuals tackle independently. Consequently, academic staff may need to deliberate on how they can set tasks that will require the students to work co-operatively together in the group

<u>Issues with or for the education of international students that need to be addressed</u>

An unusual issue with the EEBM course is that there is often a predominance of French students and, consequently, the effective language being used in some groups may well be French, rather than English. In these instances non-French speakers may become disadvantaged.

There can be cultural expectation issues, where some students are too deferential to the lecturer. They have come from a background where they are expected to listen and not ask questions until the end. This raises further difficulties when trying to engender dialogue with the student group and develop an interactive session. *"…some of the students don't know quite how to adapt to that, in terms of; 'You're the expert. You're supposed to tell us, not get us engaged in*

that dialogue.'" From a contrary perspective, other international students can be very good at interactive situations: *"You tell them and show them that they can interact in the classroom and they enjoy that."*

A number of issues relating to the marking of individual contributions to group project work were raised. The need for fair treatment of all students and the difficulties posed by dominant individuals in groups were mentioned. Some students, particularly at undergraduate level, have really appreciated the group work: *"I think in part because the coursework and the assignment they were set were interesting and relevant and challenging…it comes back to the fact that it's relevant to what they want to take out of this year, it fits with their motivation for coming here and stands them in good stead for when they go back, or on to further studies."* At Masters level there have been more negative experiences with trying to define individual marks within a group dynamic: *"How do you ensure equal contribution, or how do you ensure that individual contribution is recognised?"* There is the use of peer assessment but this can generate biased marks. Some students show a reluctance to assess their peers and there has even been the hint of coercion by some dominating individuals. In either case skewed distributions of grades are produced that may not reflect accurately individual contributions. Chris questions the validity of just using Likert scale grading for peer assessment and described some work by Ann Gardner in Australia where students were asked to provide constructive feedback for the other members of their group, indicating what they did that was good, what was OK and possibly also where they fell down. Chris thinks this might be a positive approach to introduce. In any case discussions are taking place within the department, particularly amongst the programme managers at postgraduate level about how to give the students a clearer understanding of what is expected from them in terms of group working and peer assessment.

There has also been some pressure from the students themselves, through the student consultation process, requesting the academics to use a single, consistent process for the assessment of groupwork activities. While appreciating that students might prefer a consistent process, this may not be appropriate for all types of groupwork: *"If you are assessing specifically group work as part of your intended learning outcomes then obviously there needs to be an effective way to do that. If you're using group work as a working practice, then you might want to put it [peer assessment] in there such that you can be fair to all the students in terms of giving them an individual mark and therefore by that token how you gather that information might differ."* It is necessary then to explain more clearly to students what is the role of the groups, why this method is being used and how they will be assessed: so explaining why the groupwork is appropriate for the type of learning that is expected.

Use of international students as a resource

Nothing mentioned.

Benefits, opportunities, future issues for home students

Nothing mentioned.

TIS: An engineering perspective with a focus on group and project-based work.

3. Greenwich University at Medway, Systems Engineering. Alec Coutroubis.

The School has four departments: Systems; Civil; Computing; and Business, Information Technology and Enterprise (BITE). Alec is based in the Systems department but does teach some modules that are across the whole School, particularly at Masters level. An example here is Strategy and Management. This is taught to around 400 Masters level students per year, 200 in the first semester and 200 in the second. These class sizes are still too large to handle in single rooms, so the course is taught twice each week. The assessment for this course is all formative involving a number of case studies. Approximately 90% of the students on this course are from the Indian sub-continent, only 1% or 2% are EU students and the remainder are other non-EU international students. The course is designed for 'the global student'. The students are mainly male (~95%) and in their mid to late twenties.

Other courses that Alec delivers are also aimed at 'global' students and often with a business management dimension. The courses are European Engineering Enterprise, Environmental Engineering, and Global Engineering. *"Global engineering is about the challenges of running an engineering company globally."* The last two, Environmental and Global, are becoming increasingly popular, particularly with international students. The student recruitment demographic, though, has changed in recent years and so now the European course has lost popularity: *"…with the large population from the sub-continent, very, very few are interested in European affairs."*
The Environmental Engineering course has been converted to enquiry based learning involving groupwork, again using case studies. There is a higher proportion of females on this course. All the courses are accredited by the Engineering Council.

<u>Integration of international students into UK culture, University and Department</u>

The biggest challenge can be the need to change the learning styles of some international students. In some cultures students learn to read, record and memorise. The case study approach can have difficulties for these students, where creative thinking is required and there is not necessarily a 'correct' answer. The approach to counter this has been the repeated explanation of the learning process during contact time at the start of the degree programme: *"…where you keep telling them that there is no such thing as a right or wrong answer. There are logical answers, substantiated answers and non substantiated or illogical answers."*
A further challenge with a case study approach, is that if an example is presented from a named company, then students may be tempted to research the internet, for example, to establish what actually happened at the time, rather than developing their own thought processes: *"so it's not about telling a story, it's about critically analysing the facts that you've got and telling me what you think you should do next."* Again Alec uses the contact time at the start of courses to try and instill this critical thinking approach: *"So all that happens during the early tutorials…is more about encouraging them personally and being there to explain… than really providing any other kind of pastoral support because this is basically about changing their learning entirely, changing their learning style."*

<u>Teaching/pastoral activities that benefit all students</u>

As virtually all students are international students, particularly for the Masters programmes, then there was nothing specific to add in this section.

Group and project-based work activities (that benefit all students)

For the Strategy and management Masters programme the coursework consists of 11 mini case studies and a main case study. These are all group work activities. The final exam is another case study that they have worked on individually beforehand. The coursework case studies are designed to endorse or complement the lecture content, or to draw attention to material that is not able to be covered in the lectures. The single page mini case studies are given to the groups at the start of each tutorial session, one per session, while the main case study is worked on for an extended period. The groups themselves take a few weeks to coalesce with quite a bit of movement between groups in the first few weeks. By week six the groups will have stabilised and a signed list of each group's membership is produced. In the main case study the students take on individual roles within their group, for example engineer, finance manager, marketing manager etc. For all the case studies each student will produce a log book of their discussions within the group. Minutes of all group meetings are recorded by the students and they have to produce a report and a CD copy of their final 10 minute presentation. All of these outputs from a single group are retained in a single box for assessment: *"I want to know when it happened, where it happened, what was said, what was agreed and who is doing what. And the idea is again, that in combination with the way I ask them to write the report, it gives me the opportunity to effectively see who's done more work, or who's done what."* One distinct advantage of this approach is that there is no real opportunity for plagiarism.

The Environmental Engineering course is delivered through enquiry based learning and is in two parts for each session of contact time. In the first session Alec presents a topic, such as electricity generation and the environment, or water pollution etc. and in the second half groups of students, usually pairs, will research a related topic and then make an informative presentation to the rest of the class. For example, if the lecture was on electricity generation then groups would research topics such as solar generation, wind generation and then teach the rest about it: *"So there would be four or five, effectively, maybe six, couples of students each presenting a sub-topic of the main lecture that I'd given."* Ultimately in the course, groups of students would tackle a major case study.

Group selection:
Groups are self-selected. In the past Alec has imposed group selections and this sometimes generated negative feedback when students were forced to work in groups where they couldn't get on with, or did not respect the abilities of other group members. Now students are encouraged to negotiate their way into groups. This can be a beneficial exercise for them. The disadvantage is that students will tend to stick with their friends: *"…the bulk of the sub-continent students tend to stick together, as if they come in a package."* Groups can also be seeded with the idea that if they co-opt new members that are capable, they could improve the overall performance of the group but again this approach is usually unsuccessful.

Support:
Alec provides an 'open door' policy so that students can contact him at any time, face to face, via e-mail, or by mobile phone. He has 'surgery' hours as well as times during tutorials when students are encouraged to interact. He does find that some students are shy and so he cultivates some students to function as intermediary conduits between himself and the whole cohort: *"I usually appoint amongst the students my various 'Ministers', as I keep calling them. Without being selective too visibly I would choose 4 or 5 good students and use them as drivers for the others, so in a group of say 100 when they are all working separately in groups of 4 or 5 there would be say 5 students who I will talk to much more than others and they will disseminate the stuff if others don't want to come and talk to me."* Additionally, there are postdocs and PhD

students who act in a supervisory role for the undergraduate student groups. Alec has preparatory meetings with the supervisors, also he provides them with model answers and any guidelines on the learning outcomes but initially there are official training procedures in place, which are a QAA requirement: *"PhDs and postdocs are not allowed any contact with students unless they've been trained."*

Activities tailored to the needs of international students for general engineering education

All of the activities are tailored towards the 'global' student.

Activities tailored to the needs of international students specifically for group and project-based work

All of the activities are tailored towards the 'global' student.

Issues with or for the education of international students that need to be addressed

There is a difficulty with getting students to work in groups other than with their friends. This can be particularly difficult in the taught Masters programmes where groups of graduates may have been recruited from a single overseas university. They will come in as a group who know each other and who have worked with each other previously. Encouraging these students to network with others can be a challenge. *"I can only demonstrate that by making new friends you might be benefiting but that is social science here and I'm an engineer. This is social engineering basically, which is not easy."* Additionally, it tends to be the good students that are far keener to participate in the groupwork that stick together. The biggest issue is to get the group to think and act as a team.

Some students have outside jobs and these can conflict for time with their academic work and particularly for the functioning of groups and even with their attendance.

Many of the students live in London and so need to catch the University bus at 5.00pm that shuttles students between the Medway and Greenwich campuses. This again conflicts with the tutorial work that is usually timetabled between 4.00pm and 6.00pm.

As student numbers have rapidly increased there has been an issue with the ability to identify students. Some international students are reluctant to approach staff, or are shy and so may drop below the radar. In a number of cases the true quality of some students has not manifested until the final exams at the end of the programme.

Alec is of the view that in aspects of engineering and in particular management teaching there are not necessarily definitive answers. This can be difficult for some cultures and possibly for engineering students in general to appreciate. This can be a challenge: *"but it is a good challenge in a sense that once you are in industry inevitably there are moments in time, moments…during your day, when you stop thinking as an engineer and you need to think as a manager. And that's the transition I'm trying to make for them."*

There are some specific issues that Alec seems to encounter quite frequently, such as students from the Indian sub-continent that are being forced against their will into arranged marriages and students who need to return home for a family bereavement. In this latter situation their can be serious financial implications associated with the need to obtain visas at short notice. These situations can be beyond the normal lecturers remit: *"When you see that occurring, you're like;*

'Well, this is a side of things that I obviously have not been trained to deal with.'" Consequently, universities that recruit large numbers of international students should employ people who have the specific skill sets to deal with these types of situation. It is likely that the majority of academic staff are not sufficiently aware of the cultural backgrounds of many of the students and Alec thinks that staff who have had a global exposure may be better suited to teaching international students: *"…maybe you need the people who are in contact with international students, teach them, support them, provide the pastoral sort of help, maybe they should themselves have some kind of an international exposure, familiarisation."*
Interestingly, some time in the past Alec has acquired some booklets published by Kent County Council that have proved helpful as they contain useful cultural information on different immigrant minority ethnic groups that have settled in the County.

Finally, Alec is aware that some international students are using the process as a route into the UK: *"Now this is a difficulty that one has to identify from an early stage, point them in the direction of rules and regulations and try to make them engage."*

Use of international students as a resource

Nothing mentioned.

Benefits, opportunities, future issues for home students

Nothing mentioned.

4. University of Liverpool. School of Engineering. Tim Bullough

Context

The School of Engineering provides Aerospace, Civil, Mechanical, General and Materials Engineering undergraduate programmes, and eight postgraduate taught Masters programmes. At undergraduate level there is an entry of about 100 Aerospace, 100 Civil, 100 Mechanical. Around 20 students are recruited to General Engineering and these tend to orientate towards product design. There is currently no intake at undergraduate level for Materials. The students entering for Aerospace, Civil and Mechanical are roughly 50:50 MEng (integrated Masters) and BEng entry, although students can change programme after entry. In the 2008/09 year group the student ratios were: 89% male; 74% 'white'; 15% mature; 70% UK; 20% Far East; 8%EC; 2% Middle East; 1% African. All the programmes are accredited by one or more professional bodies. The taught Masters programmes tend to piggy back on the 4th year integrated Masters programmes and are typically 90% non-EU students. Most programmes will be lectures and labs and in the last five years there has been a concerted move towards 'active learning experiences' both for lectures and design, build, test activities with an emphasis on groupwork: *"We have over the past five years or so made big efforts to do two things really, one is to move towards more active learning experiences for students, both the lectures and design-build-test type of activities, and to put group work much more at the core of many activities."*
Assessment is probably typical, with lecture-based modules having 70-80% by examination. Some modules, such as design modules will be 100% coursework and most of these will be done in groups. Towards the end of the degree programmes groups of students will do major 'capstone' projects in conjunction with industry. For MEng students these take place throughout the third and fourth years: *"For integrated masters it's throughout their third and fourth year, in the form of a single major industry-driven 'design and make' project, and that is a new thing that we introduced five years ago or so and developed over the last five years in collaboration with industry to try to sort of mimic their practices."*
There are also individual research-type projects. Much of the groupwork through using active learning experiences has been underpinned by a Conceive, Design, Implement and Operate (CDIO) framework: *"It's more just good practice, dissemination of good practice and trying to provide students with the employability skills that they will need for life as an engineer."*

Integration of international students into UK culture, University and School

The University provides a drop-in English language tuition facility and also works towards integrating international students into the wider student body. At the School level there has been very little done in the past. If a group of students arrive from a single overseas institution then a member of staff may be allocated to spend a day with them showing them around and running through the syllabus.
The first year tutorial groups also form the basis for laboratory groups and these are selected so that, as far as possible, there are at least two international students and two female students present in each group.

Teaching/pastoral activities that benefit all students

Parts of the University have drop in centres for study skills, mathematical skills, training etc. There is a tutorial system where all students have a personal (pastoral) tutor who may also be

able to help with academic issues. Module tutors can also provide tutorial support at an appropriate level, if there are any issues.

In the first year students have a personal development planning system to review progress. *"...we have a personal development planning system in the first year to meet the national requirements to have individual face to face discussions on progress and related issues."* There is a School student support office, currently with six staff, that handles the administration of the programmes and can deal with many routine student matters. *"...it is our most highly rated part of the School of Engineering in student surveys, and they're very good at dealing with these sorts of issues."*

Group and project-based work activities (that benefit all students)

Every afternoon of the first week of the first year is an ice-breaker group design and build project that is not formally assessed. This facilitates the new students getting to know each other and is probably beneficial for the integration of international students. The next major group project is a two-week design build and test project that is discipline specific and is run during the last week of semester one and the first week of semester two. Aerospace engineers make a radio-controlled aeroplane; civil engineers make a model bridge; and mechanical engineers make a rocket and a model car. The students are given some information about how such design groups would function in industry, about conflict resolution, about the design brief, and about how they will be assessed. There is some peer moderation of group marks. There is also some information provided on team roles: *"We do a very simplified Belbin exercise just to give them an initial year 1 level appreciation that in the real world things are planned and projects are managed, including individual activities within groups."*

In the second year students are given formal management teaching about models of team work and are given semester long or year long discipline-specific design activities in groups based on getting a mixture of ability within each group. This is based on their year 1 performance. Groups have to nominate leaders and different roles and the students reflect on their performance at the end of the project. Peer moderation is used and fed back to the students: *"So what we're trying to do in years 1 and 2 is very much to give students wherever possible the experience of taking on different team roles, just so they can then reflect on that, to give themselves some idea as to what their strengths and weaknesses are."*

In the third year the students organise their own groups, as if they are in an industrial setting. Visiting professors from industry help with the running of these projects and this probably involves some discussion of group dynamics and relevance to industry.

Group selection: Mixed groups in the first year. Mixed ability groups in the second year and above, with self-selected groups for some mainly laboratory based projects.

Support: Last academic year they have started to pilot the use of 'WebPA' in two groupwork projects for efficient peer-moderation and feedback to students. These pilots went well and were effective at saving staff time. Tim feels that WebPA will be adopted 'across the board' for groupwork projects at Liverpool.

Activities tailored to the needs of international students for general engineering education

There is an 'international tutor' that the students are told about and who they can approach. Very occasionally this tutor has been asked to intercede in issues involving international students.

There is always an international student representative on the staff/student liaison committee to represent the views of international students.

Activities tailored to the needs of international students specifically for group and project-based work

First year students in Liverpool's counterpart University in China will be given groupwork projects and the opportunity to criticise performance. These will be novel activities in China but are designed to help the cohort of 50 Chinese students who will be joining the second year civil engineering programme at Liverpool in October 2012

Issues with or for the education of international students that need to be addressed

Communication is an issue, particularly at early stages on their University courses. This can be bidirectional, as many home students with poor communication skills find it difficult to communicate with international students. Some home students have expressed the desire not to have international students in their groups, as they feel that the lack of English skills may be a burden. This may be in terms of the initial communication of ideas through to the dissemination of the results. International students often tend not to object as they are keen to integrate but those with poor English language skills often lack the confidence to put themselves forward for leadership roles and do more mundane tasks: *"They tend to often be keen to take on the more 'information gathering' roles and do mathematical modelling or background research on the internet or something rather than lead the group."*
There is a tendency by staff to allow these students to take on leadership roles later in the course when they have developed the necessary skills and by years three and four they have usually caught up. This issue is particularly relevant to the international student groups with direct entry into year two. This is possibly compounded because all students become familiar with tackling open-ended projects during year 1, while international students coming directly into the second year may still be unfamiliar with this approach.
There is a potential issue for the future in that a cohort of 50 Chinese civil engineering students, who will have taken the first year course in Liverpool's University in China, will then be entering directly into the second year at the start of the 2012/13 academic year. Initial work, including discussions with existing Chinese and other international students, is taking place to try and plan for this. The worry is that a group of this size may form a clique, or cliques that may not integrate well: *"All the international students we've surveyed tell us that generally international students all mix reasonably well with each other except for these cohorts who come* en masse *from China."*
So the international students themselves have indicated that these large cohorts of students from China do not integrate well and the Chinese students have indicated that there may be an issue with these students tending to be from relatively wealthy single-child families. Tim recognises that there is a need to be cautious about interpreting this information but there may be a 'single-child syndrome' that may have a bearing on their capability for contributing effectively in groupwork. To counter this, the students will be given groupwork projects during their first year in China, which is something that is not usually done. When they arrive at Liverpool they will be distributed throughout the accommodation areas to try to minimise the tendency for them to remain in cliques.

Use of international students as a resource

Nothing mentioned.

Benefits, opportunities, future issues for home students

The existing home and international students will need to be made aware particularly of the cultural issues surrounding the influx of 50 Chinese students into the second year in 2012:
"They've got to appreciate they will live in the real world when they graduate and the real world is having to deal with people from all round the world."
So integration will need to be reciprocal and more will need to be done for the pre-existing students, although what this will be has not been decided as yet.

5. Loughborough University. Chemical Engineering. Steve Tarleton

Context

BEng, MEng and postgraduate courses in Chemical Engineering, all accredited by IChemE. At undergraduate level there is an intake of ~80 students each year, so there is a population of 250 – 300 undergraduates in the department, of which about 20% are international and about 25% are female. Around 75% of the undergraduates do a placement year in industry, so students can take from three to five years to complete their degree programme. Currently, recruitment onto the programme is increasing. At postgraduate level there is an intake of about 45 MSc students each year, the majority being international students, although last year there were 10 home students, which may be a consequence of the recession with graduates finding difficulty in obtaining jobs.

Teaching is mainly lectures and labs with problem classes and tutorials in the early years with more project work in later years. Design and teamwork is introduced via lectures in the first year. There is a whole module on design in the second year. In the final year design projects may be full time for up to a semester. Undergraduate modules may be whole semester, or full year, while MSc courses have some block taught courses of one week or two weeks duration, followed by coursework assessments.

Integration of international students into UK culture, University and Department

There is nothing that is done within the department specifically for international students. There are induction programmes for all students in all years. The aim is to try to treat all the students in exactly the same way and all are allocated to a personal tutor. There are, however, some activities that, while given to all students, may be of more benefit to international students. For example, in the first year there is instruction on 'plagiarism', on safety and also on the marking system that will be used. There may be some more general advice provided as well, such as how to get a bank account etc.

Postgraduate students do have an induction week and a block-taught module in lab skills. Within the University there are various national societies, eg. The Malaysian Society and A Singapore Society. These can be helpful for students of these nationalities.

Students are made aware of the support services available within the University and there are student handbooks, for undergraduates and postgraduates that document what support is available.

Teaching/pastoral activities that benefit all students

All undergraduate students are allocated a personal tutor and there are tutorial slots timetabled each week for the first two years. Students are expected to attend. Group sizes are about four or five. Tutors vary in the formality of their tutoring style. Students, including international students, who opt to spend a year in industry, will have a placement tutor who will visit them at least twice and maintain contact with them throughout the year. The majority of placement students take their year out after the second year but some MEng students do it after the third year.

To counter issues with plagiarism, the detection system 'Turnitin' is used to promote academic integrity.

Any students with serious issues are encouraged to discuss these with the Director of Studies, or the Head of Department. All students are encouraged to talk with staff but there does seem to

be an issue with some students, who show a reluctance to do this. Many students contribute to the staff/student liaison committee and there is also a student representative on the Course Teaching Committee. There is a student run Chemical Engineering Society that organises academic and social activities. Students are encouraged to become involved with the society and this could act as a support mechanism.

For postgraduate students, there is a postgraduate tutor attached to the programme and their project tutor can act as a personal tutor. Each member of staff will have three or four MSc students and there are timetabled slots each week when the students can meet the tutor. These meetings may not happen every week and often depends on how their project is progressing.

<u>Group and project-based work activities (that benefit all students)</u>

The first year is common for both the BEng and MEng courses. Students will do eight labs on various aspects of a pilot plant and computational control. These labs will be done in pairs, or occasionally threes, depending on the number of students. The students will report separately, although oral presentations will be done jointly with all students expected to contribute. There are three design exercises starting from about week eight of semester one. Typically, these involve groups of six or seven students. These may be single day projects to solve chemical plant problems and the groups need to submit a final drawing of their solution.

In the second year, labs become more complex and may involve multiple sessions. Students will be expected to make a presentation and submit a report. There are also some problem-solving activities, again done in pairs. The team-based design problems are more formal than in the first year. Typically groups of five students will be required to design a part of a chemical plant. The team will need to select a leader and a secretary and work together to complete the project.

For the BEng students there are four team-based modules in their final year. Design is split over two modules. One of these; Team Design, is worth 15 credits, out of the120 credits for the year. This usually involves groups of five students having to design a chemical plant with individual sub-projects, also worth 15 credits, to design specific components of the plant. Additionally, there is a lab-based research and development project done in pairs over a six week period.

In the MEng, the Research and development project is done over a whole semester. It is an individual project but some aspects of team working may be involved. The projects are very flexible and some students may go abroad to do this and work within a research team. Following this is a 13 week design project done in groups of five, which is worth 25 credits out of 120 for the year. There is also a full module individual design project.

At postgraduate level there is a project component to the MSc and this is an individual project.

<u>Group selection</u>: In the first and second year labs, the groups (pairs) are selected alphabetically. In the second year project work there is the opportunity to self select, particularly with respect to the group leader. The leadership is then swapped around within the team at a midway point, so essentially there are two team exercises within the one project. After the second year, teams are selected by the staff based on second-year performance. Staff try to spread experience through the teams to give all students the best learning opportunity from exposure to working in varied groups, as would be the case in industry.

<u>Support</u>: In recent years various aspects of training have been introduced at the start of the first year to counter perceived skills deficiencies amongst recruits. The training covers report writing and presentation skills as well as how to obtain information and issues such as plagiarism. It also looks at teamwork and offers advice on how to work in teams. Subsequently, support is provided by staff acting as tutors for weekly hour-long meetings, by design supervisors, by the module organisers and by laboratory demonstrators, who are all postgraduates and in some

cases 'postdocs'. Students are made aware of the module organisers and of the associated module specifications. Modules, as well as labs and projects, all have introductory lectures that outline what is expected, so that students can gain an understanding of the information and activities to which they will be exposed.

<u>Activities tailored to the needs of international students for general engineering education</u>

At postgraduate level, as there is a high proportion of international students coming from widely differing backgrounds, a three week laboratory course is provided that covers laboratory procedure and safety: *"Safety can be a significant issue with overseas [postgraduate] students, simply because they haven't done it as part of an undergraduate course."*
International students are not necessarily penalised for poor spelling and grammar in their report writing. Errors will be pointed out to them but, as long as the meaning is clear, there will be no penalty. This latitude also benefits home students!

<u>Activities tailored to the needs of international students specifically for group and project-based work</u>

In the interests of fairness, nothing is done specifically for international students at undergraduate level: *"Because I would very much want the students to come to the UK and think this is how all students are dealt with on a fair basis, everybody gets the same information, everybody gets the same sort of opportunity, the same training…"*
Interestingly, there is anecdotal evidence to suggest that some international students opt to study in the department because of the different pedagogical approach to that in their home countries. These students want to gain experience in tackling the sorts of open-ended problems provided in UK engineering departments, as opposed to the more formal and prescribed teaching approaches in their national institutions. So international students may benefit from experience in determining an optimum solution from a range of possible solutions.

<u>Issues with or for the education of international students that need to be addressed</u>

Students often find the abstract nature of design a challenge.

<u>Use of international students as a resource</u>

Having international students spread around the project teams may influence the work ethic of the home students: *"...you sometimes find that international students have different strengths to home students and so we obviously want them to share these differences as well."*

<u>Benefits, opportunities, future issues for home students</u>

Nothing mentioned.

6. Loughborough University, Wolfson School of Mechanical and Manufacturing Engineering. Peter Willmot.

Context

The interview concentrated on the Mechanical Engineering degree that is the largest of six degree programmes for which Peter is responsible. *"It is a MEng with a BEng variant, there is a sandwich option to take the 3rd year in industry. So in fact you end up with 3, 4 or 5 year programmes."* These are all accredited by the Institution of Mechanical Engineers (IMechE). There is an annual intake of ~150 students, from which ~135 will ultimately graduate. The majority of recruits for the undergraduate programme are A-level entrants in the 18-19 age group and, despite efforts to increase the number of female students, the proportion remains between 5% and 10%. Less than 10% of undergraduate recruits are overseas students, although in the taught Masters programmes international students are in the majority.

Peter believes that the Mechanical Engineering programmes are more practical and more project-orientated than most universities. In the first year the assessment weighting is about one third through coursework to two thirds by examination. This weighting shifts to 50:50 by the final year. There is a lot of interaction with industry involving major industrial project options in each year of the course.

Integration of international students into UK culture, University and Department

There are a number of University systems in place to assist international students with the transition to life at Loughborough University. In particular there is help with English language, even though strong language skills are an entrance requirement. Halls of residence have a strong community feel to them and they provide a lot of pastoral support and this is where most of the international students stay. Within the Wolfson School the international students are just treated as Loughborough students: *"Within the school we really have a policy of trying to integrate them, not really identifying differences at all wherever possible."*

There is an international office on campus that can provide counseling for international students who encounter difficulties, although the students may not take advantage of this support.

Teaching/pastoral activities that benefit all students

Within the School, all students are allocated a personal tutor. These tutorials groups are typically ~six students per tutor, although individual tutorials can be arranged if necessary. Personal tutorial group meetings are timetabled for once a week during the first year but this frequency may drop off towards the end of the year. Personal tutors direct students to the appropriate University provision for any extra counselling that may be necessary: *"I think that we have very strong central provision for when students get into difficulties."*
In week one there is a team-building exercise to help the tutor groups to bond.

Group and project-based work activities (that benefit all students)

In the first year students do an 'Engineering Principles and Professional Skills' module. This is a relatively new module in which there are four projects of different lengths, starting off with short one-day active learning projects within tutor groups, so the students are with other students that

they know and their personal tutors are also involved. These are competitive activities that take place in week five and all other lectures are cancelled. All students do two one-day projects, where they are introduced to the project at the beginning of the day and they have to deliver at the end of the day. The first one is a design and build project using simple materials and the second is a commercial business game called SimVenture. The third project is a two-and-a-half week project towards the end of the first semester. It is student centred and involves researching a vehicle system: *"…so they'd choose a system such as 'power brakes' or 'automatic gearbox' or something similar and they work in their tutor groups to find out how the system works."* The students are encouraged to do practical activities as a video report is required: *"Preparing a documentary film appears to be very engaging in itself. They are very innovative in this respect, they look under car bonnets, take footage in our labs, go down to the scrapyard to get some parts and cut them to pieces and that's exactly what we want them to do."*
In the second semester there is a semester-long project. This is a competitive mechanical handling device design and build project sponsored by a company who award prizes: *"…this year it was for mechanically sorting tomatoes."*

There are three major projects in the second year. The first is a traditional machine design analysis project, usually of a gearbox. The second is what is described as a computer-aided design manufacturing and test (CADMAT) project. This is to design and analyse a loaded bracket. *"The bracket must have maximum strength for minimum weight and students make a prototype on a CNC machine and subsequently test it."*
The third project, which runs throughout the whole year, is an open-ended creative design project, known as the IBP (industry-based project). This forms part of the 'teaching contract scheme' that is run with a consortium of companies. Students are taken around all of the companies' factories at the start of the year and then in groups tackle a 'real' problem that is pertinent to one of the companies. Different groups of students working with different companies.

In the third year, students tackle an individual research project and the final year MEng students have a 'capstone' project, which is again part of the 'teaching contract scheme': *"In this, there are slightly larger groups, groups of 5, working for a company on a project throughout the year, culminating in a report, an exhibition and a conference presentation, typically two groups per company."*

Recently, there has been a new optional module called 'International Engineering Design' run by Dr. Chris Tuck for third year Bachelors students. In this module, groups of Loughborough students are paired with groups of students in Mexico. Using video-conferencing and other communication techniques they work together on joint projects.

Group selection:
Initial projects are done in tutorial groups. For the second-semester project of the first year, the students are mixed using a 'seeding' method: *"I try to seek out those students who have some previous relevant project experience and I simply ask the rest of the students to attach themselves to those experienced ones in teams. This process makes sure that each group has got a fighting chance in the competitive work."* The same seeding approach is used for the industry-based design project in the second year, while the groups for the other two second-year projects are picked randomly. The group selection for the fourth year capstone projects used to be randomly picked as well, with some additional alignment to chosen electives. The students requested a different system and now the groups are picked on ability, as indicated by prior performance, and aligned with module choices: *"We now put them together by ability, track*

record, so that they're grouped together, the stronger ones, and with appropriate electives where possible. It seems to work. We'd have a group which is mostly first class, a group which is mostly 2:2s etc. I was very sceptical about it actually."

Support:
Apart from the small projects at the start of the first year, all the other projects have an academic tutor, who would be timetabled to meet with the student group once a week. The second-year industry based design projects have mentors who are fourth year MEng students: *"For the finalists, this provides excellent leadership training."*

Activities tailored to the needs of international students for general engineering education

There is nothing specifically for international students: *"I really can't think of anything that picks out international students in any way. Maybe we're wrong in not doing it, but we don't."*

Activities tailored to the needs of international students specifically for group and project-based work

Again, there is nothing specifically for international students.

Issues with or for the education of international students that need to be addressed

Peter is of the view that certain groups of overseas students do find group work difficult. The 'WebPA' online peer assessment tool indicates that the international students in this year's groups: *"…do appear to be generally weaker."* This may be due to their cultural background's expectations of project work, or a reluctance to engage with the UK students, although there is variation between individuals and between countries. Over recent years, the School has built up a large database of WebPA data and this could be trawled and analysed to assess the peer-perceived performance of international student groups. In any case, exposure to group and project-based working should be beneficial for these students: *"Although you could argue, of course, that they need to learn how to do projects and to work in teams, so their experience is likely to be good for them…"*

In one year there was a large influx of students from Brunei. While the normal procedure is to spread international students around the project groups, here it was felt that pairing students from Brunei together, within teams of five students, worked best.

Use of international students as a resource

Nothing mentioned.

Benefits, opportunities, future issues for home students

Nothing mentioned.

7. University of Manchester, School of Mechanical, Aerospace and Civil Engineering. Bill Craig.

<u>Context</u>

At the University of Manchester there are three Schools of Engineering: one for Chemical Engineering; one for Electrical and Electronic Engineering; and the one Bill Craig is in, which is Mechanical, Aerospace and Civil Engineering that features in this study. The association of mechanical, aerospace and civil is a loose one, as they run three essentially separate degree programmes, with civil engineering further sub-dividing into a family of degree courses. There is some overlap of common sub-disciplines in mechanical and aerospace and these are taught together. Additionally, there is a spine of engineering management that is taught across the School throughout the undergraduate programme. For each of the three discipline streams there are separate entries onto the BEng and MEng programmes, although the first two years of the programmes are taught in common. The uptake of MEng is higher in civil engineering than in mechanical and aerospace. Preferred A-level entry requirements are two As and a B for the MEng and one A and two Bs for the BEng, or equivalent as overseas students tend to come in with other qualifications than A-levels. The majority of overseas students opt for BEng programmes, possibly because their home countries do not require professional qualification status. In recent years entry into civil engineering has been ~140, into mechanical engineering ~120, and ~80 into Aerospace engineering. Around 25% of these numbers are overseas students. Less than 5% are mature students and around 15 to 20% are female in all three streams.

All the undergraduate degree programmes have been accredited for five years from the 2010 intake. The civil engineering courses are accredited through the Joint Board of Moderators (JBM) and the mechanical and aerospace courses through the Engineering Accreditation Board (EAB). The vast majority of courses are based on lectures and coursework, large group tutorial work and examples classes. There tends to be a lot of enquiry-based learning rather than problem-based learning. The majority of mainstream subjects are assessed by 70% examination and 30% coursework, or 80% to 20%. Some subjects like design or computation are 100% coursework.

<u>Integration of international students into UK culture, University and Department</u>

An English language qualification such as the International English Language Testing System (IELTS), or equivalent, is required for international students, with scores of 6.5 necessary for undergraduate and 7.5 for postgraduate entry. On arrival, all students for which English is not their first language are requested to go on a language assessment exercise and, if that identifies problems with language, then these students are offered and encouraged to take up free additional tuition in English, although take up is not compulsory. Many international students have English skills that are perfectly satisfactory and it was commented that: *"…some of our home students are not necessarily any better than many of the overseas students!"*
A few years ago the School identified a greater problem with students coming from mainland China and so they have had parts of the School Handbook translated into Chinese: *"Now you could argue that that's slightly discriminatory because we don't do that for students who come with Farsi or other languages from other parts of the world, but we have identified a problem with an increasing number of mainland Chinese… who had serious problems."*

There is a School admissions team of four administrative staff, run by a senior administrator and with academic involvement from an Admissions Tutor, that works hard at keeping in touch with overseas applicants over a six to nine month period while the potential students are in the application cycle. This admissions team also run welcome websites.

<u>Teaching/pastoral activities that benefit all students</u>

All students are allocated a personal tutor/academic advisor and this is a University requirement. Each student will retain the same personal tutor for the duration of their stay in the School and build up a rapport with that member of staff, unless there is a request for a change from either side. Each staff member will have around six first year tutees. The University requirement is that the tutor and tutee meet face to face once a week. This has been introduced at first year level and there is pressure to continue this into all years but there has been resistance from the students to this degree of contact with tutors in subsequent years: *"What we find is there's some resistance from the students who feel they're now up and running…"*
The success of the personal tutoring system depends very largely on the attitudes of individuals and Bill indicated that some tutors are much more effective than others in working face to face with tutees, either one to one, or one to small group, although there are University training courses available on request. Additionally, new academic staff receive training on all aspects of being a university lecturer. Recently, all staff have been encouraged to take a training programme in 'equality and diversity' from the Human Resources (HR) training unit and there is an online course for all students to take as well. A significant number of the staff within the School are international: *"So we're mixing cultures among the students, we're mixing cultures among the staff."*

The School has a Welfare Officer who students can approach on personal matters. Bill is the Director of Undergraduate Studies and Chairman of the 'Mitigating Circumstances Committee' within the School and from these roles he appreciates that international students seem to have a higher proportion of problems than UK students and a greater demand on the Welfare Officer: *"I would say the take up from overseas students is considerably higher, and they have a higher proportion of problems than home students."* There is a University Counselling Service that is available to students and staff. There can also be major problems with health issues because some overseas students, contrary to the advice given, will not register with local doctors: *"…if they have medical problems they tend to put a head on the pillow would be one way of putting it, but they don't find their way immediately to the medical support services."* The School will refer students to both the Medical Support Services and the Counselling Service.

Within the University there is a central Academic Advisory Service that deals purely with academic matters. There is also some cross school teaching in mathematics in the first two years which is a service course provided by the School of Mathematics.

<u>Group and project-based work activities (that benefit all students)</u>

Students undertake group work, project work or project based group work at various stages in the three discipline streams. There is a first year management course that deliberately uses cross-discipline groups for small pieces of coursework to get the students used to the ways and management of groupwork: *"What we find is inevitably there are cultural differences between home students and overseas students. The people who tutor these courses have to work quite hard to integrate everybody across the disciplines and across the cultures."*
The individual disciplines may run projects as part of their first year programmes but there is no defined pattern within the curricula. There are 'design, make and test' exercises within the

design modules: *"I would say, anecdotally, overseas students find this harder than the home students."*
The fourth year of the MEng programmes in all three disciplines have major group design projects that are run with senior engineers in industry. By this stage the groups are reasonably well integrated.

Group selection:
Groups are deliberately not allowed to be self selected. In the early years groups will be allocated alphabetically, or in the cross-discipline projects a group will be formed of two mechanical, two aerospace and two civil students. In the single discipline projects the staff will mix the groups by academic ability, sex and culture: *"So we will not send out to British Aerospace, or any of our partners, a group made entirely of female Chinese students… they may all be together at the top of the class, but we would deliberately mix them up."*

Support:
There are no formal support processes in place. The academics who run projects will give guidance: *"…it's* ad hoc *and unofficial monitoring with guidance as necessary."*

Activities tailored to the needs of international students for general engineering education

Nothing specifically for international students: *"Once they're here we just treat them as students."*

Activities tailored to the needs of international students specifically for group and project-based work

Again the ethos is to treat all students equally. The international student dimension and problems with group working were not raised as issues at the recent faculty review and annual reviews of all the individual taught programmes within the School. There is nothing planned to address group working specifically for overseas students.

Issues with or for the education of international students that need to be addressed

One issue that occurs is that team meetings for group work projects are not formally timetabled, so group leaders will organise these themselves. Sometimes they will arrange these in a bar or local pub and this may not be appropriate for some students: *"…maybe the group leaders who are fairly outgoing people say: 'well let's meet in the bar',… and this discomforts a number of students: a) because they don't drink and b) because maybe they're just not used to that culture, a lot of overseas students are resistant to that."* This issue is now explained to students in first year tutorial groups. Occasionally, groups may not work well together or an overseas student will not engage with a group work project. This will be recognised by staff, may be difficult to deal with and will also be apparent from peer assessment.

Use of international students as a resource

Nothing mentioned.

Benefits, opportunities, future issues for home students

Nothing mentioned.

8. University of Nottingham, Civil Engineering. Bill Askew.

Context

Civil Engineering at Nottingham has a range of taught degree courses: BEng, MEng and MSc which are full time degree courses and of three years, four years or one year duration respectively. The MEng final year and MSc are very similar, drawing upon a similar batch of level four modules. The first year intake this year was approximately 150 and, typically, this will divide roughly 50:50 into BEng and MEng streams when decisions are made at the end of the second year. The MSc programmes total 50 – 70 students per year, so there are 500 – 550 students on taught degree programmes within the department. Overall, these student numbers include approximately 30% of international non-EU students.

Non-EU International students can arrive at Nottingham via several routes. One way is by individual application. A second route is from collaborating institutions, for example a university in Thailand sends students directly into year two at Nottingham into a range of engineering disciplines after having done two years of 'tailored' courses in their own university. A third route is when a cohort of 15 – 30 students joins year two of the BEng programme from Nottingham's Ningbo Campus in China, where they will have done essentially the same year one as students at Nottingham would do. Finally, there is the Malaysia Campus, where students can complete the whole the degree programme. These students will only come to Nottingham if they opt to take a year's exchange, or decide they want to complete their degree at Nottingham.

Over 90% of the students in the undergraduate programmes are in the 18 – 23 age range and in the MSc around 75% are aged between 22 and 25, although there are some much more mature students particularly from overseas. Typically 17-20% of students are female.

All of the honours courses are accredited by the Institution of Civil Engineers (ICE), the Institution of Structural Engineers (IStructE) and the Institution of Highways and Transportation (IHT) through the Joint Board of Moderators (JBM), whose last accreditation visit was in 2008.

Teaching is mainly lecture based for the full year cohort, with smaller groups for practical example work in laboratories, or computer aided design (CAD) classes in computer rooms. Assessment is by two-hour formal written unseen paper examinations for 10 credit modules with generally 10 – 20% from one or more pieces of coursework.

Integration of international students into UK culture, University and Department

The University has a 'welcome week' for international students that provides information on being in the UK, on the City and on how the University functions. The Students' Union provides support for international student groups including national societies. Within the Civil Engineering department there is nothing formally arranged for international students: *"…we endeavour to treat them the same as everybody else, essentially."* There is an induction process for all students, including MSc students, who are new to the university.

Teaching/pastoral activities that benefit all students

Students are allocated to personal tutor groups alphabetically: *"..so that for example, tutor A of 10 tutors gets students 1, 11, 21 etc. from an alphabetical student list."* This should mean that

international students are spread around the tutor groups. There is a 'Senior Tutor', who is currently Bill Askew who looks at the academic-related and pastoral support for students within Civil Engineering and is supported by 'Year Tutors', who are responsible for each annual cohort. At postgraduate level there is a 'Course Director' to support the MSc students.

Personal tutors change after year two: *"to make sure that we've got a range of people who can see them, comment on them, provide references for them and things like that."* There is a handbook for study skills and an administrative/course handbook.
An industrial liaison group links with industry for work experience, vocational employment and graduate placements. The industrial liaison group also links with the University Centre for Career Development. The University's International Office has responsibility for dealing with things like student visas and the Student Support Services provides a service for almost anything from counselling to financial support.

Group and project-based work activities (that benefit all students)

Group work is undertaken in all years and ranges from small coursework projects through to relatively major project work, such as the surveying field course and a conceptual design exercise both in year one. Coursework is often set as group work, as this can reduce marking loads. In year 2 there is a 20 credit module, built up of design-based and essay-writing exercises which students undertake sometimes individually and sometimes in groups. Towards the end of the degree programme there is a major group design project in groups of ~six and there is an individual project in the final year of assessment, so in year 3 for BEng students and year 4 for MEng.

Group Selection:
Initial group work in the first year is done in tutor groups. These assignments don't contribute to their degree classification, so the students learn about group work without it affecting their degree. At later stages in the course the students are allowed to self-select their project groups. Students that are unable to find a group will be formed into a new group or allocated to an existing one: *"… we'd try to reduce the misery and optimise the gain."*

Support:
A range of group supervisors from the academic staff is provided for project work that can give expert assistance on the technical areas such as, structures, geotechnics, hydraulics, management, transport etc. One of these will be a principal co-ordinator with the student group and can provide advice on group organisation and conduct. For the final year group design projects for the MEng students they will be allocated a tutor that is expert in the subject area of their chosen project.

The first presentation in a group project is evaluated formatively and the students would receive informal feedback and be able to reflect on what worked and what didn't work so well in their groups.

Activities tailored to the needs of international students for general engineering education

Nothing is specifically put in place for international students and the aim is to provide holistic support for each annual cohort. There is a perception that some international students may be having difficulties with English: *"Some of them will perhaps be struggling with language, English will not be their first language, … We certainly wouldn't assume international students are in this*

band, it would be rather looking at any students who need support, be they dyslexic, disabled, struggling with English, struggling with culture or whatever and work with them appropriately."

<u>Activities tailored to the needs of international students specifically for group and project-based work</u>

Nothing mentioned.

<u>Issues with or for the education of international students that need to be addressed</u>

There has been an issue in the past when large cohorts of 40 or 50 students have come from a collaborating institution into the second year, spread over various engineering disciplines. These students retained their own identities and did not usually integrate well. One reason was that the University received the applications in a batch and so the students tended to be allocated to the same accommodation block. This practice has now been stopped and the students are spread around the accommodation areas, facilitating interaction with other students. A second reason may be language difficulties: *"For me I think the big problem that is hardest to overcome is language and the only real way to do that is to set the barrier correctly at point of entry."* Nottingham has adopted an interesting practice here by utilising parents at the collaborating partner institution to use conversational English outside of the University. It was noticeable apparently that students then found it easier to meet Nottingham's English entrance requirements in the International English Language Testing System (IELTS) test and subsequently integration has been better: *"Now we've overcome that, we find we've got a better integration so I really do think that language is the main thing to overcome."*
Once the language barrier has been reduced or eliminated then other issues that stem from communication difficulties are more easily overcome too, such as cultural differences, homesickness etc. The University-level induction programmes are then more effective and the international students can benefit from the various societies and sports clubs to integrate further and appreciate the cultural diversity within the student body as a whole.

Bill thinks that improved language skills can have an impact on other areas, such as plagiarism: *"I think if the language improves you also overcome some possible plagiarism issues where students, who don't think they can rewrite anything better or in their own words, include too much quoted work in their essays so I think that plagiarism issues are avoided by better language skills."*

At departmental level it is felt that the students should all be treated equally and as naturally as possible: *"I don't think that many of them want to be seen as one of a particular cohort or something special, they really just want to be a student doing that course."*

<u>Use of international students as a resource</u>

Nothing mentioned.

<u>Benefits, opportunities, future issues for home students</u>

Nothing mentioned.

9. University of Nottingham, Mechanical, Materials and Manufacturing Engineering. Phil Shipway.

Context

There are four engineering programmes within the department: Mechanical Engineering; Manufacturing Engineering and Management; Design Engineering; and Product Design and Manufacture. All are offered to BEng and MEng levels and all are accredited by a range of accrediting institutions. The programme structure is flexible so that students can swap between the programmes. Design Engineering is a relatively new offering and has lower student numbers than the other courses. Manufacturing Engineering and Management is the programme with the largest proportion of international students. All these programmes have a varying mix between lectures, examples classes, laboratory classes, project work and tutorials. The tutorials often deal with wider issues than the actual discipline subject matter.

Assessment practices are also varied. A small fraction of modules have 100% assessment by examination; most modules have a split of assessment between exam and coursework. The coursework ranges from laboratory write ups, question sheets and design activities for modules early on in the courses, to major individual and group project work later in the courses.

The student recruits to the undergraduate programmes are typically standard entry age with ~17% female students. Over all the undergraduate programmes there are currently 35% who are non-EU students. These come from a range of countries directly into the first year, with a significant proportion coming from China. The University has campuses in China and Malaysia; the University of Nottingham, Ningbo, China (UNNC) and the University of Nottingham Malaysia Campus (UNMC) respectively. Next year ~ 20 students from UNNC will enter directly into the second year of the programmes in the Department in Nottingham. These students will have received a virtually identical first year programme in China, taught in English by staff, some of whom have been seconded from Nottingham. Currently, the entire Mechanical Engineering programme (at both BEng and MEng level) is delivered at UNMC; there is mobility between the campuses and some students do come to Nottingham for the later stages of the programme having started their programme at UNMC. In addition to the international campuses of the University, there is also a collaborative link with Thammasat University in Thailand; a reasonably large number of students from there enter directly into the second year of the programmes at Nottingham.

Integration of international students into UK culture, University and Department

The first year of the programmes are referred to as a 'qualifying stage' and marks obtained do not contribute towards final degree classifications. It is recognised that students will have come from a range of educational backgrounds: *"…we select people on a whole host of criteria and we need to make sure that by the end of their first year everybody is well prepared for their further years."* This can involve an appreciation of cultural differences and adjustments that some international students may have to make. Phil suggested that some international students come from a background where there was no coursework assessment at all. He also indicated that some international students come from a strongly mathematical culture base where 'correct' solutions are stressed and that this has implications for some engineering aspects, such as design, where there is not necessarily a correct answer but instead a range of potential solutions. Many students can experience difficulties working with these types of projects but

there would seem to be a greater prevalence among international students: *"many students will have to work hard to develop the skills required to deal with such open-ended problems, and there is a perception that some of our international students find this more of a challenge."*

In an attempt to allow students to 'acclimatise' to the ways of working at Nottingham, the majority of first year examination assessment is at the end of the year. In order to balance this so that students have some objective measure of their progress during the course of the year, a small examination assessment is taken in January, for typically less than 20% of the module mark. It is also intended to introduce these small mid-sessional examinations into the second year programmes to assist the assimilation of the international students having direct entry into the second year. This is where Phil thinks the greatest improvements can be made. The students coming from UNNC and UNMC will be familiar with the way of working at Nottingham but they will not be familiar with either the geography of the department or the cultural differences associated with living in the UK. Students arriving from Thailand will be unfamiliar with the whole experience: *"we will get a significant minority of students who are entering into the second year and working alongside students who have been with us for the previous year and who have all the benefits that such familiarity affords. The direct entry students enter into a year where the module marks they are awarded in those first few months are counting towards their degree classification…and yet who have only just arrived in Nottingham."*
Phil believes that despite these difficulties, the department aids the students in managing their transition well; this has been verified by performance analysis of students who completed their early years in Malaysia before transferring to Nottingham; it has been very positive to see that these students obtain later year grades with the same distribution as those who have completed the full three years at Nottingham.

Teaching/pastoral activities that benefit all students

Generally, pastoral support is through the tutorial system and a recent change has been for students to remain with the same personal tutor for the first two years, instead of changing every year.

Lecture notes are placed on the University Virtual Learning Environment (VLE) and some staff are now working to put audio content with their PowerPoint presentations. This can help with students with learning and language difficulties. The department tries to keep its entry level English language scores for international students as high as possible, so that language is not an issue in most cases but if any students need additional support they can obtain that from the Language Centre: *"in my experience, the Language Centre at Nottingham is excellent."*

Group and project-based work activities (that benefit all students)

All students will do project work and project-based group work. In these the majority of students work well: *"…if you want to get a good group report…everybody needs to be delivering to as high a level as possible."*

Group Selection:
Group selection is not done on ability. The groups are either randomly allocated, or self-selected.

Support:
All project-based group work will have a tutor or supervisor for each group that they will meet with on a regular basis.

Activities tailored to the needs of international students for general engineering education

Phil is of the opinion that there are some particularly difficult aspects, such as design, that some international students need extra time and effort to tackle well. To support students with aspects of design the department has devoted resources to teaching 'ProEngineer', which is one of the main design software packages that they use: *"…we've got videos etc. really taking them through that step by step and they can go and log in and work out exactly what they've got to do."*

Activities tailored to the needs of international students specifically for group and project-based work

There is nothing that is done specifically for, or customised towards international students. The significant group projects tend to be later in the courses, by which time the issues are dealt with in general terms for all the students.

Issues with or for the education of international students that need to be addressed

The Department tries not to differentiate between UK and international students. *"I think the concept of a student being 'an international student' has almost gone."* If there are any issues it is possibly with the student cohorts having direct entry into the second year. *"…maybe they're doing a project in their third year and they've only been with us for a year, so they're still getting used to our way of working."*

Phil does feel that some international students may have difficulties around the critical thinking processes required for project work: *"Students from some cultures, not lumping all international students together, find that critical thinking, the idea that you can read something and it may not be right or it certainly contradicts something else you have read and you've got to try and work out what they both mean, is new to them and thus can be difficult. Tutors are aware of these differences and can help the students to develop in these areas."*

As the international student cohort is large, the department wants to ensure that no student group is disadvantaged compared to their peers. One aspect, relating to language capability, is the speed with which information is assimilated during lecture delivery. As mentioned above, lecture notes and PowerPoints are available through the University's VLE and the department is now starting to experiment with adding audio to these resources, so that students can revisit the lecture content at their own pace.

The final issue concerns the marking system that is used in the UK that may be new to some international students, particularly ones coming from mathematical backgrounds, where they may have expectations of receiving much higher mark percentages than they receive for their engineering assessments. *"When we award 70[%] we mean; ', This was a good piece of work - room for improvement, but first class', whereas, when they see 70 they say; 'My goodness me, what have I done wrong, I've never had a mark so low'. And that's a difficulty for them that needs addressing by explaining the system and managing their expectations."*
The department has marking guidelines across the classification range that establish the standards: *"It's self consistent…but we do not use student mark distributions as high as some international assessment procedures might do… For the students, it is different to that to which they have been exposed before and that's a shock."* To counter this issue it is important that the marking system is explained to all students at an early stage in their degree programme.

Use of international students as a resource

Working with students from around the world is a very positive experience for the whole peer group.

Benefits, opportunities, future issues for home students

Nothing mentioned.

10. University of Sheffield. Automatic Control and Systems Engineering Department. Linda Gray.

Context

At the undergraduate level within the Automatic Control and Systems Engineering Department the degree programmes are all Systems and Control Engineering with variants. Egs: Electronic Control Systems Engineering, Medical Systems Engineering, Computer Systems Engineering, Mechanical Systems Engineering, Systems and Control Engineering and there is also Mechatronics. At postgraduate taught, Masters level, and postgraduate research the degree programmes are all Control and Systems. At undergraduate level the programmes can be for BEng or MEng qualifications and the streaming for these depends upon performance, although some students opt for the BEng programme. Currently, across all four years of the undergraduate programme there are 216 students of which 116 (54%) are from outside the UK. The age range is from 18 to 42, with the majority being in the 18-23 age group. Only 14% are female. In the postgraduate taught or the Masters programmes there are 81 students from 15 countries of which 83% are from outside the UK. The age range is from 22 to 42 with the majority being in the low to mid twenties and with 10% being female. The courses are accredited by the IET and the Institute of Measurement and Control. For postgraduate research there are 49 students from 22 countries. 82% of these are non-UK. The age range is from 22 to 43 with 22% of the PhD students being female. It is interesting to note that in all the programmes a number of the UK students were not born in the UK but have attained this status through residency and other means, so it may be necessary to review the use of the blanket terms 'UK' and 'home' students.
The teaching processes tend to be a mixture of lecture, tutorial, lab, group work and project work. There are some examples of good practice in the department that have been funded by learning and teaching development grants within the University and there are some national award winners.

Integration of international students into UK culture, University and Department

Language support is provided within the department and within the University. Each year Linda bids on behalf of the department and based on the needs of the students for a number of hours of English language support from the English Language Teaching Centre. Staff from the centre then come and deliver the language support within the department.
The University has a range of support for all students and there are various international/ national societies that promote internationalisation: *"Some of them are specific to international students because they'll have social groups, social clubs which meet particularly for individual country groups and they'll have international days which support the wide cosmopolitan make-up of the entire university, so the institution's very good at supporting and celebrating the international students..."*

Teaching/pastoral activities that benefit all students

Academic and pastoral support is provided by personal tutors. There may be some *ad hoc* pastoral support given by administrative staff. All of the modules have varying degrees of academic tutorial support.

Group and project-based work activities (that benefit all students)

There is project-based group work in three modules of the first year programme, two modules of the second year programme, and one module of the third year programme. There is no group work in the fourth year MEng programme or in any of the MSc programmes. At the early stages of the undergraduate programme the sorts of group work activities are laboratory work, some investigative projects, and some software projects. The assessments will usually involve group oral presentations, individual written reports, and sometimes group written reports as well.

Group selection: This may vary between lecturers but during the introductory week and early on in year one the groups will be selected so as to mix up the various nationalities. Personally, Linda ensures that there is representation from at least two countries in every group. Later in year one groups may be allowed to select themselves and this then is the most common method of selection. Anecdotally, Chinese students still tend to cluster in self-selected groups, even towards the end of the first year, while other nationalities tend to integrate and be dispersed more readily. Linda thinks that this relates to English language capability, as the Chinese students may still be weak linguistically and lack confidence. There could be other cultural factors involved as well. Linda is currently researching how different cultural groups within the University approach critical thinking, which may provide some answers to some of the underlying cultural variables.

Support: Linda gives the first year students a talk on working in groups. There are also electronic resources provided on the University VLE and within The Academic Skills Hub (TASH) that support groupwork. Linda thinks that it is a departmental weakness that students are not given more formal support for enquiry-based learning: *"I think this is actually a weakness that we have… if you start doing things like enquiry based learning, there's actually a way of working that students have to be taught and we never actually teach them how to work this way, just throw them in at the deep end and let them get on with it."*
Academic supervisors for the projects will act as mentors and sometimes the project groups are linked to personal tutors, who again will perform a mentoring role. At other times Linda has acted to mediate in problems within groups on an *ad hoc* basis.

Activities tailored to the needs of international students for general engineering education

Nothing described.

Activities tailored to the needs of international students specifically for group and project-based work

The process of deliberately mixing nationalities in the groups, is tailored to the needs of international students but Linda prefers to think of the groups as 'global' rather than a mix of international and home students. *"...so again it's a global group and each individual in it has their own personal needs, some of which are characterised by where they come from and some aren't."*
This encourages the students to start to appreciate the benefits of 'global grouping'.

Issues with or for the education of international students that need to be addressed

The main issue is language but there are also issues with fitting into the culture and understanding the way people behave. There may also be issues with the way they are taught and the way they are expected to learn. International students often seem to get relegated to passive roles within the groups and those with weak language skills have communication

issues. This can lead to UK students feeling that they are carrying the international students. On the other hand international students can be dismissive of the work ethic of UK students and their motivation. In other cases there have been examples of altruistic behaviour where students have realised the benefits of working together. To counteract the issue of international students adopting passive roles in year one project groups, Linda is intending to introduce placing non-UK students into leadership roles, or having these roles rotate so that all students will be exposed to these activities. Linda will also be feeding back the results of her study into cultural aspects to critical thinking into the department so that they can influence curriculum design and the awareness of other staff.

Use of international students as a resource

Nothing mentioned.

Benefits, opportunities, future issues for home students

The potential benefits for employability by engaging with the international experience is stressed in the introductory week in year one. *"...I'm really explicit about it being an opportunity for them to really improve their experience and their employability by engaging with this whole international experience."*

11. University of Sheffield. Mechanical Engineering. Elena Rodriguez-Falcon

Context

Bachelors (3 years) and Masters (4 years) in Mechanical Engineering. These are also available with various subsidiary subjects: with industrial management; with sports engineering; with motor sports engineering; and with various languages – egs French, Spanish, German and Italian. They are also available as sandwich courses with a year in industry and this is becoming increasingly popular. The students who take a language subsidiary are able to take a year of their course in the foreign country. All courses are accredited by IMechE.
~180 students recruited for BEng and MEng courses in Mechanical Engineering. ~70% MEng, 15% BEng and the remaining 15% spread across the subsidiary options courses. Students have the opportunity to switch courses once they have been at the University for a few weeks.
~35% are international students.
9-11% are female.
This year (2010-11) across engineering as a whole there are 34 non British countries represented, with 40 different native languages spoken. The greatest numbers are from China, Europe, Malaysia and Pakistan.
Teaching Methods: lectures; seminars; presentations from external speakers; enquiry based learning; project based learning; independent learning; virtual learning.
Assessment Methods: exams; online exams; group work presentations; peer assessment; essays; lab reports; and other types of report, like creative reflections etc.

Integration of international students into UK culture, University and Department

When international students arrive they have an orientation week with mentors, other staff and student mentors learning about UK culture, the city, the University and its regulations, and the departmental expectations. This is followed by an English test to ascertain standard and identify any weaknesses. Support tailored for any identified weakness can then be provided by the University's English Learning and Teaching Centre.
With international students that come for three or four years there is time to gradually integrate them into the UK and University cultures. With MSc students that only come for one year, it is much more important to get them through the culture shock as quickly as possible, so that their studies do not suffer. The induction process for these international students has to be: *"very quick, very bold and you have to tell them exactly what it is going to be like and you have to give them the tools to overcome any challenges"*.
There are international societies within the University that are helpful for international student integration. There is an international wives club that has been around for around 30 years that was originally to support the wives of international PhD students. There is a branch of the Students in Free Enterprise (SIFE) international organisation that promotes business and enterprise development. This group is run by students and is open to all students but it seems to be the international students that make the most use of this organisation. Similarly, international students seem to be more proactive at joining Engineers without Borders.

Teaching/pastoral activities that benefit all students

When all students arrive as undergraduates they are allocated a personal tutor. Each member of staff has a group of five or six tutees that they meet once a week. These groups are mixed to

provide a balance of home, international and female students. The department values and takes advantage of the 'cultural capital' available among both the student and diverse staff populations.

Group and project-based work activities (that benefit all students)

Group Work: Engineering Applications Week in the first year. Required by IMechE for accreditation. Groups of students, guided by mentors, learn the functioning and safety aspects of workshop equipment.
Project Work: The first project is given to student groups during induction week. This is a design brief that they have to solve. Such group projects are given in the second third and final years as well. A lot of these will be as competitions between the groups.
Group sizes vary but try to limit to seven, as above this number the teams become "ineffective". This upper limit is becoming difficult to maintain, though, as student numbers are increasing. When teams are greater than seven: *"…then we'll ask students to sub-divide into a specialist organisational structuring, in which they have different functions within their sub-teams."*

Group selection: In the first year, groups are determined by staff and they try to get a good mix with at least one international student and one female in each group. This is so that: *"…they learn to work together and make use of the cultural capital in their backgrounds"*. This does not guarantee interaction between the home and international students. Home students will often sub-divide into cliques and international students will often re-assort with their national groups. Elena considers this one of the most difficult aspects to manage.
In subsequent years then grade point averages may be used to sort students into groups. Sometimes these are selected to generate mixed ability groups but recently they have been experimenting with groups of the same ability based on their grade point averages: *"...we tend to have students complaining that the weaker students didn't do their share and then peer review is so difficult as well, so we thought; 'What if we put them together into groups of [the] same level of skills...?'"*
This has generated some surprising results, where the best ability groups tend not to perform to their ability, while the least able groups tend to perform better than expected. The students are unaware of their grade point averages but presumably can judge their relative positions within the overall pecking order. Possibly, the best students might want to out perform each other leading to a poorly functioning group, while the worst students academically may benefit from working together without the pressure of having high performing individuals monopolising the process. They have been trialling this process for three years and are now going to evaluate it to assess the reasons behind the observations.
Another method for selecting groups is to get the students to apply for specific jobs within a team. There may be 10 different topics, so a student will apply to be part of the team that is tackling a topic of interest to them. They are asked to submit a brief of their interest, their skills, and of how they propose to address an aspect of the topic: *"So if you are interested in fluid dynamics, or whatever it is, just submit a brief of your interest, of your skills, or how you plan to address certain areas of the project, and then there is a selection process where we give the students that opportunity to apply for their job, pretty much."*
Staff then select the groups based on the applications.
Self selected groups are allowed for some projects in the final year. In one example, students are asked to recruit a team to tackle a particular project. Some groups will just coalesce because they are friends but the more dynamic/ competitive students will recruit the students with the skills they need: *"The more competitive students will actually go and recruit the students who will help them get the best marks."*

<u>Support</u>: The group and project based work has supervisors, mentors and in some cases external mentors allocated to projects. Additionally, PhD students can guide and advise.

<u>Activities tailored to the needs of international students for general engineering education</u>

None described.

<u>Activities tailored to the needs of international students specifically for group and project-based work</u>

None. All students receive the same support.

<u>Issues with or for the education of international students that need to be addressed</u>

International students' contributions to group and project work are the most controversial and difficult to manage. Home students often complain that international students do not contribute sufficiently. This is often due to a lack of confidence in English language skills, which may lead to international students appearing shy. Elena encourages the international students at Masters level to try to integrate with home students and not wait for home students to make the first move, because: *"…it is not something that they do"*. There may also be difficulties for international students in trying to comprehend UK regional accents. So international students can be reticent and this can be interpreted as failing to contribute by home students, leading to tension or friction. This is where supervisors, mentors and tutors can play a crucial role to mediate and facilitate between the student groups. Not all staff, though, are aware of the conflicts and frictions. If these emerge through peer assessment at the end of the project, then it will be too late to rectify or ameliorate: *"So if students don't mention it then they can go unnoticed completely by the mentors and supervisors and that's where the mentorship scheme doesn't particularly work well. If students don't bring it up and you are not clued up well enough, you might miss those conflicts and those frictions. And right at the end when you have the peer review, then it's a bit too late I think."*

Elena is considering proposing that, where project work uses peer assessment then there should be an assessment mid project so that any issues that arise can have an opportunity to be addressed before the end of the project.

Many international students, particularly those from Asia, have no prior experience of how to conduct engineering projects: *"Most of the Asian students have never experienced group work before and facilitating that, is very, very challenging. The other problem is...many lecturers are even unaware of these facts and that makes it even worse because you have a group of students wandering around not knowing what to do."*

Sometimes it is not until the individual final year project (40 credits) that this deficiency becomes apparent. Often the students will have high grade point averages, indicating that they are proficient at examinations and must somehow have passed through the earlier group projects unnoticed: *"I've had the experience of supervising final year project students from China, Malaysia and you would be surprised, in the final year, in students that average 75-77% grade point average and then you discover that they are not capable, they have no idea how to conduct a project whatsoever."*

Elena thinks that all international students should receive specific training in how to conduct project work: *"I think it requires... that international students get some specific training on how to work in group projects and actually how to do projects full stop."* This would probably be of benefit to home students as well, because although they are familiar with project work, they tend not to have a clear understanding of enquiry-based learning.

TIS: An engineering perspective with a focus on group and project-based work.

Use of international students as a resource

Elena, as part of her teaching on 'Managing International Projects' uses third year students from across the Faculty as a resource by asking them to write down: 'What is one thing I must do if I go to their country to run a successful project, and what is one thing I shouldn't do if I go to their country?' Elena has compiled these responses into a useful guide from students, to students on the perceptions of how to behave in different countries to be successful. This has been very successful with third year groups but has not been successful when tried at first year level. The students are not mature enough and don't appreciate the need for this information until they are nearing the point when they will be applying for jobs in the global marketplace.

Benefits, opportunities, future issues for home students

Home students do not seem to be as globally aware as the international students and may be starting to lose out in the global competition for jobs. International students may already have a competitive edge in the market because they have made the first move by coming to the UK. Home students, on the other hand, are possibly complacent in the knowledge that they speak English and so should be able to work anywhere as English is an 'international' language. This, though, does not take cultural differences into consideration. Elena feels that engineering jobs even in the UK are likely to have international dimensions, such as the procurement of parts that will necessitate dealing with other nationalities and these aspects may fail if people are not sensitive to the different cultures involved: *"The market is very competitive and even if you get a job in Bakewell it probably will have an international aspect to it. The procurement will be international, the parts that you're buying will be international, you'll have to deal with someone in China no doubt, and if you don't know how to approach those people, you probably will make a mess of your project if you are not sensitive enough."*
Home students should be encouraged to learn from the international students and staff to develop a global perspective.

About this report:

The study described in this report forms part of the Teaching International Students (TIS) Project being co-ordinated by the Higher Education Academy (HEA) along with the UK Council for International Student Affairs (UKCISA). The aim of the project is to recommend ways in which academic staff can enhance the learning of international students. Several HEA Subject Centres are involved with the project and this report details work by the Engineering Subject Centre, which has a focus on group and project-based working.

About the centre:

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

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

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

an **engineering subject centre** report