



Fellowships in  
Teaching and Academic Development

2007-09



# Foreword



Dr Philip Nolan, Registrar

With the successful introduction of modularisation, UCD is now at the forefront of educational innovation in Ireland. Building on this success, the university is finding new ways to stimulate academic innovation and disseminate new ideas and practices in education.

The cornerstone of this effort is the establishment of a number of Teaching and Academic Development Fellowships. I am very excited by this initiative. It is a reflection of the importance that the university places on creativity in this area and a great way of recognising and rewarding the excellence of the academic staff at UCD.

**Dr Philip Nolan,**  
*Registrar*



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# Introduction



Professor Bairbre Redmond,  
Deputy Registrar for Teaching and Learning

## UCD Fellowships in Teaching & Academic Development 2007-9: Rationale and Outcomes

The 2007-9 UCD Fellowships in Teaching and Academic Development scheme was originally conceived as a hybrid model to support both the development of institutional academic leadership and also educational solutions to strategically important issues at institutional level (Noonan & Redmond 2007). The scheme was made possible through a successful application for funding from the Higher Education Authority's Strategic Initiative Fund (SIF 1). This first round of the Fellowships focused on the identification and development of new academic leaders who would be capable of responding to the educational changes and challenges that were emerging in the university's newly modularised and semesterised teaching structures. The Fellowships were also designed to recognise and reward emerging leaders in teaching and learning and to facilitate them in playing more significant roles both in their own schools and at college and university level. The first eight Fellows (2007-9) came from a range of disciplines including computer science, geography, engineering, languages, linguistics, psychology and sociology. Members of the group already had expertise in a number of key areas of teaching and learning such as curriculum development, student engagement, innovative large group approaches and language teaching and assessment. Their shared characteristic was a strong commitment to high quality teaching and student learning. Working both individually and collectively over a two-year period, they have demonstrated the expertise and the leadership capacity to effect transformational changes in teaching, learning and assessment practices both in discipline specific areas and thematically across the university as a whole. As this report shows, the Fellowship scheme has supported the development of strategic individual and group projects that have had a university-wide impact. The Fellows have also emerged not only as teaching leaders, but as teaching scholars and as models and mentors for other staff who are keen to follow a career path as outstanding teachers.

## Rewarding for Future Development

An important aspect of the Fellowship scheme has been its effectiveness as a proactive vehicle through which teaching excellence is not only recognised but also further encouraged at both an individual and an institutional level. Research into different approaches to rewarding teaching excellence reveals that some of the more traditional elite teaching prizes can be divisive or may label the recipients, unhelpfully, as 'non-researchers' (Warren & Plumb 1999). Other teaching reward schemes have ironically been found to take recipients further away from teaching by encouraging significant 'buying out' of teaching time (Collins and Palmer 2006). In designing effective teaching reward schemes it is important to differentiate between the characteristics of retrospective and prospective schemes. Retrospective teaching prizes that reward past behaviour

are effective in highlighting individual excellence, but they may not be as aligned to areas of strategic importance for the institution as are prospective, forward-looking schemes (Hanson 2003). Prospective schemes, such as the UCD Fellowships, can also be useful in supporting more fruitful approaches towards integrating teaching performance and learning gains, rather than reinforcing an unhelpful divide between the two. Incorporating projects that focus on the scholarship of teaching and learning—one of the key aspects of the UCD Fellowship scheme, has been suggested as the most effective way to accomplish this (Skelton 2003:189).

## Teaching Excellence

While frequently referred to in higher educational policy documents, the concept of 'teaching excellence' needs to be addressed and it is one of the most complex problems encountered in recognising and rewarding outstanding teaching. Sherman *et al* (1987) suggest characteristics of teaching excellence that include enthusiasm and clarity of presentation along with interest in and knowledge of one's subject matter. While these characteristics of the excellent teacher are helpful, they primarily relate to the performance of the teacher in the classroom. Outstanding teachers should also be able to demonstrate skills in parallel areas such as an understanding of the mechanics of the teaching encounter, developing a sound analytic grasp of the pedagogic theories that underpin teaching and learning and an ability to scientifically explore and analyse both teaching and learning in a formal approach to inquiry. An outstanding teacher should be clearly functioning at a number of different levels. A useful three-level paradigm, developed by Kreber (2002), divides outstanding teaching into teaching excellence, teaching expertise and teaching scholarship. The paradigm is characterised by the nature and sources of knowledge construction that underpin each level.

An important aspect of the UCD Fellowship has been the fostering of a level of teaching scholarship that emerges from a combination of high-quality, reflective teaching practice that can be developed into robust pedagogic research (Trigwell *et al.* 2000; Redmond 2006). Kreber (2002) sees the outstanding teacher as being able not only to teach well and demonstrate effective teaching practices, but also to draw on personal and formal sources of knowledge construction about teaching. The UCD Fellowships have been designed to support individuals with just such multi-layered abilities and to encourage their capabilities as catalysts for the growth of teaching excellence within their own schools and colleges. The development of teaching scholarship within the Fellowships has also been supported at team level, with two Fellowships teams researching into strategically important issues for the university—the first year experience and the educational responses to general education electives in the undergraduate curriculum. Such scholarship teamwork has allowed Fellows to contribute their own discipline-specific teaching and

research skills to the projects, adding depth and perspective to the outcomes.

### Teaching & Research

One of the key objectives underpinning the establishment of the UCD Fellowships has been to address a perceived lack of parity of esteem between teaching and research (Hattie and Marsh 1996, Ramsden and Martin 1996). Locating and rewarding excellent and scholarly teachers within the research-intensive university is an essential but complex activity. UK research suggests a strong correlation between academic attitudes to teaching and the reward system for teaching within the university (Nicholls 2005) i.e. what is most rewarded will be the most valued and actively engaged in. The international debate on the impact of an institutional focus on the research, rather than the teaching and educational achievement of academics, indicates a negative impact on the quality of teaching offered to students (Hattie and Marsh 1996). Key writers on the research/teaching debate have been Ernest Boyer and his contemporaries at the Carnegie Foundation for the Advancement of Teaching in the United States of America (Boyer 1990; Glassick *et al.*, 1997). The Boyer Commission report (1998) played a significant role in encouraging international debate about the quality of teaching within research-intensive universities. The Commission noted that in the US, where research and teaching became increasing polarised activities, research gains were primarily achieved at the expense of the teaching experience for many undergraduate students.

Teaching and research need not be exclusive activities and encouraging teaching scholarship that encompasses pedagogic research can provide a nexus between research and teaching. Such scholarship is close to Humbolt's concept of *Wissenschaft*, that of learning in a research mode, (Elton 2005). Robertston and Bond (2005) advise acknowledging the variation and complexity between teaching and research and not to seek for unity but for dialogue that enables a productive co-existence of different ways of being. In terms of reward, Hattie and Marsh (1996) note that the characteristics of creativity, commitment, investigativeness and critical analysis span both research and teaching and they suggest that it is such characteristics that should be rewarded, regardless of which sphere they appear in. Through its individual and group projects the Fellowship scheme has attempted to mobilise active involvement of academic staff in a change process with an emphasis on collegiality and collaboration - such collegiality has been recognised as an essential component in redressing the teaching-research balance (Frost and Teodorescu 2001:399).

### Teaching Leadership

The creation of new academic leaders who can drive informed and effective educational change across the university has been

fundamental to the aims of the Fellowships. In higher education there is a need for academic leaders with an understanding of and a familiarity with pedagogy to set up and mobilise good academic subcultures that support an enthusiasm for innovative and effective teaching (Knight and Trowler 2000). Other studies have also recognised the role of inspirational academic leaders in the improvement of teaching and learning (Ramsden 1998), Martin *et al.* (2003) have examined the relationship between the attitudes of academic leaders and the perception of that leadership and have shown evidence that the experience of academic leadership has an impact on the way academics operate and on the resulting quality of student learning.

As we face difficult and worrying times in terms of our national and international economies, with an inevitable impact on our university, this quality of informed leadership is needed more than ever before. Ramsden (1998) presents evidence that points to the crucial role of academic leadership in maintaining morale, enhancing productivity, and helping staff to cope with difficult or momentous change. Within the last two years individual Fellows have been successful in establishing themselves as academic leaders in their own disciplines and some have also taken on key academic leadership roles at university level. Perhaps it should be no surprise that they have been able to assume the mantle of leadership so easily, as the fundamental characteristics of good teaching are very similar to those of competent academic leadership—responsiveness, positivity and a capacity to combine clear goals, reflective analysis and intellectual challenge (Ramsden 1998). As the rest of this report ably demonstrates, the UCD Fellows in Teaching and Academic Development (2007-2009) have demonstrated just such competencies and, in Ramsden's definition of an academic leader, have been able to "encourage staff to give their best to their students and their subject ... make best use of their knowledge to solve problems in research and teaching collaboratively as well as individually and to feel inspired to overcome the obstacles presented by change and upheaval in university life" (1998:106-7).

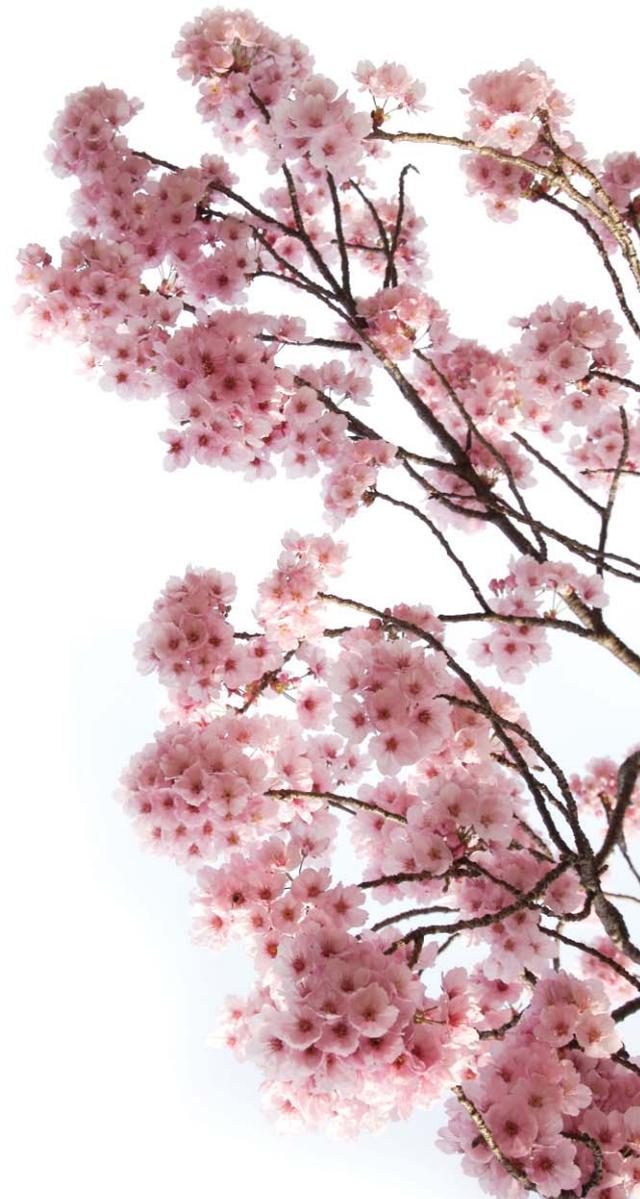
It has been my pleasure and privilege to work with the first UCD Fellows in Teaching and Academic Development over the past two years. They have shown themselves to be talented, collegial and generous with their time. Their enthusiasm and ability for innovative, high-quality teaching and learning and their capacity as teaching scholars has set down a high benchmark for others to follow. They represent much of what is best about teaching and learning in UCD.

### Professor Bairbre Redmond

Deputy Registrar for Teaching and Learning  
Joint Project Director

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# The Projects



Ms Elizabeth Noonan,  
Director of Academic Development

The UCD Fellowships were designed to focus on strategically important teaching and learning issues within the University. Two strategic themes with a strong student orientation were chosen:

## First Year Experience and Student Engagement

Fellows were organised into two teams to define group research projects which would help improve the university's understanding of key factors influencing the student learning experience in the context of UCD's newly modularised curriculum. In addition each Fellow undertook an individual project in their disciplinary area. This report, consisting of two papers and a series of individual case studies, presents the outcomes of the work of the UCD Fellows in Teaching and Academic Development (2007-2009).

Section 1 presents the work of the First Year Experience Project Team (Gibney, Moore, Murphy & O'Sullivan) and the individual case studies. The group project took as its focus the gap between students' expectations of university at the outset and their subsequent experiences once at UCD. Overall the project revealed that the majority of students had positive views of their learning experience at UCD and believed that they had chosen the correct programme. A number of changes were identified from the student responses which, if implemented, could enhance the first year experience. These included: supporting students' academic and social integration to the university; increasing tutorials; and fostering group work within modules. The findings from this project were presented at the Universitas 21 Teaching & Learning Conference (February 08) and at the European Association for Institutional Research (August 08).

Section 2 presents the work of the Student Engagement Project Team (Hennessy, Hernandez, Kieran & McLoughlin) as well as the

Fellows' individual case studies. The introduction of electives as part of the Horizons programme offered students a new level of choice and flexibility in their studies to move outside their chosen disciplines for part of their programme. This group project focussed on understanding the motivations of students for choosing elective modules outside their programme, their learning experience and the staff teaching experience on these modules. The project revealed that the majority of students chose electives on the basis of interest in the subject, while a smaller number of students behaved tactically and chose modules they perceived would be easy. A number of recommendations were made on the potential for developing the elective portfolio to support the development of core transferable skills and to meet expressed student demand for particular subject areas. The findings of this project were presented at Universitas 21 Teaching and Learning Conference (February '08) and at the Society for Research into Higher Education (December '08).

Both of these projects and the individual case studies are valuable in fostering a wider institutional understanding of key aspects of the student learning experience and highlighting the policy and academic responses which can further enhance the learning experience. The issues of student engagement and motivation addressed by the Fellows' work are shared beyond UCD, as universities across the world adjusting to the demands of massified higher education face similar issues. The work of the Fellows has contributed to and benefited from this debate internationally. The outcomes of the first phase of the UCD Fellowships in Teaching and Academic Development provide a very important foundation upon which the next stage of the Fellowships can build to help develop and extend UCD's reputation for excellence in teaching and learning.

**Ms Elizabeth Noonan**  
Director of Academic Development  
Joint Project Director

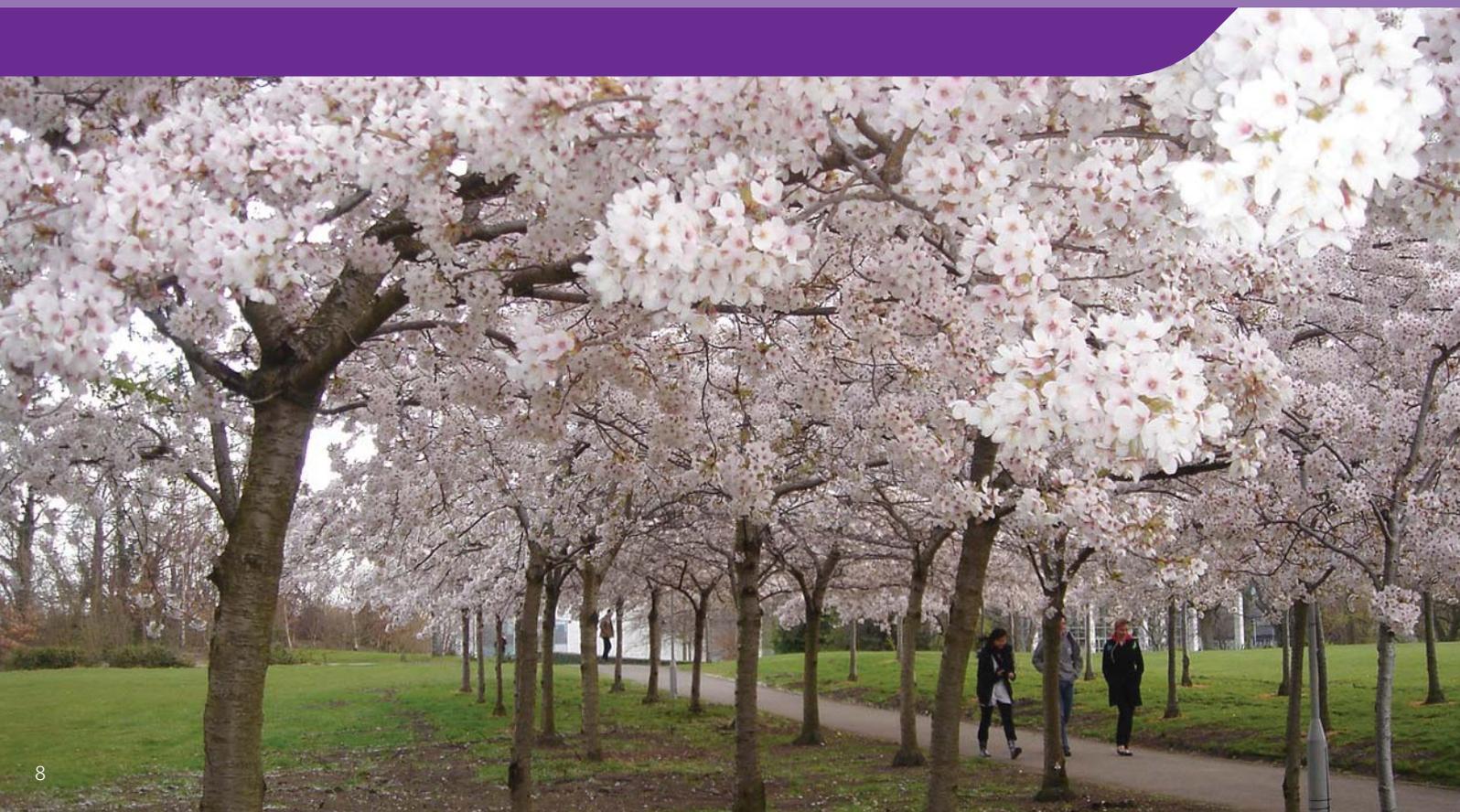
# Title: The First-Year Experience: Assessing Expectations and Enhancing Reality

**Project team:** Amanda Gibney, Niamh Moore,  
Feargal Murphy and Sara O'Sullivan

## Introduction

This project aimed to assess student expectations of university on arrival and their experiences during the first year with a view to identifying key issues relating to student engagement and recommending possible enhancements at University College Dublin. Four key tasks were identified in relation to this project:

- To develop an understanding of incoming student expectations and early experiences
- To assess student experiences of university after the first year
- To develop the necessary evidence-base to contribute to effective policy enhancement
- To disseminate the findings across the university community and externally.



## What did we do?

In order to improve the experience of teaching and learning within universities, insights into the “unarticulated beliefs that underpin practitioners’ conceptions as well as those of their students” should be gathered (Smyth 2003; 52). In a large university, one of the most efficient methods of doing this is to survey the relevant stakeholders and we assessed student experiences at UCD through online surveys. Students were asked to answer a series of questions in order to uncover both apparent and previously unvoiced concerns in relation to their expectations and experiences of Year 1 at university. While the data provided us with significant feedback on the student perception of the university, it also challenged and helped to expose the assumptions that we, as academics, make about student life and behaviour.

### Data Collection

Two online surveys were undertaken with students—one midway through semester one and the other at the end of semester two. A self-selecting random sample of over 1200 stage one students completed the first questionnaire which assessed students’ expectations and initial experiences in semester one; just over 800 students completed the student experience survey at the end of semester two. Although this represents just 19% of the cohort, these appear to be highly engaged students. 80% of them had attended more than half of their classes during the year and 73% of them had submitted all of their assignments. The surveys addressed issues in relation to motivation, socialisation, learning approaches and the overall university experience and generated a range of quantitative, but also some qualitative, data. This provided a significant evidence-base from which policy recommendations have emerged.

## Student expectations and initial experiences of University: Key results

Generally, student feedback after just a few weeks at UCD was overwhelmingly positive.

- 75% of respondents agreed that UCD was an interesting and stimulating place to study.
- 56% of students knew what their programme involved before coming to UCD, however 22% did not.
- 78% had found their course challenging with 60% enjoying classes.
- 58% had found the workload to be more than at school.

The primary motivating factor for UCD students entering third-level was to enhance their employment prospects (71% of respondents), closely followed by a desire to explore subjects that really interest them. The postponement of full-time employment was not a motivating factor for most of the students, but there is clearly a social expectation that students will participate in third-level education. 63.1% agreed or strongly agreed that going to third-level was a ‘normal’ thing to do, while 56% agreed or strongly agreed that their parents expected them to go to third-level.

The survey also required students to rate their perception of their skills levels in relation to their classmates. While the responses show that UCD students are highly ambitious, their level of confidence in their time-management skills—a crucial factor in university success—is much lower (Table 1). The analysis of the responses relating to skills also revealed distinct differences when explored by gender, programme area and broad age categories, and is reported at [http://www.ucd.ie/fellows/fellow\\_pub.html](http://www.ucd.ie/fellows/fellow_pub.html).

PERCENTAGE OF RESPONDENTS IN “HIGHEST 10%” CATEGORY							
College	Academic ability	Maths ability	Writing ability	Ambition	Self-confidence	Time mgmt	Social skills
Business & Law	14.1	11.6	19.6	28.8	16.1	9.5	14.1
Eng, Maths and Physical Sciences	10.7	11.7	9.4	20.7	13.3	5.7	13.7
Human Sciences	10.3	0	13.8	13.8	6.9	3.4	24.1
Life Sciences	9.9	9.9	10	27.1	11.1	6.5	14.2
Arts and Celtic Studies	7.4	1.9	13.2	26.1	10.8	6.3	16.6

Table 1: Percentage of respondents self-reporting as ‘highest 10%’ in a range of skills

The results also highlight that while student behaviour may not always reflect the expectations that academics hold of appropriate engagement, students do understand that they have to attend lectures regularly, that this is not all that is required to succeed (85% of the respondents), and that they will have to complete the majority of assignments in order to succeed (97% of respondents).

### Concerns regarding the new learning environment

In answers to an open-ended question regarding their greatest concerns, a wide range of anxieties about coming to UCD were described, forty-four in total. The response rate for this question (86%, once those who answered nothing were removed), indicates that for incoming UCD students the start of the first year of university is a particularly anxious time (see also Cooke *et al.* 2006). The most frequently given answers related to the social aspects of college life, with one-third of answers falling into this broad category.

Making friends emerged as the key issue and respondents described this anxiety as follows; “Making friends as I knew no-one in the college before coming here”; “making new friends and feeling comfortable in my new environment”. It was interesting to note that 27 of those who cited fear of social isolation in the first part of their answer gave a second example also; in most cases making friends. For those who already had friends at UCD there was often concern that they did not know anyone in their class; “getting to know people in my course, as none of my friends were doing the same course as me”.

The second most important set of issues, raised by 29.3 per cent of respondents, related to academic concerns and “whether I would be able to manage it all”. Here students were most concerned about workload (11.6%) and that the level of the course might be too difficult for them (9.3%), described by one respondent as a fear of “being in completely over my head”.

Another significant issue, mentioned by 16% of students, was a general concern about their third-level choice. Of these students, a key concern expressed was that they wouldn't enjoy either their course or UCD itself (10.8% including both first and second responses). They were concerned "Would I actually like it even though I had always wanted to do it?" One respondent described this anxiety as worrying about "having made the wrong choice of course and being stuck in it".

The group of students who were concerned about the challenges of university life, particularly "the size of UCD and how I would find everything" were a small percentage of the respondents to this question. Anxieties here included logistical issues (getting to college, getting around college), and their abilities to manage personal issues (such as moving away from home for the first time or finances). There were variations in responses from students living at home or away from home, and across different colleges. However these differences were not found to be statistically significant. Variations according to CAO points, sex of respondents and whether they were mature or traditional students were found to be statistically significant at the 0.01 level. The first thing to note is that females were more likely than males to answer this question (89.7% v 84.6%). Male respondents were less concerned than their female counterparts about social isolation and college life and more concerned about the challenges of a new life at college. Mature students were found to be less likely than traditional students to be concerned about social isolation, choice of course or university and more concerned about academic matters, but not about workload. The specific issues that were of particular concern to mature students were returning to education, being different from other students, their academic ability, managing different commitments and financial concerns.

### First-Year Experience of Life at UCD: Key results

In the follow-up survey undertaken in April 2008 at the end of semester two, students remained very positive generally about their experience of university. Key indicators include:

- 83% agreement that stage one at UCD had been a positive experience overall
- 72% agreement that they had chosen the right programme of study
- 68% agreement that lecturers and tutors were very approachable

However, a number of areas of concern did become evident:

- 26% reported that they did not feel part of a community at UCD, stating that "I never felt part of it" and "there is a very poor community on campus, this needs to be rectified".
- 32% found it somewhat or very difficult to make friends arguing that "it's very hard to make friends in such large classes".
- 33% had considered withdrawing from UCD at some point in stage one, with many commenting with statements such as "I found the first semester the worst and almost dropped out".

#### Academic demands

Adjusting to academic life at university proved difficult for many students, but this was not reflected across the entire student body. When asked how easy it had been to develop effective study skills,

52% of students rated it as having been difficult or very difficult. Time management emerged again as a critical issue, with 64% of respondents arguing that it had been difficult or very difficult to manage their time effectively. This may be related to a major gap between the expectations of students and academics in relation to appropriate workload. In the surveys, students were asked to state the number of hours per week they spend on a variety of academic and social activities. The results show that on average students are spending 29.5 hours on academic activities, in contrast to the staff and university notional expectation of 40 hours per week. An area of particular interest is the responses received to the question regarding the numbers of hours spent in paid employment, as shown in Figure 1. A much higher proportion of the respondents than had been anticipated are not in any form of paid employment. However, just over 45% of students are working more than eight hours per week, with approximately 7% of these working in excess of 21 hours per week.

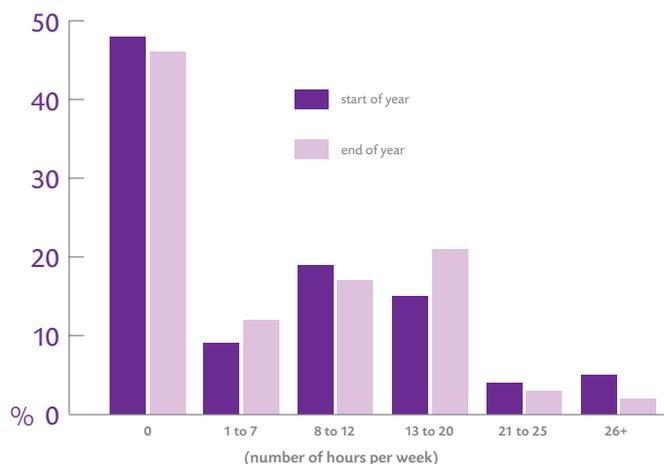


Figure 1: Time spent by UCD students in paid employment per week

Students who are living at home are more likely to be in paid employment and engage less with university activities. In a recent comparative study of English and Spanish students, Rosado (2006: 358) found a similar pattern, arguing that "the students who for various reasons have opted to live at home and come and go to university every day appear to be most detached from the university as a space in itself". In our study, distinct gender differences also emerged. Female students are more likely to be working and for longer hours than their male counterparts, which may be attributable to the need to fund particular lifestyle choices. A comparison of the work patterns of the mature to non-mature respondents illustrates that a much greater percentage of the non-mature students are working in the 8 to 12 hour category. It is of concern, however, that 32.6% of the mature respondents are working more than 13 hours a week, compared to 21.9% of the non-mature respondents—perhaps out of necessity to support children or other dependants. Also of concern is the increased numbers of students working 13-20 hours per week at the end of the academic year, compared with the first survey early in semester one. This is of concern given that recent research has demonstrated in the UK context that students engaged in part-time employment usually underachieve academically. The

Education and Skills Select Committee has recommended that students do not work more than 12 hours per week during term time (Callender 2008).

## Recommendations

Arising from this project, a number of recommendations have emerged for future academic policy making. Student responses to our open-ended questions argued for the introduction of:

### 1. Additional support services:

- "More help in showing new students how to adjust in UCD because in the first semester I was lost about a lot of things"
- "Make available extra tutorial sessions for students if they are struggling"

### 2. More small classes:

- "Break down big lectures into many smaller ones"

### 3. A preference for tutorials over lectures:

- "More tutorials. The intimate setting makes it easy to learn"

### 4. More group work in tutorials and lectures:

- "...encourage more group work within modules, this would encourage more class participation and hopefully help in the formation of new friendships"
- "...more chances to work with other students"

### 5. More social activities linked to particular class or tutorial groups

Kirby (2002) has argued that while it is important to respond to student concerns, "universities must be strong enough to be very demanding of their students; to demand a real participation in the interactive exchange of knowledge and values that is the hallmark of the university experience" (quoted in McInnis 2003). Drawing on international evidence and on the empirical work undertaken by the Fellowship team, we would recommend a number of key actions:

### 1. Responding to student requests for additional clarity regarding university expectations:

- Resources for initiatives aimed at enhancing key skills, e.g. drop-in writing centre
- Innovation in delivering small group experience and supporting ICT use
- Adopt a rights and responsibilities approach clearly outlining university expectations of students and consistently apply university policies

### 2. An intensive, non-subject specific 5-credit 'transition' module:

- To provide advice on practical issues
- To help develop the idea of a learning community through clustering students
- To establish effective and appropriate learning patterns and behaviours

### 3. Community-building initiatives:

- The transition module could assist in developing 'communities of inquiry'
- New university policies to support the academic delivery and assessment of group work

- Greater use of social networking opportunities prior to the arrival of students on campus, e.g. the MyUCD.ie portal
- An expanded peer mentoring scheme

## Outcomes of the First Year Project

- Major focus institutionally now on the first-year experience
- Initiation of first year survey at university level (now an annual survey led by Director of Institutional Research)

## Dissemination

- Gibney, A., Moore, N., Murphy, F. and O'Sullivan, S. *The first year experience: Assessing expectations and enhancing reality*, UCD/UL Colloquium on Teaching and Academic Development, December 2007
- Invited speaker: Gibney, A. "Encouraging creativity within an engineering curriculum", An International Symposium in Engineering Education: Student-centred learning in small groups, January 2008
- Gibney, A., Moore, N., O'Sullivan, S. and Murphy, F. "Won't someone tell me all I need to know?: First Year Expectations of University Life", U21 Teaching & Learning Conference, Does Teaching and Learning Translate?, February 2008, Glasgow
- Presentation to College of Human Sciences Teaching and Learning Committee, Feb 2008
- Presentation to Engineering Programme Board Forum meeting, April 2008
- Presentation to Senior Management Team, June 2008
- Presentation to School Heads of Teaching and Learning meeting, November 2008.
- Presentation to College of Arts meeting, January 2009.
- Moore, N., Gibney, A., O'Sullivan, S. and Murphy, F. "Channelling innovation: The scholarship of teaching and learning and academic policy formulation", 30th Annual EAIR (European Higher Education Society) Forum, August 2008, Copenhagen
- N. Moore invited extern to the National Qualifications Authority of Ireland Programme Verification Panels at Dublin City University
- O'Sullivan, S. (2009) "Using Research Evidence to Inform Enhancements in the First Year Experience at University College Dublin", European First Year Experience Conference, May 2009, Groningen, Netherlands.



# Problem Solving and Creativity in Design

Fellow: Amanda Gibney

## What were the aims of the project?

My aim within this project was to encourage creativity and inventiveness within an engineering curriculum, challenging students to take control of their own learning. The initiative aimed to break the cycle of prescriptive learning that students have become used to at second level, encourage them to actively pursue knowledge and to take their learning experiences to a higher more engaging level than they have previously experienced.

Engineering education must provide the students with a knowledge and understanding of scientific principles and fundamentals. Engineers need to develop the ability to apply this knowledge to solve problems, innovate and invent, identifying available resources and constraints. Effectively tackling and solving problems also requires communication with design team members, with the community and with other stakeholders. The approach taken in this initiative allows the development of these skills and the building of confidence required to successfully and creatively solve problems.

### The learning objectives for the initiative were:

- On completion, students will understand the relevance and importance of creativity in design and generate design solutions in a creative way.
- On completion, students will be able to use problem-solving tools and techniques and understand the process for initiating and using creative techniques within project structures.
- On completion, students will be able to apply the basic techniques of observation, sketching and prototyping to their design work.
- On completion, students will understand the dynamics of teamworking and effective teamworking.

## What did you do?

Stage one students are often unaware of their strengths and abilities and it is important that we facilitate their development and awareness of their strengths and skills at an early stage in their university education. This initiative took an active learning approach, introducing students to the techniques and tools of problem solving and actively engaging them, through a series of group work exercises, in using these techniques, developing creative solutions to the tasks.

An existing semester two module in graphics was identified as having the potential to be redesigned to incorporate the initiative, with sketching and prototyping being central to the approach. The capacity of this particular module is 195 students, with enrolment numbers of 150 students for the 2008/09 academic session. A key component of successfully rolling out an active learning approach to this number of students lies with the expertise and enthusiasm of the group-work facilitators. As such, students, in stage two of one of our taught masters programmes were identified as suitable candidates for training for facilitation of the initiative. These students undertook the training as part of one of their semester one modules, taking all of the instruction and undertaking the exercises that the stage one students were going to be given the following semester.

The three main components of the module were manual graphics, computer-aided graphics and creativity in design (problem-solving techniques and applications). The learning outcomes and content of the manual and CAD elements of the module were to remain as they had been previously and the major change was the inclusion of the creativity in design element, which was covered in five weeks.

The focus in this document is on the creativity in design element of the module. Students were divided into groups of 5 and were provided with a table-top flip-chart, flip-chart pens, a notebook for each team member and a bag of model-making equipment for prototyping. Students were encouraged to identify and draw on resources that were available to them, beyond the material provided.

The first lecture described how design impacts on the outcomes of successful projects. The Innovation Design Cycle was introduced and students were brought through the steps in the innovation process; understanding the problem, identifying sources of information, resources, constraints and opportunities, observing the user experience, brainstorming, rapid prototyping and testing. The following lecture sessions focused more particularly on prototyping, the value of prototyping in developing and testing concepts, demonstrating ideas and identifying technical issues. A number of projects were used to illustrate the points in addition to demonstration of the concepts within everyday examples.

## This project was to encourage creativity and inventiveness within an engineering curriculum, challenging students to take control of their own learning.

The first practical session was aimed at allowing the groups to get to know each other, to identify the skills and interests of the group members. As part of this introductory session the groups were tasked to design a team logo and to present this to their classmates. At the end of the first session the students were given the assignment for the following week. They were told that they were expected to meet during the week and to develop their ideas in advance of the session.

The assignments challenged the students to look at facilities and service design from a user's point of view, to identify problems and opportunities and to prototype solutions. The assignments were centred around the following themes:

- A building, amenity or area of the UCD campus
- A children's playground in a corporation park
- A website
- The student experience of orientation week.

Each week the groups presented to their peers, using their analysis output and their prototype results. The use of the prototype in the design process was considered key.

### How did the students respond?

The students overwhelmingly responded positively to the initiative, stating that they would like to have a full module in this area. The students reported that the approach was totally different to what they had experienced to date. They commented that the workload was heavy but that they really enjoyed it and felt that it would benefit them during their studies and beyond. They commented on the enthusiasm of the lecturer and identified him as an experienced practitioner with very relevant industry-based knowledge which was shared with them, making the design and innovation process real. The students commented on how this initiative helped them to develop their teamwork, presentation, prototyping, creativity and research skills. The nature of the sessions helped them to get to know their classmates, building their confidence. The style of the delivery and the project-room environment were noted as being very different to that which they had experienced in other subjects.

### How did you evaluate the project?

The main aim within this project was to encourage creativity and inventiveness within an engineering curriculum, challenging students to take control of their own learning. It was evident from observation over the five weeks that this aim was met. Students were also asked to complete anonymous questionnaires in order to get their feedback; these were independently administered during the final session. Based on the student responses only procedural changes would be required. Students have requested that this initiative be expanded into a complete module and this is currently under consideration.

### What did you learn from the project?

The main surprise was the calibre of the work presented and the realisation of what the students are capable of at this very early stage of their education. There was very healthy competitive rivalry between the teams, making for a very good interactive, enthusiastic environment within the project rooms.

The expertise of the lecturer in the area of innovation in industry greatly enhanced the initiative. The lecturer, Keith Finglas, is one of the founding directors of Innovation Delivery Ltd., his practical experience allowed real examples to be described, providing a context for the process.

### What might other academic colleagues learn from the project?

Other colleagues have reported difficulty in engaging students and refer to reducing attendances over the semester. They could consider whether the approach used could be aligned with the learning outcomes of their modules.

The approach used in this initiative challenges students to take control of their own learning, work together in teams, identify and solve problems. They learn to respect each others' viewpoints and how to harness the potential of the team to find information. They are developing key skills which they will need during their studies and beyond. They are enthusiastic about their learning, they are challenged by the assignments, they invest the necessary time outside the sessions and provide excellent solutions to the tasks, demonstrating their creativity.

### What implications arise for the university in terms of developing academic practice and policy?

The university must provide support for training staff to develop the skills necessary to effectively manage an active learning approach, managing to create an environment in which students can develop many skills, engage in their learning and find it enjoyable.

#### Dissemination

Details of the initiative and its outcomes will be disseminated at school, college and wider university level. In addition, opportunity for wider dissemination at university level and through an article prepared for an engineering education journal will be sought.



# Teaching for Better Learning: A First-Year Enhancement Project

Fellow: Niamh Moore

## What were the aims of the project?

This project aimed to build on and expand the pilot Large Class Teaching Project (LCTP) implemented from January to May 2007 on Introduction to Human Geography I: People and places. The Geography LCTP pilot was developed in March 2006 as part of a wider university concern with improving the first-year undergraduate experience. The overall aim was to enhance the first-year experience of teaching and learning by fostering student engagement, incorporating generic learning skills and encouraging social networks for learning.

## What did you do?

Introduction to Human Geography I (GEOG 10030) is one of four modules in the level one Geography curriculum and was also available as an elective to students from other parts of the university. In March 2006, a colleague and I began work with the Centre for Teaching and Learning and identified some core underlying principles for our revised module design. It would be thematically based, integrative and adopt an active learning approach. We wished to combine learning formats and resources to cater for different learning styles, to introduce 100% continuous assessment to improve engagement and to try to simulate small-group teaching in a large class setting. An enquiry-based learning approach combining small-scale investigations and individual research was adopted and students became central partners in the module preparation. Underpinning all of these aspects was a desire to encourage active and peer learning through short in-class activities, individual and group lecture preparation work and enquiry-based tutorial activities.

My period as university fellow enabled this approach to be refined and the lessons from the pilot phase to be implemented. During the academic year 2007-2008, the evaluations that had been undertaken at three time periods during the pilot phase were reviewed. Assignments and some activities, including the management of group dynamics and the encouragement of more effective reading skills were revised and updated in response to the evaluations and in preparation for delivering the module for the second time from January to May 2008.

The second key aspect of the Fellowship was to identify ways in which this or similar approaches might be adopted in the Geography curriculum more generally. I have worked with the coordinator of the core first-year Physical Geography module to provide advice on techniques to improve engagement in that class and how the sequence of activities between the two modules might be better organised. I have also been developing, in collaboration with colleagues, a second year skills-based module which provides a follow on to the type of learning encouraged in GEOG 10030 and it has been delivered in semester two of the 2008-09 academic year.

The final aspect of the project has been to develop collaborative links outside of UCD. Dr Mary Gilmartin (NUI Maynooth) and I have been working to develop GEOG 10030 as a common first-year Geography module across our two institutions. We have also developed links with colleagues at the University of Glasgow and are currently producing a number of papers on our experiences and results.

## How did the students respond?

Analysis of the questionnaire results, combined with anecdotal evidence, suggests that assessing the module by tutorial participation and a range of continuous assessments throughout the semester played an important role in keeping students engaged and motivated to attend lectures and tutorials. Students rate the relevance of the tutorials to the assignments as critical in their decision-making processes, highlighting the absolute necessity of ensuring constructive alignment of all elements of the module. More importantly, incentivisation of attendance and participation emerged as the crucial factor in promoting better engagement and attendance. Student engagement does appear to have been much higher than in modules delivered in a more traditional manner and, as this was a core objective of our re-design, it was an encouraging finding. This was particularly evident in the time students spent preparing for lectures, the work that they did with classmates outside the lecture or tutorial room and their use of the electronic medium—a core element in the blended learning approach. While engagement was generally higher than in other modules, patterns of activity monitored in the online environment demonstrated that this was again primarily driven by the pattern of assessments.

Perhaps the most significant change in relation to student behaviour was their rapid embrace of social learning networks, facilitated through the online discussion board, and the regulatory role that they adopted with each other to ensure that work was completed on schedule and to a relatively high standard.

The overall aim was to enhance the first year experience of teaching and learning by fostering student engagement, incorporating generic learning skills and encouraging social networks for learning.

### How did you evaluate the project?

During the pilot year, this module was evaluated using a range of methods. A pre-module SETLQ questionnaire was undertaken to assess student expectations of the module. At the mid-point and end of the module, questionnaires were undertaken on the student experience that compared their approaches to learning in this and their other geography modules, as well as their levels of engagement. Focus groups were also undertaken with small groups of students and with the tutors at the mid-point and end of the module to provide more qualitative feedback. The module coordinators also kept a teaching log to chart their experiences and issues throughout the module.

During the delivery in 2007-2008, a pre-module expectations questionnaire and a post-module evaluation were completed. This was complemented by a more informal mid-term feedback quiz delivered through the online learning environment to which approximately 40% of the students responded. In 2008-2009, students at UCD and NUI Maynooth were given a similar pre-module questionnaire and will be given a post-module questionnaire. The pre- and post- results will be compared to highlight the changing experiences of students through the module and a comparison of UCD and NUI Maynooth students will be undertaken to determine if there are any institutional differences in students' approaches to similar modes of learning. A focus group with tutors who are centrally involved in the delivery of the module will also be undertaken.

### What did you learn from the project?

The key finding from this project, supporting existing international literature, was that the constructive alignment of assessment with learning goals is crucial to student engagement. The importance of social interaction – with peers and with tutors and staff – clearly demonstrated the significance of the active creation and maintenance of communities of inquiry for effective student learning. Some students responded very positively to this blended learning approach, and performed extremely well. However, a higher proportion of students performed more poorly than in the original, more traditional structure, primarily because the redesigned module required continuous engagement and left no room for traditional “cramming”.

### What might other academic colleagues learn from the project?

First-year curriculum design must facilitate the development of social networks as a means of building student confidence. Being among ‘friends’, gives them a vested interest in attendance and promotes their willingness to engage in self-directed learning through group-regulation of learning activities. Assessment can also be used as a motivational tool and key instrument in modifying student behaviour.

### What implications arise for the university in terms of developing academic practice and policy?

Delivering a large first-year module using innovative techniques requires some small-scale additional resource investment by the university. The successful delivery of this module to date has been supported by the employment of a dedicated teaching assistant to deal with the additional administration demanded by such a module. One of the key challenges is also to manage student expectations and their perceptions of what constitutes an appropriate level of engagement. For some students, this is not articulated clearly enough or at all by the university from the beginning of stage one, semester one. However, what is also important to ensure is that we do not create expectations among the student body that all modules can be delivered in this way, nor that it would be desirable to do so. A diversity of new approaches in teaching and learning must be encouraged so that innovation does not become solely equated with ‘online’ or blended approaches.

#### Dissemination

- Moore, N. (2008) Innovation in *Teaching and Learning: Opportunities and Challenges for Enhanced Learning*, Presentation to Inaugural School of Geography, Planning and Environmental Policy, Teaching and Learning Day, January 2008
- Moore, N. and Gilmartin, M. (2008) *Making It Different: A Blended Learning Pilot Project with First Year Geography Undergraduates*, Presented at U21 Teaching and Learning Conference, Glasgow 2008
- Panel participant in Online Learning for UCD staff module (Media Services, Nov 2008)
- Contributor to QAA Scotland First Year Curriculum Design Project
- Contributor to QAA Scotland First Year Enhancement Theme Booklet
- Moore, N. & Gilmartin, M. (2009) *Teaching for Better Learning: A Blended Learning Pilot Project with First-Year Geography Undergraduates*, *Journal of Geography in Higher Education* (forthcoming)
- Moore, N. and Gilmartin, M. (2009) “How about we figure a time and get this thing rolling?” Re-negotiating the teaching-learning nexus with first-year Geography students, Keynote address at University of Glasgow, 2nd Annual Learning and Teaching Conference: Promoting Student Success through the Curriculum, April 2009.
- Advisor on redesign of first-year Physical Geography module (2008-09) and on Introduction to Cities module (2009-10)



## Where are you when you are only halfway there? Defining semester one outcomes

Fellow: Feargal Murphy

### What were the aims of the project?

The transition from second-level to third-level education can be difficult. Part of the difficulty is working out what is expected in the new academic environment. There is also the added problem that success in a university can depend on developing skills that are not taught overtly. The development of Horizons in UCD led to a situation where the expectations could be more clearly articulated in terms of learning outcomes. The skill sets could also be more overtly imparted in class if they were integrated into the teaching in the first semester. My project aimed to achieve a consensus on the skill sets and academic level that we expected from students in our school, with a view to then feeding these back into the modules the school offered in the first semester of stage one.

### What did you do?

The project involved running workshops with co-ordinators of stage one semester one modules to compile a list of agreed generic learning outcomes, which co-ordinators would agree to integrate into the content and delivery style of their module. These skills would address such areas as essay planning, information skills, library use, time management etc. and would help students master skill sets that are crucial to their success throughout their undergraduate studies. The agreed set of learning outcomes was then fed into the module descriptors.

Once co-ordinators could see that there was a common expectation about the skills and level of achievement, they were happy to integrate training in these skills into their modules. Co-ordinators could be confident that the students were being reinforced in these skills in other modules in the school, and that all students would receive training in the relevant skills. This would produce students with the right kind of skills for maximising their learning in the second semester, eliminating the need for tutors or lecturers to spend time on a one to one basis going over mistakes in students' essays or coaching students in study skills. It allowed students to quickly come to grips with the library and computer skills that form part of the learning environment in UCD, as well as training students in the intellectual practices that form the basis of successful learning in university and beyond.

### How did the students respond?

Students weren't actively involved in the project, and should not have known that anything unusual was happening. The crucial factor was how module co-ordinators reacted and they were happy to co-operate in ensuring that the skills sets students needed to manage the transition from second level to third-level. There was agreement that the transition was made easier by the clear identification of and training in the necessary academic skills.

### How did you evaluate the project?

I evaluated the project in terms of the willingness of co-ordinators to agree to build skills into their module delivery. The benefits to the students I took for granted.

### What might other academic colleagues learn from the project?

Other schools could easily duplicate this process by agreeing on a concise list of skills they feel ought to be mastered by students in their discipline at stage one in order for those students to maximise their learning and performance in their undergraduate degree.

### What implications arise for the university in terms of developing academic practice and policy?

This project fits in very well with UCD's aim to improve student engagement. It facilitates an easier transition to university education and allows students to successfully become active learners at a very early stage in their university careers

My project aimed to achieve a consensus on the skill sets and academic level that we expect from students in our school.



# Enhancing The First Year Experience in Sociology

Fellow: Sara O'Sullivan

## What were the aims of the project?

The project was informed by a review of stage one Sociology and evidence from the 2007-8 end-of-semester group fellowship survey (see <http://www.ucd.ie/fellows/fye.html>). The key issue addressed was the effectiveness of seminars - in particular, the contribution they made to the first-year experience. The overall aim of the project was to make seminars more engaging for students and use them to support transition during the first semester of university life. This was seen as particularly important in a subject where the size of first year classes ranges between 520 and 550 students.

## What did you do?

To achieve these aims a number of changes were made to seminars in both stage one Sociology modules in the first semester of the academic year 2008-2009. To make seminars more engaging for students, the format and content of seminars were redesigned to facilitate an active-learning approach. This involved developing student-friendly topics, picking accessible readings and designing seminar activities that focused on application of key sociological concepts to everyday life. This process was informed by the available literature on teaching and learning in Sociology.

To support transition, attention was paid to using seminars to help students feel that they belong at UCD and in Sociology. Students taking Sociology as a 20-credit block, (approximately 80% of students), were registered to weekly seminars, in the same groups and with the same tutor each week. The seminars involved small group work. Four working groups of five or six students were created and students worked in these groups for the rest of the semester. To support these changes there were also improvements to communications with students and monitoring of seminar attendance.

The overall aim was to make seminars more engaging for students and use them to support transition during the first semester of university life.

## How did the students respond?

There were a number of observable improvements in student behaviour. The numbers of students not attending a single seminar in the first semester has been substantially reduced (see Table 1 below). Weekly seminar attendance increased, with an average of 71.5% of students attending weekly. Essay submission rates also increased: 89% of students submitted the SOC 10010 essay (up 6%) and 97.5% submitted the SOC 10020 essay (up 7%).

	SOC 10010	SOC 10020
2007 - 08	19.5	19.7
2008 - 09	8.5	7.4

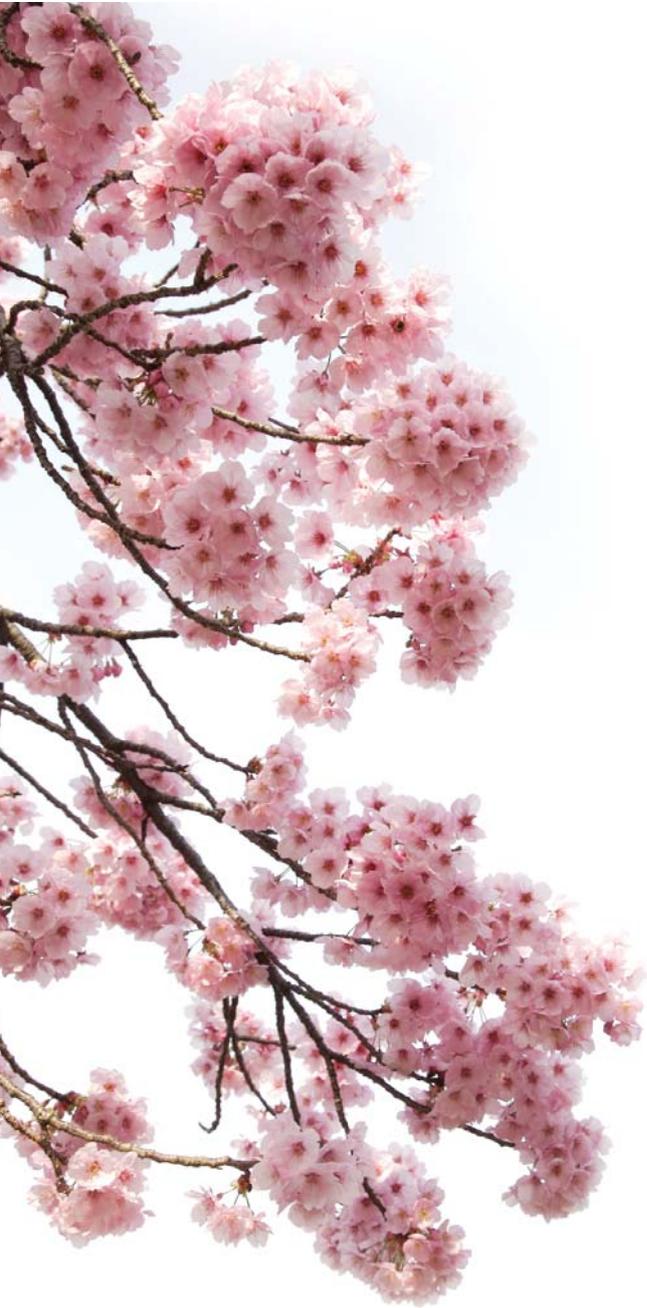
Table 1: Percentage of students attending no Sociology seminars.

## How did you evaluate the project?

A student evaluation of the new seminar format was undertaken using an anonymous online survey at the end of the first semester 2008. Fifty percent of the cohort completed the survey (N= 298). Student evaluations were positive overall, with less than 10% reporting that the seminars were not useful to them. The two aims of the project appear to have been achieved: students' responses both to the active learning approach, and to group work were positive. 86% of respondents rated 'applying the sociological concepts' as somewhat or very important to their experience of the module, 79% rated 'being encouraged to actively participate in seminars' as somewhat or very important, 76% rated 'getting to know the other students in my seminar group' as somewhat or very important, and the same number rated 'feeling part of a cohesive class group' as somewhat or very important. The comments in response to the open questions also focused on these two issues and provide an insight into students' experience of the seminars and of their first semester at UCD.

## What did you learn from the project?

This study shows that changes to the pedagogical approach underpinning seminars can improve student learning and student attendance. The combination of seminar alignment and small group work can go a long way to ameliorating the negatives students associate with being in a large stage one class.



Findings from the student evaluations highlight the heterogeneity of the student group. Of particular interest were the different approaches to learning evident from the different attitudes to the marks awarded for attendance and participation at seminars. 40.4% agreed with the statement 'I only attended the seminars because there were marks for attendance and participation' and had an instrumental or surface-level orientation to learning. Members of this group were more likely to be only taking one Sociology module, to find the set readings difficult, and were less positive about the seminars. It is encouraging to find that this group is representative of a minority of first-year Sociology students. At the other end of the scale, 35.2% disagreed or strongly disagreed with this statement and had a more engaged and intrinsically oriented approach to learning. They reported spending more time preparing for seminars and appeared to get more out of seminars.

### What might other academic colleagues learn from the project?

Existing research on the UCD student population provides a valuable starting point for enhancements and could be drawn on by others. Resource-neutral enhancements can be effective and the approach reported here should be applicable elsewhere, particularly in other large first-year modules.

### What implications arise for the university in terms of developing academic practice and policy?

To achieve alignment, the School of Sociology manually registered the majority of stage one students in 2008-9. This is neither resource-efficient nor student-friendly. Alignment of seminars for stage one students in large classes should be facilitated by the registration system in future and this should be a university priority.

#### Dissemination

**Internal:** The findings have been presented to the School of Sociology and to a small number of colleagues from other schools. It is envisaged dissemination will continue in 2009-10.

**External:** 'Using the Scholarship of Teaching and Learning to Enhance the First Year Experience in Sociology: Mission Impossible?' paper presented at *Sociological Association of Ireland Conference*, Waterford Institute of Technology 8-10th May 2009.

'Using Research Evidence to Inform Enhancements in the First Year Experience at University College Dublin' paper presented at *European First Year Experience Conference* University of Groningen, 13-25th May 2009.

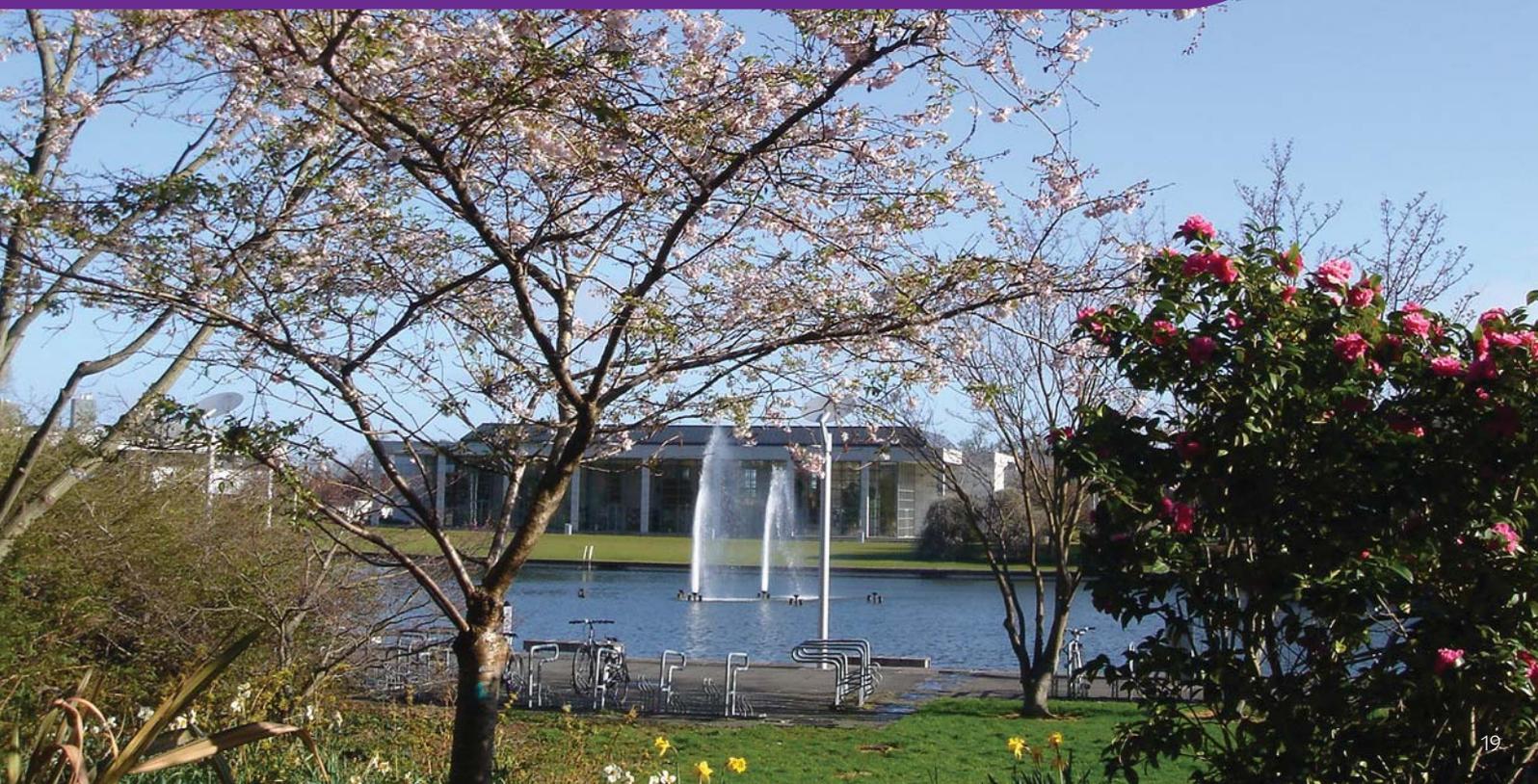
# Title: Translating teaching and learning across disciplines in a modular system

**Project team:** Eilis Hennessy<sup>1</sup>, Rosario Hernández<sup>2</sup>, Patricia Kieran<sup>3</sup> and Henry McLoughlin<sup>4</sup>

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## Introduction

University College Dublin introduced the Horizons modular degree programme in 2005. Although modular degrees have been the norm in North America and Britain for many years, there has been very little research on student choice in such systems. The present study focused on students who chose modules outside their main programme of study. The primary aims of the study were to investigate: (i) students' reason for choosing non-programme electives; (ii) students' experiences of taking non-programme electives; (iii) staff experiences of having non-programme elective students in their classes. The findings suggest that interest in the subject matter was the most important reason for student choice, although the anticipated difficulty of the module was also relevant. The majority of students believed they had the necessary skills to succeed in their chosen module, although some raised concerns about essay writing. Staff also emphasised the importance of essay writing skills for success in assessment tasks.



The introduction of the UCD Horizons initiative in 2005 heralded a campus-wide restructuring exercise, yielding modular and credit-based degree programmes. Modular degrees are now the norm in UK and North American universities. According to Betts and Smith (1998) they provide a more flexible, faster and cost-effective way in which to educate the growing number of students entering third-level education. For students, modular degrees have many advantages, particularly for individuals wishing to combine grades for learning in different institutions (as, for example, in the case of Erasmus exchanges). Walker (1994) also argues that modular degrees can reduce boundaries between disciplines, thus promoting integration, a feature which characterises UCD Horizons. And, crucially, Horizons facilitates the formation of 'creative and innovative graduates', central to UCD's Strategy for Education and Student Experience (2009-2013).

Despite the fact that modular degrees are now common, surprisingly little research has been undertaken on the way in which student choice is exercised and, in particular, on the implications – for both students and staff – of choosing modules from outside the main degree programme. This is a surprising omission as student choice impacts significantly on student engagement. Notwithstanding the lack of research-based evidence, there has been speculation as to what might prompt student choices. For example, Simonite (2000) argued that students may be motivated to identify a relatively 'easy' module, in order to maximise their overall degree classification. And there are obviously many other possible bases for student choice, including inherent interest in the subject matter, the recommendation of a friend or the perceived career-related value of a module.

In addition to the many advantages of the modularised degree structure, there are also potential challenges associated with the enrolment of students in courses from outside their main programme of study. For example, discipline-specific assessment traditions have long been recognised and students who move outside their discipline may not be well equipped to succeed in novel assessment tasks. Such differences in traditions are, perhaps, most obvious when natural science subjects (e.g. physics, chemistry) are contrasted with subjects from the arts and humanities (e.g. history, English) (Neumann, Parry & Becher 2002).

The implementation of curriculum change always involves challenges for teaching staff (e.g. Sng 2008) and the introduction of a modular degree is no exception. Billing (1996) highlighted a number of practical problems experienced in a large university following modularisation. For example, he found that staff had not always anticipated the heterogeneity in their classes resulting from students' freedom to take modules from a wider range of disciplines. There is already a substantial body of empirical research and policy material relating to the changeover to modular degree programmes (e.g. Billing 1996). However, analysis of this literature reveals little

evidence of examination of the associated experiences of students and staff. For the current research, therefore, students were directly consulted about their experiences of taking modules outside their programme of study - in particular, their motivation for so doing and their concerns (if any) about the skills necessary to succeed in such modules. Staff were interviewed about the challenges associated with teaching and assessing students from a variety of disciplinary backgrounds.

## Method

### Survey of Student Experiences of Non-Programme Electives

The survey was directed at the 3425 UCD undergraduate students (stages one to five) who registered for non-programme electives, during semester one, 2007-08. This cohort represents approximately 26% of the undergraduate population. Students were invited, via email, to participate in an online survey which included both qualitative and quantitative questions.

### Interviews with Module Coordinators

Based on the results of the student survey, modules with significant numbers of non-programme students were identified. The coordinators of 12 modules were approached, with a view to discussing their experiences of teaching and assessing the module, specifically in the context of non-programme students. Modules from Arts and Human Sciences, Medical and Health Sciences and Science were selected; non-programme enrolment levels in modules in all other discipline areas were significantly lower (Figure 1). All but two of the 12 were level one modules, pitched at a level appropriate for students entering university. As such, it is reasonable to expect that they would be accessible to most students, regardless of discipline.

## Results

### Survey of Student Experiences of Non-Programme Electives

Overall, the survey response rate was 29.8%, with a valid response rate of 24.0% (820 responses). The respondents were representative of the UCD undergraduate student population in terms of gender (population: 46.0% male, 54.0% female; survey: 43.7% male: 56.3% female), discipline and stage of progression. Figure 1 shows elective enrolment patterns for students who took non-programme electives and the disciplines in which they took those electives. Across the university, on average, 28.6% of students enrolled in non-programme electives; however, Figure 1 clearly demonstrates that this percentage was much lower in the Arts and Human Sciences, and was much higher in Business, Law and Science. In contrast, students who took non-programme electives overwhelmingly chose them from modules offered by the Arts and Human Sciences.

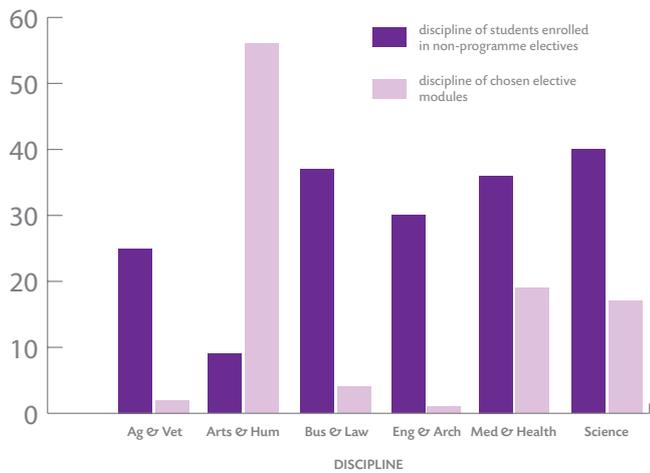


Figure 1. Summary of the discipline-based distribution of both UCD undergraduate students choosing non-programme electives during Semester one 2007-08 and of the modules in which they were enrolled

With reference to their motives for selecting their non-programme elective module, students were given five statements to rate. In addition, they were invited to indicate their own motive, if not covered in the five statements. In practice, a large number of students used the open-ended question to expand on their ratings, rather than to introduce a different motive. The results are summarised in Table 1.

The majority of students 'agreed' or 'strongly agreed' that they selected the module on the basis of an existing (63.8%) or anticipated (79.7%) interest in the subject area. The following quotations are illustrative of the range of explanations offered by the respondents:

*'Just because it was such a great opportunity to have a look at something that I never would have taken up independently'* [2 MHS/1 AHS]

*'With a programme consisting of a lot of mathematics, a subject with real facts and theory such as this one was a welcome change.'* [2 EE&A/1 SC]

A substantial minority of participants (46.1%) 'agreed' or 'strongly agreed' that they selected the elective as an 'easy option' and a number used the open-ended question to justify this decision based on the demands of their major programme of study.

*'When doing finals in a course like Engineering it's handy to have one subject that requires little study.'* [4 EE&A/1 AHS]

*'It's easy and I needed the space to concentrate on my core subjects.'* [3 BE&L/2 AHS]

Table 1. Summary of student reasons for taking a non-programme elective module

STATEMENT	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
It's a subject which really interests me	25.3	38.5	21.5	8.5	6.1
It's a subject which I thought would interest me	29.8	49.9	9.7	6.6	4.0
It would enhance my employment prospects	8.1	13.6	29.1	27.7	21.5
The subject supports my programme of study	5.9	14.5	22.0	29.7	27.8
I thought it would be an easy option	16.3	29.8	24.8	20.5	8.6
It was the only elective module I could get into	6.7	15.9	16.3	29.4	31.7
Someone recommended it to me	6.7	15.9	16.3	29.4	31.7
Other	14.8	9.3	43.3	4.8	27.8

In total, 27.8% of respondents either 'strongly agreed' or 'agreed' that it was the only elective they could get into. This is due, in part, to the fact that so many of those taking non-programme electives had substantial laboratory commitments and, consequently, less flexible timetables. However, student choice is a defining element of the Horizons programme and the university must be alert to the availability of sufficient, appropriately timetabled module spaces to reasonably facilitate all students.

In the survey, students were then asked to rate seven statements about their ability to cope with the demands of their elective module, the associated workload and their overall enjoyment of the module; the responses are summarised in Table 2. Despite the fact that many students may have been facing the demands of a new discipline, the results suggest that the majority believed that they had the skills necessary to manage the work required (66.5% 'agreed' or 'strongly agreed').

Table 2. Distribution of students' experiences of taking the non-programme elective module

STATEMENT	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
I found this module easy	10.4	30.5	28.1	23.7	7.4
I enjoyed the classes in this module	19.5	34.9	20.6	17.4	7.6
On average, I found this module easier than my programme modules	24.9	30.9	20.9	15.8	7.5
The workload for this module was heavier than I expected	9.2	26.2	24.8	30.8	9.0
There was more independent work than I expected	8.5	26.2	27.5	30.3	7.6
I have the skills to be successful in this module	19.0	47.5	23.7	6.9	3.0
Overall, I found this module challenging	11.2	39.8	29.0	14.4	5.7

While students generally believed that they had the necessary skills to succeed in their chosen module, 51% 'agreed' or 'strongly agreed' that the module was challenging. Some clues as to the nature of these challenges emerged from the open-ended question. Here, students' responses indicated that some were specifically concerned about aspects of the assessments:

*'As I'm studying science I haven't had any experience of writing college essays and found it difficult.'* [1 Sc/1 AHS]

*'My essay-writing skills weren't as good as those of the other students and they used a different type of referencing system.'* [2 EA/1AHS]

Responses to the questions on module workload suggest that the majority did not believe that the workload expected of them was excessive. However, some students indicated in their comments that the novelty of the module they had chosen resulted in a more substantial workload for them.

*'It is completely unrelated to my core area of study. That would make it more time consuming.'* [3 MHS/1 AHS]

Simultaneously, there was clear evidence of a widespread attitude that electives, in particular non-programme electives, ought not merit the same degree of either effort or rigour as core modules:

*'It came very low on my list of priorities. My core modules were of much greater importance so I neglected this module.'* [3 Sc/1 AHS]

To summarise, the findings from the student survey indicate that the most important factor motivating student choice was interest in the subject matter, although some students were also interested in reducing their work load by choosing modules which they perceived to be easy. The majority of students believed that they had the necessary skills to succeed in their chosen elective module; however, some were concerned about their essay writing skills.

## Interviews with Module Coordinators

The initial interview question directed at module coordinators focused on the target audience for the module, and in particular, on whether the module had been specifically developed to attract students from a variety of disciplines. Of the 12 coordinators interviewed, only 2 had developed their module specifically to attract non-programme students. The remaining modules were designed as core or optional modules within their respective disciplines although, in most cases, coordinators were aware of their potentially broader appeal. Within these modules the coordinators reported that teaching and assessment strategies had been tailored to accommodate non-programme students, for example, by avoiding specialist jargon and including a variety of assessment techniques.

The interviews also revealed that staff are as aware as students of the hurdles presented to non-programme students by discipline-specific skills. As the following quotations show, staff identified essay-writing as the most critical skill, mirroring student comments and reflecting the very high non-programme enrolment levels in these modules:

*'Most of the students did not know how to write essays, despite the presence of lots of guidance on essay writing.'* [1 AHS]

*'In general, students perform most poorly in the essay.'* [1 AHS]

## Conclusions and Implications for Academic Policy

The findings of this study raise several issues for consideration by academics, academic administrators and policy developers in ensuring the success of a modularised curriculum which allows students to take electives from disciplines outside, and often very different to, their degree programmes. Based on the findings of this study, consideration should be given to the following key issues:

1. Consistent with the UCD Education Strategy's (2009-2013) emphasis on delivering a 'broad, liberal education', adequate provision of appropriately-timetabled elective places (both in-programme and non-programme) must be a priority for the university. Programmes/programme clusters should be encouraged to offer electives that harness the very real interest of the majority of students in taking on new learning challenges. In particular, there is a need for dedicated, broadly accessible, level one elective modules.
2. The development of sequences of themed elective modules, in key areas, offers a real opportunity for the university to support students in both broadening and deepening their learning experience throughout their years at UCD.
3. There is a need to focus on the timely development of generic learning and assessment skills for all stage one students: Elective modules, primarily chosen from level one, have enormous potential for the provision and development of core transferable skills (such as essay/report writing), essential for students throughout their academic and working careers.
4. Academic staff must be supported in their use of assessment strategies which will contribute to student engagement and deep learning; particular emphasis should be focused on formative assessment, which will enhance student performance.
5. Schools/Programmes should be alert to the availability of modules which may offer little additional benefit to their own students and consider limiting student access to such modules. However, this is a non-trivial undertaking, with implications for programme coordinators, module coordinators and the student registration system.



This study has revealed the real value of well-formulated and carefully implemented Horizons modules in exposing students to subject areas beyond the comparatively narrow focus of their degree programme and allowing them to develop skills for learning and skills for life. The words of this Horizons student capture the very best of this innovative initiative:

*'It was very different to my core modules. It was nice to expand my education and introduce new material/concepts to myself. It was interesting and colourful. I found it stimulating to have to think and exercise my brain, rather than having to learn hard-core facts.'* [2 MHS/2 AHS]

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# Developing writing skills among graduate students

Fellow: Eilis Hennessy

## What were the aims of the project?

When students begin a graduate research degree one key skill that they must develop is academic writing. This skill is crucial if they are to successfully write an academic thesis and to communicate the findings of their research to a wider audience through journal articles and reports. For a first- or second-year graduate student, however, a finished thesis is still a long way off and the difficulty of identifying suitable writing projects may result in the neglect of writing in favour of developing methodological and/or analytic skills. For a student who is close to completing a PhD the temptation is to focus exclusively on writing the thesis to the neglect of writing articles for peer review that will be crucial in securing post-doctoral appointments. The challenge for the present study was to develop a writing skills module that would have something to offer students at any stage of their graduate research work. The aims of the project were:

- To develop a module for graduate research students that encourages them to undertake appropriate written projects (such as writing academic articles), in a supportive environment.
- To evaluate the module from the students' perspective.

## What did you do?

This project involved developing a module with a structure that would be suitable for students at any level of their graduate career (PSY 40310 Writing up research in child development). The structure was loosely based on the academic peer review process with one piece of writing being reviewed by the group every month over the full academic year. The only exception was that one session (a writing exercise) was kindly delivered by a staff member from the Centre for Teaching and Learning. Because of the amount of work required for the module, it carried 10 credits and because the module was based on peer review it was evaluated as pass/fail rather than having an associated grade. The schedule for submission of written articles was determined in September. In total, 8 graduate students in Psychology registered for the module, 7 registered for credit and 1 for audit. Five students were registered for PhD degrees and 3 for M.Litt. None was in the first year of their degree and they were spread across years 2 to 4.

A week before each monthly meeting the student whose work was to be reviewed submitted the article to the module coordinator, together with full information on the journal to which the article was to be submitted. Articles included literature reviews, critiques of methodology and empirical articles; all written pieces were approximately 5000 to 7000 words long. The module coordinator circulated the draft article to the group who were then expected to write reviews that were brought to the monthly meeting and formed the basis for discussion. Each meeting lasted approximately 90 minutes although sometimes ran for two hours. Guidelines for writing reviews were provided and were supplemented with additional articles on writing/publishing as appropriate. The monthly meetings were discussion based with the module coordinator acting as facilitator. At the end of the meeting all written reviews were provided to the author.

## How did the students respond?

Students were enthusiastic about the module and discussion in the monthly meetings was positive and productive. All students found the preparation of their article to be quite difficult and often stressful depending on what other commitments they had at the time. However, many acknowledged that they would not have completed their article in the absence of the enforced deadline.

This challenge was to develop a writing skills module that would have something to offer students at any age of their graduate research work.

### How did you evaluate the project?

The writing group was first introduced during the 2008/9 academic year and is ongoing, so final evaluation will not be complete until June 2009. However, an independently-run focus group in February 2009 provided an interim view on students' perceptions of the module and the extent to which it met its objectives. The transcript of the focus group indicated that the students believed they had benefited in a number of ways from their participation in the module:

- The module had maintained students' focus on writing by encouraging them to write more and the feedback from discussion helped to develop their skills. The module also proved useful as a forum for asking questions.
- Students enjoyed the sense of belonging to a group all doing research on a related theme (child development). They were interested to discover that they all had similar concerns about academic writing.
- Students believed they had learned a lot about writing style and aspects of child development from reading one another's articles.
- Students believed they had benefited through getting credits for participating in the module and having this acknowledged on their degree transcript.

### What did you learn from the project?

The key learning point from this project is that students recognised the value and success of an academic writing module, based on a peer-review process, in (a) encouraging the development of their writing, and (b) providing them with sense of membership of a community of writers with similar concerns.

### What might other academic colleagues learn from the project?

Although specifically developed for the School of Psychology, the structure of this module renders it easily adaptable for any academic discipline. Initial experience of the module has provided a number of general learning points which may be useful for academic colleagues seeking to implement it elsewhere:

- it is essential to establish the schedule for the entire year at an early stage, so that each student has sufficient time to plan his/her own contribution;
- guidance on review writing should be provided so that students who may have never reviewed an article understand what is required;
- student commitment to the module must be emphasised, as poor attendance at discussion sessions or failure to provide feedback for other group members would compromise the cohesion of the group;
- skill-based sessions (e.g. introductory writing exercises) should be scheduled for early in the academic year.

### What implications arise for the university in terms of developing academic practice and policy?

The university's Strategy for Education and Student Experience (2009-13) identifies the growth and development of graduate education as a strategic priority. This module could potentially provide a model that could easily be integrated within structured and thematic programmes in any college across the university. The fact that the module focuses on the practicalities of writing a journal article for publication means that it will enhance the professional development of graduate students. This claim is supported by the fact that the students evaluated the module positively and saw it as a support to them in their writing and research.

#### Dissemination

The module was based in the School of Psychology and all students registered to the module were undertaking research in area of child development. Accordingly, development and evaluation of the module will be written up for publication in a Psychology teaching journal such as *Teaching of Psychology or Psychology Learning and Teaching*.



# Using Learning-oriented Assessment Practices

Fellow: Rosario Hernández

## What were the aims of the project?

The introduction of the modularised UCD Horizons curriculum in 2005 empowered academics to move towards more flexible learning environments by adopting a range of assessment strategies that have the potential to contribute to the engagement of students in self- and peer-assessment practices. The use of assessment strategies that are aligned with the teaching context and the learning outcomes meant that it was a timely opportunity to design a project that would aim at promoting student learning through assessment.

To accomplish that aim, the students participating in the project were using methods of assessment embedded in teaching and learning. The emphasis of the project was on the implementation of formative ways of assessing student learning and on the impact that learning-oriented assessment had on the learning experience of the students.

## What did you do?

This project was implemented with the students undertaking SPAN 30090 Expresión Escrita (Written Expression), a final-year level 3 undergraduate module offered as an option/elective to students of Hispanic Studies. This module is also available as an elective to students from other programmes across the university.

A pilot study was undertaken during semester one of the academic year 2007-08. Based on the evaluation of the pilot study, the project was implemented in 2008-09 with a new cohort of students. The students came from Arts, Commerce, Computer Science, Law and Erasums. The number of students taking this module is limited to 20-25.

The aim of this module is to enhance learners' communicative competence in two ways by:

- a) engaging students in writing a variety of texts in Spanish (e.g. journalistic, creative, functional, etc.);
- b) encouraging student reflection on texts already written by competent writers or by the students themselves.

Spanish is the prescribed language of instruction and assessment in this module, and the target language is used by the students and by the teacher at all times. The teaching methodology adopted promotes students' participation in class, and the teacher is perceived as a facilitator of learning. Special attention is given to the process of writing through the development of cognitive and meta-cognitive competencies, students' affective dispositions and the social dimension of learning through group activities.

A key feature of the project was that students were allowed to submit their written texts as drafts, and they were engaged in the process of giving and receiving feedback on the drafts in conjunction with the teacher. Another feature of the project was the use of the Blackboard VLE as a medium in the facilitation of feedback.

## How did the students respond?

The two groups of students responded very positively to the project. They expressly valued:

- handing in drafts which built their confidence to experiment with the use of language and risk taking;
- the written and oral feedback provided on every piece of work submitted;
- the activities done in class were very engaging, thus keeping the interest of the students and their motivation to work;
- the opportunities provided to work in pairs and in groups;
- the personal interaction and support received from the teacher;
- the emphasis placed on their intellectual development and on skills that are valued in the professional world;
- the module being taught exclusively in Spanish, the only such module in the Spanish curriculum.

There were few negative comments reported by the students about the project; among them was the writing of the reflective tasks. Some students perceived those tasks as time consuming and other students would have liked to have more support by looking at exemplars from previous years. A small number of students from the 2007-08 group reported that they would have preferred to receive a grade for the first drafts of the texts submitted.

## How did you evaluate the project?

The project was evaluated using a range of methods. Students' expectations were assessed orally (2007-08) and online (2008-09) at the start of the module. Half way through the semester students from both groups had an opportunity to meet with the teacher and evaluate their progress. At the end of the module a student survey was designed and anonymously completed by the students from both groups to assess the project; quantitative and qualitative data were obtained. The 2007-08 pilot project was further evaluated using a

The emphasis of the project was on the implementation of formative ways of assessing student learning and on the impact that learning-oriented assessment had on the learning experience of the students.

snowballing activity during the last class of the semester and qualitative feedback was collected. Focus groups were held with a number of students (2008-09) at the end of the module to provide further qualitative feedback.

### What did you learn from the project?

The positive feedback from the students suggests that the project has achieved its aim. In addition, the external examiner singled out for praise this module in his report, stating that “[it] promotes the acquisition of language skills in imaginative and stimulating ways”.

Reflecting on the project, there are a number of key points that I personally have learnt from the experience:

- the benefits that formative feedback has on students’ motivation and learning;
- students’ appreciation of the value of feedback on learning, with the component of feed-forward; investing time on this significant aspect of students’ learning is a must;
- the importance of building trust between the students and the teacher and among the students;
- the value of fostering collaborative learning through assessment;
- the detrimental consequences that joining the module in week 2 of the semester seem to have on student engagement;
- the difficulties of addressing the learning needs of students whose language levels vary significantly;
- the need to provide greater support to students on the reflective tasks;
- the need to ensure a greater use of the online discussion forum to promote reflection on writing while using the writing medium.

The key learning points arising from this project are essential in facilitating the ongoing review of the module in order to continue improving the quality of the teaching provided and to further enhance the learning experience of students taking the module in coming years.

### What might other academic colleagues learn from the project?

The use of learning-oriented assessment practices can be transferred to all disciplines. It demystifies the assessment of student learning as an activity that has traditionally been done by the teacher and transforms it into a social activity in which students and academics are involved. It enables students and academics to enjoy assessment as a learning experience.

Engaging students in the assessment of their learning does not necessarily require that the students grade their work. Peer and self-assessment should be regarded as learning experiences with the view to engaging students in their own learning. Feedback and feed-forward become embedded into the teaching and learning context and the VLE can facilitate the process of giving and receiving feedback. The formative dimension of assessment is at the centre of the teaching and learning experience.

### What implications arise for the university in terms of developing academic practice and policy?

The engagement of students in the process of assessment needs ongoing support at institutional level. More emphasis needs to be given to the assessment practises within the curriculum as opposed to the logistics of assessment (e.g. examination boards, etc.). The involvement of students in the research of this important area of curriculum design and development is essential. Although there is a need for grading students, the primary purpose of learning-oriented assessment should be helping students to learn, providing them with feedback and feed-forward and engaging them in the process of assessment. Undoubtedly, this mode of assessment requires more time and dedication to students from academics.

#### Dissemination

A poster outlining the initial stages of the project is available at <http://www.ucd.ie/fellows/loa.html>

A number of findings arising from the pilot project (2007-08) were presented at two international conferences:

*'The Challenges of Engaging Students with Feedback'*, presented at the Fourth Biennial EARLI/Northumbria Conference 2008, Potsdam-Berlin, 27-29 August 2008.

*'Student Engagement in Assessment for Learning'*, presented at the Irish conference on Engaging Pedagogy 2008, Dublin, 11 September 2008. The paper has been published in the conference proceedings:

Hernández, R. (2008) *'Student Engagement in Assessment for Learning'*, in F. O'Riordan, R. Smyth, G. McGing and F. Toolan (Eds) *Engagement Pedagogy ICEP08 Conference Papers*, 129-141, Dublin: Griffith College Publications.

The analysis of the 2008-09 project has not been completed yet. Eventually a journal publication will disseminate the results of the completed project.



## Introducing Problem-Based Learning (PBL) To The Chemical Engineering Curriculum: Design, Construction & Evaluation Of A Heat Exchanger (HXCR)

Fellow: Patricia Kieran,  
School Of Chemical and Bioprocess Engineering

### What were the aims of the project?

Engineering typically attracts highly motivated, academically able students. Stages 1 and 2 of most engineering curricula necessarily focus on the development of competencies in the relevant mathematical and scientific principles and students often have difficulty in recognising the direct relevance of the associated modules and material to their chosen discipline. This project was developed in recognition of the need to offer engineering students greater opportunities for a deeper exploration of an engineering-related topic, implemented through self-directed learning, at an early stage of their undergraduate education. Working in groups, students were required to design, construct and evaluate the performance of a heat exchanger (HXCR). The objectives of the project, which are entirely consistent with relevant professional accreditation guidelines, were as follows:

- to provide students with an open-ended, group-based problem, of the type not commonly encountered during the stage two Chemical/Bioprocess Engineering curriculum;
- to allow students to gain confidence in practical engineering work, in a 'safe' environment, but unconstrained by 'cookbook' type instructions commonly (and necessarily) provided for most undergraduate experiments;
- to facilitate the development of (professionally essential) group interaction, independent thinking and technical communication skills;
- to excite students about their discipline!

### What did you do?

This PBL-based project combines the principles of active learning and team learning for the design and construction of HXCRs by stage two undergraduate Chemical/Bioprocess Engineering students, working in groups of 4. It was based on a similar activity, originally developed by Davis (2005) and subsequently implemented in DCU, (Freeland *et al*, 2006). In the UCD context, the project was first implemented during semester one, 2008-09, as part of two core (co-requisite) modules: the CHEN20040 laboratory module, (Chemical & Bioprocess Engineering Laboratory 1), and the associated CHEN20020 lecture module, (Chemical & Bioprocess Engineering Measurement). The initiative was developed under the auspices of the UCD Fellowships in Teaching and Academic Development and with the support of Dr Geraldine O'Neill, UCD Centre for Teaching and Learning. The project required the support of a member of the technical staff (Ms Patricia Connolly) and a postgraduate demonstrator (Ms Barbara Wood).

The test apparatus was designed and constructed by Ms Patricia Connolly. Materials for the test apparatus, including data logging equipment and a PC, as well as materials for the HXCRs were funded by the UCD Fellowships in Teaching and Academic Development. For the future, HXCR materials will be funded by the UCD School of Chemical & Bioprocess Engineering. Construction and testing of the HXCRs was undertaken in the Mechanical Engineering Laboratories; the support of academic and technical staff from the School of Electrical, Electronic & Mechanical Engineering is gratefully acknowledged.

The project was initiated during week one of semester one, 2008-09. The class of 35 students was provided with the problem statement; groups were designated and asked to develop a list of team expectations. Through directed independent study, during weeks 1-6 of the semester, each group designed a simple shell-and-tube HXCR, using a specified range of materials. Students attended a 1-hour session, led by a senior technician, introducing them to the materials, the associated tools and the test rig; opportunity to work with the materials and tools was provided. There were weekly 'PBL HXCR Project Update Sessions', during scheduled lectures. Training in the use of a software graphics package (Visio) was provided. Each group submitted a design report at mid-semester (week 6). The post-graduate demonstrator assigned to the project subsequently reviewed the designs and associated drawings with each group. During the second half of the semester, each group of students spent two 3-hour sessions in the laboratory, building and testing their HXCR. Within 2 weeks of the construction session, each group submitted a final report on the HXCR, evaluating the construction and performance of their device, as well as the chosen design (including cost and environmental factors). Prizes were awarded to the winning team.

## Working in groups, students were required to design, construct and evaluate the performance of a heat exchanger, ((HXCR)).

Assessment of student performance in the project spanned both modules (CHEN20020 - Design Report: 15% of CHEN20020 module grade; CHEN20040 - Final Report: 14% of CHEN20040 module grade). All elements of assessment were group-based. For both reports, 20% of the marks were awarded on the basis of evidence of effective group work and inventiveness/resourcefulness. Additionally, a question on the CHEN20020 end-of-semester examination dealt explicitly with material related to the HXCR project. However, only one-quarter of students chose to answer this question.

### How did the students respond?

Student response was extremely positive. From the outset, although this project was very different in nature and structure from anything they had previously encountered, it was clear that students welcomed the opportunity to work together, in the design and construction of a working piece of apparatus of real chemical engineering significance: *The HXCR project...made it easier to get to know people in the class. It also was relief from just learning off info from a book, then spouting it out in exams and forgetting it 5 minutes later—it's ingrained in my memory now.* The majority embraced the associated challenges: *It gave perspective to the amount of thought and research that goes into the designing of even the most simple process apparatus.* Negative comments were few, and related primarily to the credit awarded for the projects: 'It should count for more marks!'



Members of the winning team in the PBL HXCR Project 2008-09, (L-R) Matthew Perron, Phillip Roche, Meabh Doyle and James Robinson, with their tubular HXCR.

Although based on self-directed, problem-based learning, the project was carefully structured to optimise student achievements throughout the semester and students appreciated this feature: *I knew what we were doing every step. Had to find equations and use them to aid the design of the HXCR. Questions on the end of semester test were related to the HXCR. It was a well organised project. There were sufficient lectures introducing the goals and outcomes of this project. I felt any queries about the project were answered.*

### How did you evaluate the project?

The effectiveness of the project was evaluated in a variety of ways. Informal questioning of students at the end of semester revealed a high level of satisfaction with the project. The few dissenting voices focussed on the (perceived) relatively low percentage of marks allocated to the associated reports: these students felt less-inclined to commit themselves to an activity which would contribute relatively little to their GPA. However, the percentage of the grade allocated to the related activities corresponded very well with the time and effort which students admitted to committing to the activity.

In an online survey circulated to all stage two students in early January, 5 questions dealt explicitly with the PBL HXCR project:

- (1) To what extent were you aware of the learning outcomes for the HXCR Project?
- (2) To what extent do you feel you achieved the learning outcomes?
- (3) To what extent do you feel the assessment of the HXCR Project supported your learning?
- (4) What was the best aspect of the HXCR Project?
- (5) What was the worst aspect of the HXCR Project?

Student survey responses supported informal feedback: 80% of respondents were 'very much' or 'fully' aware of the project's learning outcomes, and 80% believed they had 'very much' or 'fully' achieved those outcomes. 77% believed that the assessment of the project 'very much' or 'fully' supported their learning. In identifying the 'best' aspect of the project, students unanimously mentioned 'group work', and the practical/hands-on aspects of the project. Only 56% of respondents identified any 'worst' aspect of the project; among these students, half indicated that they believed that more marks should be allocated to the activity (*...A few more marks are required for the project as a lot of work went into it and the marks were split between two courses which meant that it didn't mean as much if you didn't do well in the project...there was no real incentive.*); other responses related to the use of the software graphics package for preparation of drawing of the HXCR and to non-equitable distribution of workloads within individual groups, (*Making sure the work was more evenly spread out through the team.*).

Feedback was also solicited from the technician and the postgraduate demonstrator associated with the project. Both of these individuals, who have prior experience of traditional experimental work within the school, believed firmly that (a) the PBL HXCR project was a worthwhile undertaking, and (b) students appeared to have engaged with it more fully and more enthusiastically than with conventional experimental work. Feedback from all sources will inform modifications to the delivery and assessment of the project for the coming academic year.

## What did you learn from the project?

The most important finding from this project was that students were genuinely enthusiastic about the HXCR project and believed that they had achieved the specified learning outcomes. While a very small minority of students were initially discomfited by the relatively open-ended nature of the project "Maybe a lecture or two more on the theory of Heat Transfer.", overwhelmingly, they recognised the learning potential of the project—both in terms of 'soft skills' (e.g. group work, independent learning), and engineering-specific skills, "I had to do a lot of research in order to do the calculations for the HXCR. While reading engineering literature I learned about many concepts e.g. friction factors, moody diagrams, heat transfer coefficients, which are now very useful in Semester 2". What had not (perhaps, naively) been anticipated was the degree to which some students would analyse the marks allocated to the activity and feel they should adjust their efforts accordingly.

## What might other academic colleagues learn from the project?

While design of a HXCR is specific to Chemical Engineering and related disciplines, this type of project has real potential for implementation in a diverse range of practically-oriented disciplines, in which design is an underpinning activity. For engineering programmes, accredited by Engineers Ireland, this type of project contributes directly to the development of stipulated graduate abilities in design, team work and life-long learning. Considerable effort is involved in initiating the project; the most difficult task is the identification of a safe, affordable, professionally-relevant task, affording a reasonable degree of student freedom in its realisation and which can be achieved within an appropriate time frame. But the demonstrable benefits to the students—in terms of engagement with their discipline, commitment to self-directed learning, establishment of closer inter-class bonds, development of effective team-working skills and the achievement of a real sense of personal and collective accomplishment—more than justify the input. This student comment captures the spirit of the project: "The HXCR project promoted hands-on learning...It required abstract thought and it stimulated the most creative part of my mind, more than any other class."

## What implications arise for the university in terms of developing academic practice and policy?

One of the fundamental themes of the UCD Strategic Plan 2009-2013 is the formation of 'creative and innovative graduates'. Projects similar to the PBL HXCR project described here, introduced in the early stages of all relevant programmes, have potential to facilitate deeper and more structured student development, actively engaging students in their chosen discipline throughout their time at UCD and harnessing their creativity in the solution of real and discipline-relevant problems. It is important that the university give appropriate consideration to supporting academic staff in the development, implementation and evaluation of such activities.

## Dissemination

Kieran, P.M. (2008) Introducing Problem-Based Learning to the Chemical Engineering Curriculum, *International Symposium in Engineering Education: Student-Centred Learning in Small Groups*, Loughborough University, January 11 (Invited presentation)

Kieran, P.K. & O'Neill, G. (2009) Introducing Peer-Assisted Learning to a Chemical Engineering Curriculum, Students learning from students - from theory to practice, KU Leuven, Belgium, April 3 (invited presentation)

The development of the HXCR project, in its original form, has already been documented in the literature (Davis 2005). However, the current project has revealed valuable information about the ways in which students engage with less traditional projects of this nature; analysis of the PBL HXCR survey results will be the subject of a paper prepared for *Education for Chemical Engineers* (ICChemE).

## References

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Freeland, B., Tobin, J.A., and Foley, G. (2007) *International Symposium for Engineering Education*, DCU



# The formal programmers repository

Fellow: Henry McLoughlin

## What were the aims of the project?

Within the BSc. programme in Computer Science, I am responsible for teaching 4 modules which cover some of the more formal and mathematical material in the curriculum. The material is essential for any student who wishes to really understand the science. Unfortunately, many students find the material abstract and difficult and have trouble motivating themselves to learn. Perhaps this is due to the type of students we attract; most seem to prefer to spend time sitting at their PC addressing what they see as practical problems rather than pondering theoretical issues. Another cause may be a reduction in the standard of mathematical skills among the students; without the skills they will not have confidence in their ability to master the material.

This is not an isolated phenomenon; students worldwide seem to react in the same way. This has been a concern for Computer Science teachers for a long time and many international conferences and workshops have been devoted to finding ways to address the problem. A consensus has yet to emerge as to how to do so.

We feared that the introduction of a modular curriculum could add to the problems. Although a modular curriculum offers students the freedom to choose their individual learning path, this freedom may lead to a situation where they fail to see the links between modules and so fail to see how the skills learned in one module can contribute to their understanding of another. We have already observed this happening even with core modules in a programme. When the material covered in a module is perceived to be difficult or abstract, students often treat the module as one which they must get through, secure in the belief that once they do so they can forget about it.

Our aims were to try to address some of these issues. We wanted to show students how these modules linked together and to show them how the skills they learned could be applied in other modules. We wanted to dramatically increase the learning resources available to them by providing a large collection of examples of theorems and programs. Finally, we wanted to present this repository of material in a lively way so that it encouraged independent study.

## What did you do?

We view programming as a mathematical activity, which is intimately linked to theorem proving. Theorem proving skills can only be developed by practice. However, many students find that studying a finished proof in a text is dull and it fails to show the dynamic aspects of the proof. Typical questions which students often ask include "Why did the author choose to make this step?" "What other choices were available to them?" and "Are there other theorems which can be proved using the same techniques?" Unfortunately the textbooks rarely provide the answers.

Over the last 2 years a group of us have trawled through textbooks and research papers and have assembled a large collection of examples. Some are puzzles, some are theorems and others are programming problems. We now have a collection of hundreds of examples ranging from quite simple ones appropriate for students at stage one, through to those suitable for graduate students.

In each case, we have explicitly annotated each of the steps in solving the problems with hints to explain why the step was chosen or why a different one was not. Where appropriate, we have produced alternative solutions so the students can see the effect of choosing different solution strategies.

We have designed a way to index the collection. A subset of the collection has already been indexed so that students can select those examples which use a particular strategy, those which deal with a particular topic, or those which directly address some area of Computer Science. We have invited some of our students to use the material and we have asked them for their feedback and advice. This has proved very valuable.

To capture the dynamic nature of problem solving, some of the examples are presented using PowerPoint annotated with voice-over. Some have been presented as short videos and we have also explored using podcasts.

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During the coming summer we intend to complete the indexing of the collection and to make further use of such technologies to animate the problem-solving process. This material will then be made available online to our students in an easy to use way and most of the material will be available for the students to download and study privately.

The system will allow students to see the bigger picture of how the material spans the entire Computer Science curriculum, and to then select a particular area and zoom in to explore the details.

### How did the students respond?

The response of our students so far has been quite positive. We have held meetings with a small group of them and we have given them access to the material. They all agreed that the repository will be useful and that they would be prepared to spend time browsing it.

Their feedback and suggestions have been really useful. They are enthusiastic about the use of technology to lift what is usually perceived as dull material. They have asked that we emphasise the links between the material and other modules in the curriculum. We are currently addressing this.

### How did you evaluate the project?

The evaluation is ongoing. In the past 12 months we have used some of our material to teach students both in UCD and in Fudan University in Shanghai. In responding to their feedback we have changed our emphasis somewhat and are concentrating on making more use of the technologies available.

The major evaluation will begin in the autumn and we expect to conduct ongoing evaluation over the next few years.

### What did you learn from the project?

Often, in a project like this, what you learn may read like a statement of the obvious. We can sum up what we have learned as follows.

- We cannot rely on the students to know in advance how skills learned in one module can be transferred to another. Providing a roadmap that shows the bigger picture will help.
- Involving students in designing learning material helps to make that material more relevant and accessible. We should be prepared to present it in ways which are familiar to them.
- We should try to anticipate the questions which students may ask when they are studying and try to address them explicitly in the material we provide.

### What might other academic colleagues learn from the project?

There are a few things which our colleagues might consider. First of all, providing a view of streams in the curriculum at a level higher than just that of the module can assist skills transfer for students.

Secondly, when teaching a skills-based module, it is important to make sure the dynamic aspects of the skill are communicated to the students and that these aspects are communicated in the learning material.

### What implications arise for the university in terms of developing academic practice and policy?

In the past few years the university has been able to introduce a modular curriculum. This has been an enormous effort but we now have a system whereby prospective students can browse through the huge number of modules available and choose those which will satisfy their individual learning needs. However, with this increased freedom of choice, some students may view individual modules as islands of knowledge and not see the connections between them.

It would be useful if these connections were made more explicit. Perhaps at the programme level we should expend some effort to create these roadmaps so that students can get a more holistic view of the subjects.

#### Dissemination

So far our dissemination has been informal. We have held a number of discussions with other teachers who teach the formal side of Computer Science, in Ireland, the UK, China and the USA. We are working on a proposal to run a workshop at SIGCSE 2010 next year in the USA and we are hoping to run something similar in Europe in the future.

We will be publishing as we formally evaluate how the students use the repository over the next few years. Our major means of dissemination is to make the repository of material available to any other Computer Science teachers who wish to use it.





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