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EXPERIENCE IN THE DUBLIN INSTITUTE OF TECHNOLOGY MOVING TO A STUDENT CENTRED PARADIGM FOR PART-TIME MATURE STUDENTS

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This paper, originally presented at the World Conference for Continuing Engineering Education (WCCEE) in Vienna in April 2006, examines how the Engineering Faculty in the Dublin Institute of Technology is coping with change on its part-time accredited engineering programmes as it widens access and moves to constructivist learning approaches on one new degree programme. A comparison is made between this programme and a more traditional academic programme. This move though largely successful, has led to some unexpected results.

The Setting

This paper is set in the Dublin Institute of Technology (DIT), which describes itself as a multi-level institution with 22,000 students. This includes 10,000 wholetime students, 8,000 apprentices and 4,000 part-time students. DIT has a long tradition of providing continuing education, having been founded in 1887 to provide education to working class students, industry, the community and the disadvantaged sections of society in Dublin. From its earliest days it provided educational opportunities for women. Duff et al (2000) suggest it did all of this flexibly with part-time programmes suited to the needs of students and society.

An analysis is made of two part-time engineering programmes. The first is a part-time ordinary degree (Bachelor of Technology) in Electrical Services Engineering with over 150 students presently enrolled. This programme is populated almost exclusively by mature students (mainly electricians) who complete this degree in four-years part-time. Recognition is given to their experiential learning and their prior learning on the educational phases of their apprenticeship. In particular recognition is given to the fact that they have better opportunities to apply their learning and develop higher order learning skills than younger whole time students who must postpone application of their learning until they enter industry. According to Boud et al (1996), association and integration are higher order learning skills. Association is the connection of new learning with existing knowledge and attitudes. Integration seeks to find the nature of relationships. Integration draws conclusion and seeks insights. These are the essential features of deep learning. Deep learning is where students seek understanding and meaning to what they are studying. They relate new material to previous knowledge and interact with the material by using it in other areas of their study such as assignment and project work. Most students will adopt different approaches at different times but Knowles (1998) contends that adult learners will tend more towards deep learning than surface learning when given a choice.

Marton & Saljo (1976) in Sweden were the first to identify students' approaches to learning as surface and deep but independent research in the UK and Australia produced similar results, Toohey (1999). The programme team on the ordinary degree believed that surface learning had evolved over the years on engineering courses in DIT. Teachers and course designers kept expanding syllabi to include new information, which it *was essential for engineers to know*. Little or nothing was taken out of courses with the result that students were exposed to ever expanding curricula, without being given time to think reflectively or critically.

The premise was that the student is an empty vessel waiting to be filled with knowledge by the expert teacher as described by Freire (1998). According to Biggs (1989) there are four principal factors that have been shown to encourage a deep learning approach:

- Motivation of student
- Learner activity – engaging with the material
- Interaction with peers and teachers
- A well structured knowledge base in the student.

The second programme to be considered in this paper is a part-time **honours** degree programme (Bachelor of Engineering) in Electrical Engineering which has about 50 students enrolled. This programme is accredited by Engineers Ireland (the Professional accrediting Institution in Ireland) as fulfilling the academic requirements for Chartered Engineer. This has traditionally been a much tighter academic programme which was accredited at a time when syllabus content and tuition time was the emphasis by the accrediting body as distinct from programme outcomes which is now the emphasis.

The writer operates with some personal bias. Whilst teaching on both programmes he was programme leader for the first programme when it was first developed and the accreditation of prior learning of students on this programme was part of his thesis for a taught Masters Degree in 2002/2003. He is also a former electrician himself.

Background

Ireland has undergone unprecedented rates of growth and change as a society and an economy in the last twenty years. Higher Education has been attributed by many people to have been a key driver in economic growth by providing young graduates for the new knowledge economy, ESRI (2005). In 1987 the Economist magazine characterised Ireland as the poorest of the rich, alongside an image of a beggar on the street. The 1990s saw an incredible turnaround in the Irish economy. An economy burdened by debt with crippling levels of taxation, a poor enterprise culture and relatively low participation rates in higher education was turned around into a so-called tiger economy. By 1997 the Economist proclaimed Ireland as Europe's shining light. The *Celtic Tiger* is the name given this thriving Irish economy with the highest levels of growth in the OECD, averaging over 6%, between 1990 and 2000, OECD (2005). Unemployment is at 4% presently (compared to 15% as recently as 1993). An OECD study in 2004 found that in terms of GDP (Gross Domestic Product) Ireland, with a GDP per capita at US\$ 32,600 was ranked 4th in the world behind the USA, Norway and Luxembourg. Direct taxation levels are amongst the lowest in Europe and participation rates in higher education by school leavers are amongst the highest in the World, 52% in 2002, ESRI (2005).

It is widely acknowledged that Ireland's current economic prosperity has been underpinned to a large extent by the role that the education system has played in developing the knowledge base of our workforce..... As Ireland develops as a knowledge based economy, new sectors and new occupations are emerging which require a flexible and adaptable workforce. Today's Ireland is a bustling high-tech, business friendly country driven by competitive and innovative companies experienced in international business at its leading edge. It is a knowledge based economy The key challenge for the education system is to develop the necessary mix of creativity and skills to enable us to respond to the needs of the labour market (Minister for Education and Science, White Paper on adult education 2000).

This move to a knowledge economy has meant that Irish Society is fast becoming a learning society. This means that adults who missed out on education first time around must be provided with the opportunity to access third level education if they are not to be seriously disadvantaged in this new economy. The Government White Paper on Education (2000) set targets for participation by adults of 15% by 2005 and 25% by 2015. This was agreed as part of the national partnership programme "Prosperity and Fairness" (2000) and was seen as part of the means of creating a fairer society. Whilst participation rates for young school leavers are presently over 50%, this has been a relatively recent occurrence. In 1980 participation rates at third level in Ireland was less than 20% (CAO). An OECD comparison of those attaining tertiary education in Ireland indicated that whilst over 40% of 25 to 34 year olds completed, only a little over 20% of 45 to 54 year olds had done so OECD (2005). According to the CAO (2003) the participation rate of adults at third level in 2003 was 8% and this was amongst the lowest in Europe. The White Paper (2000) argues against front loading of education and recommends the development of pathways for progression, credit accumulation, diversification of provision and flexible route ways.

Many older workers have contributed to the highly subsidized higher education sector through their taxes so that students from better off families could gain higher qualifications Action Group (2001), and in more recent years, so that higher education could be expanded into a universal system as defined by Martin Trow, Trow (1999). Many of these older people now find themselves in industries with rapidly changing needs or indeed in some cases they are out of work. It is not just equitable and fair to widen access for mature students, it makes economic sense. To quote the Minister for Industry, Michael "the Tiger has found a resting place but will only remain while conditions are right". In a knowledge society this means an educated workforce updating their knowledge and skills in relation to the demands of the external environment.

For this to be successful in Ireland, there must be recognition of their prior learning thus providing opportunity for advanced entry and/or accelerated programmes which are based on learner outcomes suited to our modern economy and society.

New degree Programme

As part of this move towards adult education, as well as the need to fill a skills gap, a new Electrical Services Engineering Degree programme was designed and provided for electricians in the DIT. The first graduates were conferred in December 2005. There are 142 students enrolled on this part-time programme at present. First year places have been extended to sixty to cater for the increasing demand from students and with retention rates very high, this means that overall numbers on the programme are set to increase over the coming years. This programme, which would normally take school leavers three years whole time is completed in four years of part-time study by electricians. Normally a three-year wholetime programme would require six years of part-time study in the engineering faculty. It was envisaged when developing the new programme, that accrediting the prior learning of these people on apprenticeship educational programmes combined with their experiential learning would enable them to cover material more quickly than traditional wholetime students. Graduates of the programme have been very successful gaining appropriate employment and feedback from industry is excellent.

There is freedom to move from the whole time to the part-time and vice versa. Some of the part-time students have moved over to the equivalent whole time programme to accelerate their study time. They can complete the whole time programme in two years. A lot of students spend two years on the part-time programme and then complete their studies with one final year of whole time study, which excluding the holidays requires that they take eight months off work.

New Learning Environment

This programme has been developed in a way which acknowledges the changed learning environment. With the advent of Information Computer Technology and the changing nature of the learning society the role of the teacher is now often that of a facilitator. The students are facilitated to actively learn in a cooperative environment. The new paradigm is active student centred learning.

There must be a shift of orientation in tertiary education, less the teacher as a source of canonical knowledge and more the student as a learner and a client; less the enclosed college and more the wide-ranging enterprise Skilbeck (2001).

Sheingold, (1991) argues that effective learning hinges on active engagement by the students. The construction of knowledge around their own knowledge leads to a much deeper understanding. The result of this is the use of higher order cognitive skills as defined by Bloom and collaborates in the 1950's.

The constructivist teacher facilitates the students and provides the tools for the students to work out a solution and gives them an opportunity to develop their critical thinking. The students **learn how to learn**. This is an important asset, in an age, where the shelf life of what is learned on an engineering course is becoming progressively shorter. It is no longer necessary to expand syllabi with *new information the student must know*. Faculty can relax in the confidence that graduates will have the meta-skills necessary, to find out later, anything they need to know. Students also improve their communication skills and ability to work in a team.

Confidence and self-esteem are nurtured in the student, in a way, which is not possible with traditional methods of teaching. Constructivist learning programmes should also encourage peer support and a collaborative learning environment. Curricula that encourage student co-operation and discourage student competition are likely to create a much better learning environment according to Knowles.

On the new programme we have found that mature students help improve the learning environment in many respects. For example, mature students bring many work related problems to the programme. This provides opportunities for research and the application of theories and learning. Knowles (1998) argues that fear of failure or embarrassment is an impediment to learning for all, but this is particularly the case for adults. The intention with this programme is that learning takes place in a safe environment where mistakes are seen as an opportunity for learning and student learning outcomes become the focus of properly aligned assessment.

Androgogy is the term which Knowles (1998) advocates should be used to refer to the science of teaching adults. Knowles suggests according the learner a role in shaping the purpose and process of learning. This promotes personal development and is motivating to adult learners.

Knowles argues that a competitive environment should be discouraged. He believes adults respond best in a collaborative environment and that the behaviour of the teacher probably influences the character of the learning environment more than any other single factor. He suggests that teachers convey in many ways whether their attitude is one of interest and respect for the student, or whether the students are seen as receiving sets for the teacher's transmission of wisdom. Knowles believes that once teachers put students in dependent roles they are likely to meet rising resistance.

Industry Requirements

Industry requirements in graduates have changed. Industry now wants engineering graduates with emotional intelligence as defined by Scott & Yates (2002), i.e. graduates with higher order personal and interpersonal skills who can problem solve, think creatively, communicate, negotiate and find solutions rather than know them. They will eventually want these graduates to be able to manage and to lead.

There is a developing consensus in the field and the literature that the modern worker increasingly requires problem-solving, teamwork and leadership skills in a work environment requiring flexibility, adaptability and mobility.a broadly based, person centred active learning approach. White paper on Adult Education (2000: p 76).

The DIT strategic plan (2000-2015) emphasises the *promotion of the capacity to learn and reason and promotes learning skills as being more important than learning content.*

Constructivist Learning

On the new programme we tried to develop curricula that increasingly encourage teachers to become facilitators and encourage students to take responsibility for their own learning. Learning outcomes are not always predictable with a constructivist approach. Assessment methods must be flexible and teachers should not attempt to control the learners. According to Dick, (1992), the classroom of the future will support the constructivist belief that learning must be BIG (Beyond the information given) if not WIG (without the information given). BIG/WIG puts emphasis on the learner, but the assessment method must be appropriate. Constructivism puts a greater emphasis on higher order learning, application and synthesis rather than mere memory.

Students also improve their communication skills and ability to work in a team. Confidence and self-esteem are nurtured in the student in a way, which is not possible with traditional methods of teaching. Teachers use less direct instruction activities. They are more likely to get students to make presentations, do analytical work or write. They encourage collaborative, project based learning where students present their work to peers. They use computers in cognitively challenging tasks.

This constructivist course was somewhat problematic to develop. Teachers have less control and students need to be well motivated. Teachers must also have a wider range of knowledge and skills from which to draw and be responsive to students needs.

Traditional Learning approaches retained in part

It was the view of many lecturers on the programme that science and mathematical type subjects should still be delivered using traditional methods. This they argued was more efficient method and it was they believed what students wanted. This we believed would allow us help the student build a well structured knowledge base, as described by Biggs, in an efficient way. So the early stages of the programme tend to be more traditional with constructivist approaches developing gradually as the student progresses. There are a small number of students who would like us to retain traditional approaches throughout the programme, but these are in a small minority (5%). The majority of students favoured a mixed approach to assessment and retaining examinations for up to 50% of the overall assessment. But students were particularly critical of heavy assignment work which provided little reward.

The Argument Against New Approaches

When in my enthusiasm for constructivist approaches I tried to get the BE Honours degree part-time students to adopt active learning approaches they were quite shocked, even though they too were mature students. They would say “Look Kevin, your role is to deliver the material, we do not have time to look for it. We will learn it and you examine it – simple. We do not care about deep learning or higher levels of learning. We just want our degree so as to improve our earning power.”

Hanson, in Edwards, Hanson & Raggatt (1996) argues that Knowles theory of learning for adults is somewhat utopian. She believes that any theory of adult learning that advocates the importance of each individual but avoids issues of curriculum control and power does little to address the actual learning situations of adults. Hanson concludes that adults will often relinquish self-direction and autonomy when learning something new. They may well suspend some of their rights at the door in the Institution in order to learn. They temporarily accept an unequal relationship between teacher and student and accept the authority of the teacher provided the teacher has something to offer to justify his/her authority she argues.

With the BE programme students constructivist approaches made no sense to them. They are looking to the teacher as the expert to filter the information and deliver it in the most efficient way possible. This programme is designed in a teacher/subject centred traditional format. Students prioritise on passing examinations and any learning, which results from that, is secondary. The students on this programme tend to be academically accomplished and have a strong history with traditional examinations.

Burton, in Middlewood & Burton (2000) argues that a curriculum that focuses upon content can be seen as an academic approach to learning. Teaching methodology will concentrate on the delivery of knowledge and is best served by assessment techniques that emphasise recall, interpretation and analysis.

Silcock & Brundrett, in Middlewood & Burton (2000), offer three models of curriculum design:

1. Teacher/subject centred
2. Partnership approach
3. Student centred

Change cannot be forced upon an unwilling community. Lumby, in Middlewood et al (2000) warns that managing teaching and learning, is a political as well as a technical process and any innovation will only be accepted in proportion to the degree of support that exists or has been constructed. It must be expected that that opposition will present itself and divergent views offered. Nonetheless change took place in a collaborative way and the new constructivist programme was designed and delivered successfully by a very motivated team.

The key to successful change appears to be building a collaborative team with all stakeholders and theory laden researchers not attempting to implement change against the will of stakeholders.

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