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## The application of learning skills in an engineering programme

Leslie Shoemaker

### Abstract

At the Dublin Institute of Technology, an engineering programme in the School of Control Systems and Electrical Engineering has successfully incorporated a study skills module into the core curriculum. The module, titled Academic Development and Key Skills, is part of the first year of the programme and has a two-fold purpose. Primarily the goal is to assist the students with the transition from second level education to third level by teaching them a more competent learning style. This, in turn, helps to create a positive impact with respect to the retention of this student group within the programme. The second year of this module develops these study skills further. It has been recognised by industry that study skills – otherwise known as soft, core, key or transferable skills – in fact mirror many of the skills that students require for their future careers, for example time management, presentation skills, communication skills and task management. This paper discusses how the implementation of study skills into the core curriculum of a third level engineering programme can be of benefit to the current and future needs of students, both academic and for personal development. By providing an environment in which to develop and learn these skills, the engineering programme thus addresses the holistic needs of its student population.

### Introduction

The value of study skills has long been a source of discussion among teachers and lecturers at all levels of educational development (Gibbs *et al.* 1994). Even though there is a growing body of research to support the inclusion of study skills such as time management, problem solving and note taking into third level curricula, it appears that the approach to the dissemination of this knowledge is ad hoc. It is the author's observation that many lecturers assume their students have already acquired these skills during their second level education. In addition, there are other academics who expect third level students to have the initiative and motivation to independently learn and/or improve these skills during their time in college.

With regard to the transition from second level education, students entering third level are arriving from a sheltered academic environment. In their previous school setting, students were restricted in their choices and learning styles, and the responsibility for their education seemed to rely more on an extrinsic model, through teachers and parents, rather than an intrinsic one. Third level education encourages and facilitates independent learning and communication skills – both written and verbal – as well as a student's ability to critically evaluate their own work. It is through the acquisition of such skills that the student is encouraged to move from an extrinsic model to an intrinsic one. This transition presents a major academic and personal change within the life of a student (Hunt 2003). It has been noted that for many third level students this is also the first time they will encounter other demands of living, such as rent, course fees, living and social expenses, as well as academic costs (Student Development and Counselling Centre 2006). It is this author's experience as a psychologist that this further step into independent living can often be frightening and overwhelming for the inexperienced young adult.

### **Academic Development and Key Skills modules**

With the Faculty of Engineering, a degree programme in the Department of Electrical Services Engineering, which is part of the School of Control Systems and Electrical Engineering, has successfully incorporated a study skills module – Academic Development and Key Skills – into the curriculum. This module aims to assist to students who may have insufficient skills to cope with the many personal and academic transitions they encounter upon entering third level education. For this reason, the backbone of the module is teach students *how to learn* the skills, both personal and academic, that are required for a successful academic career and smooth transition to future professional employment. The module also aims to encourage positive self-esteem by increasing students' sense of achievement. As a positive side effect, supporting students with the transition from second level education, and helping them to develop their study skills, has proven to have a positive impact on the retention of the students within the Department of Electrical Services degree programme (Shoemaker 2002).

During the second year of the Academic Development and Key Skills module, students apply the concepts and skills attained during the first year of the programme. These study skills in fact mirror many of the skills students require for their future careers, for example time management, presentation skills, communication skills (verbal and written) and task management (Education and Professional Development 2006; Curry, Sherry and Tunney 2006). Although these employment related skills are commonly referred to as 'key skills', 'generic skills' 'core skills', 'transferable skills' or 'soft skills', the way in which they are applied in the module in the degree programme means it would be more appropriate to refer to them as 'learning skills'.

Oxford Brookes University has stated: 'it is clear that graduates value transferable skills and rate them as more useful than course content while they are in their first jobs' (Gibbs *et al.* 1994). Research by the university has noted the benefits accruing from these key skills being embedded within their programmes, showing that over the last 20 years, since the implementation of these key skills modules, graduates from Oxford Brookes University have earned the respect of the professional community and, as a consequence, a good reputation with both prospective employers as well as with potential students (Gibbs *et al.* 1994).

### **Module structure**

The structure of the Academic Development and Key Skills module is based on the recognition that students require their social, personal and psychological needs to be addressed in addition to their academic needs. It is the overlooking, or lack of recognition, of these 'non-academic' needs that can have a significant impact on the third level student's ability to complete a programme of study, as well as to make a successful transition to the workforce (Gibbs *et al.* 1994).

The structure of the module is also based on recommendations from employers and on research completed during 2001/02 by Frank Costello, Retention Officer at the Dublin Institute of Technology (DIT) (Curry, Sherry and Tunney 2006; Costello and Russell 2002). The study focuses on the experiences of first year students at DIT and evaluates the responses of 1,356 students across 43 programmes in the six faculties at the institute. Costello identifies four types of students: (1) the 'at risk student'; (2) the 'struggler'; (3) the 'average student'; and (4) the 'confident student'. The needs identified for the first two types of students relate to many personal identity issues, such as confidence, career

choice and course choice. Academic issues pertaining to study skills relate to the first three categories (Costello and Russell 2002).

In light of the results of this survey, humanistic psychological research was incorporated into the formation of the Academic Development and Key Skills module. The intention was to utilise this information to address further the variety of issues, both academic and non-academic, that are presented by a typical third level student population.

The Academic Development and Key Skills module comprises the following elements: one-hour lectures; supplemental laboratory classes; research projects; and workshops/seminars. The students are actively involved in class discussions, peer learning, presentations, group work and individual assignments, as well as problem based learning. In this way the module facilitates the students' development of how to learn in an academic setting with the objective of transferring these skills to the world of employment.

The concept of peer learning has been integrated into study skills assignments based on its successful integration into programmes in both Ireland and abroad (Ehly and Topping 1998; Adalgais, King and Staffieri 1998). Derived from the psychological concept of modelling, otherwise known as observational/social learning theory, the basis of this theory is that learning can occur through the process of observing the activities of others. The academic environment, the behaviour of the learners and the students' own cognitions/beliefs thus form important aspects of the learning process (Huitt and Hummel 2006), and efforts have been made to create a supportive and positive learning environment that fosters the academic and personal development of students. This in turn helps to create an atmosphere that promotes deep learning. It is important to recognise that is reflective also of the ethos of the degree programme in DIT (Department of Electrical Services Engineering 2004).

A typical example of an assignment for the first year group requires the students, in small groups, to participate in a college based scavenger hunt. This activity requires them to locate specific items and areas that are relevant to their college experience, for example finding the location of the mathematical learning centre, the medical centre, the library and, of course, the departmental secretary. Next, the students are required to write a group essay on teams and their development. As part of the exercise, the students must include their personal reflections of their team experiences during the scavenger hunt. Both aspects of this task are meant to assist the students with skills such as problem solving, goal setting, conflict management, group work, self-reflection, research skills, computer skills and written communication.

In the second year of the Academic and Key Skills module, the students teach workshops on specific skills such as presentation skills, memory techniques, and examination revision to first year students. The workshops include active learning exercises that require self-assessment as well as a practical application of the specific skill set being taught. What emerges is a mentoring relationship between the first year and second year students. This relationship is enriched by the insights that the second year students have gained from their experiences during their first year of the programme.

Each year of the module is examined by means of continuous assessment and progression from one year to the next requires a pass mark. The benefit of this method of assessment

is that the students further develop their independent learning skills thus preparing them for lifelong learning (Department of Electrical Services Engineering 2004). In addition, students are encouraged to reflect on their own personal developmental and academic progress. Formative feedback regarding their academic performance helps to encourage self-reflection.

### **The role of developmental psychology**

The general age of full-time students at the DIT is between 18 and 22 years. This age group corresponds with Erik Erikson's *adolescent* and *young adult* stages in his theory of psychological development. From this theory two distinct target areas are highlighted: personal and social needs. These areas focus on the development of individual identity and relationships with others (Harder 2006).

Following Erikson's theory, which is supported by the results of the survey conducted by Costello during 2001/02, a clearer picture of the needs of DIT students emerges. Students entering third level education are in the midst of the *adolescent* stage, which is characterised by identity versus role confusion conflict (Harder 2006). At this stage in any individual's development, the person is searching and struggling for his/her identity with regard to self, occupation, politics as well as religion. This can be a very challenging experience for the third level student. During this time, students are faced with the prospect of forging new relationships, negotiating a new academic setting and, possibly, living in a new environment. In reality, a conflict regarding identity may manifest itself as an internal confusion where the student is attempting to make sense of *who* they are, *what* they believe, *what* they think, *what* they want/need while at the same time presenting this independent, all-knowing self to others. This experience can feel very confusing, isolating and threatening to the student, which can lead to an undermining of self-esteem, possible behavioural problems, or a lack of engagement with the programme. Interestingly these issues were identified in Costello's study as being most prominent among the 'struggler' and 'at-risk' student categories (Costello and Russell 2002). Observation of students on the programme has revealed individuals who have been identified as 'struggling' academically or personally or in both areas. More, those students who have declined assistance from the Department of Electrical Services degree programme often withdraw during their first year in the DIT.

The Academic Development and Key Skills module is aimed at supporting students through the many academic and non-academic transitions they face, assisting the 'at-risk' or 'struggling' student to become the 'average' or 'confident' student. The successful completion of this developmental stage will affect programme satisfaction, healthy relationships, psychological well-being and social involvement and is linked to a positive outcome for the student in terms of commitment and endurance.

In the full-time student population, another phase of development encountered is *young adulthood*. This is characterised by the conflict of intimacy versus isolation in which the young adult must develop intimate relationships with others in order to proceed successfully to the next life stage, *middle adulthood* (Harder 2006). Once again, stepping out as an independent adult is the challenge of this particular age group. The individual may not have the skills to make this transitional step on his/her own. This may be observed in incidences of bullying, scapegoating, social isolation, difficulty in performing any activities, notwithstanding social or academic ones in which the spotlight is on them, as illustrated by Costello's 2001/02 research (Costello and Russell 2002).

The successful completion of this stage will affect psychological well-being, relationships within the college, communication of needs, responsibility for self and social activity. The module thus aims to prepare the individual for entering the workplace by equipping them with learning skills that enable them to adapt to a work environment (Chan 2004).

In light of this information, the second year of the Academic Development and Key Skills module has a strong focus on group work. Students are provided with information about groups, how they form, the roles that are found within groups, communication and conflict management. The assignment work requires the students to apply this information to their own experiences within the module and to reflect on their own personal development in these areas. One of the main aims of the second year module is to assist the students with developing, understanding and fostering relationships within the class group, thus preparing students for the challenges that await them in their future professional and personal roles.

### **Observations to date**

The feedback from both current and former students as well as programme staff is that the module is a success. One observable trend that has emerged is an improvement in retention of the first year students. During the 2001/02 academic year, 58 per cent of first year students were eligible to progress into the second year. This increased to 61 per cent during the 2003/04 academic year (Costello 2005). At the time of writing, statistics for the 2004/05 academic year have yet to be published.

Still, as has been pointed out, not all retention issues can be eliminated, and nor should they be. Instead there should be a monitoring system to understand the reason(s) for the withdrawal (Moore 2006). This type of monitoring began in the Department of Electrical Services degree programme three years ago. The one main trend that has emerged is that the majority of first year students have left this programme to make a lateral move into an Electrical Apprenticeship (Shoemaker 2005).

Another positive development that has been observed is how at least 80 per cent of graduates have been successful in locating employment in the area of Electrical Services Engineering. This has been a constant since the first set of students completed the programme in 2001. In addition, many of those students who do not enter the job market immediately choose to continue their studies within other DIT engineering programmes or other institutions in Ireland and/or the UK (Harding 2006). Finally, the module received special recognition and praise from the Validation Committee during the most recent validation process in March 2004.

### **Conclusions**

The implementation of learning skills within the core curriculum of a third level engineering programme can be of benefit to the current and future needs of the students – in both the academic and personal arenas. These learning skills have been integrated into a first and second year ordinary degree programme in the Department of Electrical Services Engineering in the DIT. Based on qualitative data it has been shown that retention rates have improved and that the programme has assisted students with their transition to third level education. By providing an environment in which to develop and learn such skills, the Academic Development and Key Skills module represents a move

towards addressing the holistic needs of the student population. Future research will be conducted in order to measure the impact of these enhancements.

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