

Professional Skills Portfolio for a Progressive Engineering Education

D. F. McGarthy¹

Lecturer

Dublin Institute of Technology

Dublin 1, Ireland

Dermot.mcgarthy@dit.ie

D. M. Kennedy

Head of Mechanical Engineering

Dublin Institute of Technology

Dublin 1. Ireland

David.kennedy@dit.ie

Conference Key Areas: curriculum development, continuing engineering education, employability of engineers

Keywords: Communications, professional development, emotional intelligence, key performance indicators.

INTRODUCTION

At the 2013 launch of the return to work scheme, “Springboard” in Dublin, it was stated that employers were seeking staff with enhanced language, presentation, communication, coping, and team-working skills. Graduates without these skills were finding it more difficult to gain permanent employment and were more likely to find themselves out of work unless they developed these skills. Enhancing personal development skills in education requires a revision of existing programmes. Not alone will these skills open new doors of opportunity for those who have lost their jobs during the recession, but should help sustain them going forward. The education of the modern engineer and technical experts for the changing and demanding world of work in the 21st century must consist of a multi-disciplined integrated approach. The vital and invaluable technical skills should be explained, practiced and demonstrated concurrently with equally essential and crucial pedagogy and so called “soft” skills. The ability to work independently, to manage and communicate effectively with people from other disciplines will yield dividends for future engineers. Skills such as problem solving, computer literacy and business acumen together with company specific skills,

technical dexterity and an ability to understand the commercial goals of Industry must form an integral part of engineering education. There is currently, calls from industry for educational changes that enhance basic economic knowledge, management skills, learning to learn, and competencies in communications and teamwork. One of the challenges herein, is that programmes should provide capabilities for graduates to handle changing economic and cultural working environments [1]. This broad and integrated learning will help prepare the graduate for an increasingly complex modern working environment. Educators have a critical role to play in addressing the skills gap between education, environment and Industry.

1.1 APPROACHES TO LEARNING

The psychologist, Howard Gardner cites eight distinct *types of intelligence* in the average person. However, the traditional and mainstream approach to education has consistently employed and tested just two of these which are basically literacy and numeracy. In this somewhat blinkered if not limiting process, Gardner[2] argues that to solely concentrate on linguistic and logical-mathematical intelligence is a disservice to both the learner and the instructor. Some of the other types of intelligence that Gardiner discusses which could be considered, are the visual naturalistic, interpersonal and intrapersonal intelligences. The educator, like perhaps the Physician is obliged to test all options available and to provide the best possible educational service to the learner. The student in turn will have much greater opportunity to gain self-knowledge/self-appraisal and more easily attain their full potential in their respective and chosen career paths. If the process of instruction, could in some part, be tailored to the inherent talents of the learner then the system could be more inclusive and less discriminating. At the core of each learning process a student learns at their own pace and in their own style and will still achieve their objectives.

If you think you can, you can. And if you think you can't , you're right.

Mary Kay Ash

Action planning, setting objectives, recognising and using initiative are also skills that need to be instilled in the learner. In this instance “SMART GOALS” can be applied to teaching disciplines such as entrepreneurship and research. These goals refer to tasks/duties that are specific rather than general, where learning outcomes are measured and completion is evident. The goals are acceptable and set on one's own terms by allowing the learner to concentrate on their own particular strengths. The targets must be realistic and the overall tasks, in order to be achieved, need to be time framed. Self belief and talent while by themselves are of paramount importance, need to be harnessed to a more scientific approach to the business of work and study.

The Greek Philosopher, Epictetus (55-135 AD) maintained that it was not so much what life throws at us, but how we deal with it, that really matters. What Epictetus might be referring to are coping skills, work-life balance, and stress management. In this context, psychologists Daniel Goleman [3] and Aaron Beck

[4] have written extensively on the world of *emotional intelligence* and have advocated what has become known as socio-emotional training for life. Socio-emotional learning just like conducting research is accumulated over our lifetime. It is central to our identity and its impact is beyond and outside our awareness, most of the time. More importantly it helps us to work and manage effectively. This type of training relies on a learning process of imagination, exploration, practise, feedback and reflection in an interactive and concurrent way. It empowers the student to question assumptions, to make and test hypotheses, to take risks, to imagine the future and to both recognise and celebrate achievement. Reflecting on the vision and enterprise of those such as Columbus, Galileo, Newton, Harvey, Edison etc. might help us appreciate just how valuable these socio –emotional skills, when called upon, truly are.

There is nothing so practical as a good theory.

Kurt Levin

Education most assuredly provides choice. Thus the approach to scholarship which Goleman and Beck proffer, taps into, in many cases the hidden potential of the learner, and can unearth a myriad of options. In practical terms, assertiveness training, quite commonplace in many modern entrepreneurial and educational contexts, is just one example of this method of teaching and learning. Taking responsibility for one's own learning is a crucial dividend for the student in any effective educational structure.

1.2 MEASURING LEARNING OUTPUTS

Key Performance Indicators (KPIs) are measures of different factors critical to success. Organisations use these to benchmark and measure performance and plan for future productivity. This approach can also be used to good effect in the assemblage of personal development skills necessary in education. Setting and measuring targets coupled with a world class management approach can lead to greater success for the learner on his/her journey to becoming highly confident and competitive in the workplace. The more rounded the individual is in this context, then the wider will be the pool of human capital available, from which options can be chosen and key decisions made. The teaching of personal development skills should not be narrowly prescriptive but should offer clear and abundant choices, and in so doing instil a higher level of confidence in the learner, which often times can make the totally impossible seem in actual fact, quite probable after all. Any level of progress is performance related and continuous, success being a rather long journey, and not an instant or brief destination. One way of producing success for the learner is to give them ownership of what they study and this can be achieved through modularisation.

The value of a principle is the number of things it will explain.

Ralph Waldo Emerson.

2.1 METHODS OF ACHIEVING SKILLS PORTFOLIO

There are numerous ways of attaining interpersonal, social, communications and business skills which will greatly enhance the career outlook and future performance of the modern technical engineer. A list of these topics which may form part of a curriculum for embedding these skills are as follows and also outlined in Figure 1.

- Team work and Role Play in the learning environment
- Embedding research into the lectures by addressing topics that require independent investigation by the learner
- Confidence building
- Involvement on committees and decision making
- Public speaking and self expression skills
- Enhance knowledge of Industry activities
- Mind mapping practice
- Development of competency in writing and presenting
- Deductive reasoning and listening
- Organisational skills and time management
- Capacity to adopt
- Quality focus

These should be supported by effective feedback which enhances the quality of the learning process.

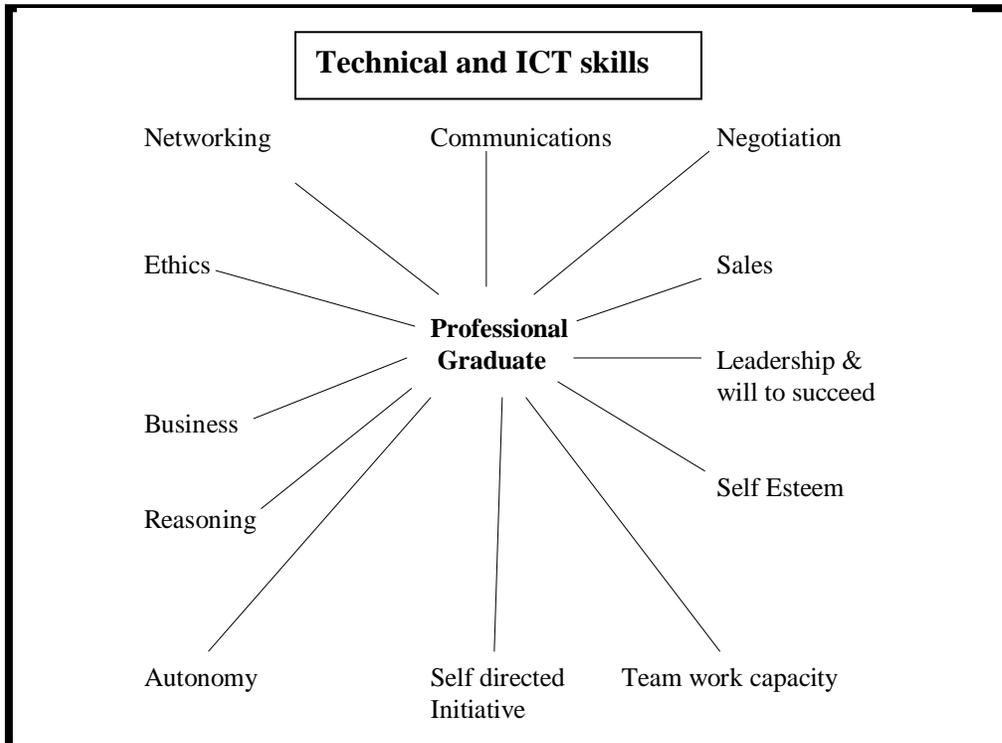


Figure 1. Basic Personal Development skill set for Learners.

2.2 THE TOOLS OF COMMUNICATION

Communication is individual and everything communicates. No two people are the same, understanding another person's viewpoint is vital and "helping someone up the hill" so to speak, means that we all reach the summit. Being an effective communicator comes natural to some and for others it has to be developed, honed and tested on an ongoing basis. It is generally accepted that actual words account for about ten per cent of any verbal communication. Thus, one's body language including personal appearance and posture alongside the rate and volume at which we orally convey information are potent tools in any interpersonal activity. Verbal skills, for example choice of language used in a particular context, are skills that can be taught and learned best by instruction and immersion. Good working practices and successful enterprise are highly dependent on the implementation of communication skills. Listening skills are equally essential, both in one to one situations as well as within large organisations. Poor listening skills including making assumptions, not being relevant, needing to be always right, time wasting, lack of assertiveness, are only some of the many obstacles standing in the way of effective communications.

Writing skills for those producing business reports and correspondence are invaluable working tools. Meetings/minutes/memos/record keeping are part and parcel of all sectors of business. Communicating with customers, for example promotions, presentations and negotiation, while sometimes best learned through practical experience can also be learned via the classroom environment. Classroom case studies and group work will reinforce and develop these techniques.

Personal communication such as self promotion by using resumes and job applications are transferrable skills and all third level programmes should incorporate these. Career days provided by college services or career guidance staff can also support these learning outcomes.

For conflict resolution, good communication skills help one avoid stalemate and at the very least, resolve difficult situations. People will not listen until they feel they are being heard. Being mindful of the positives in the stance of an opponent can help achieve maximum benefits for all. Thus, it is essential that one does not take communication for granted or leave it to chance. One should be aware, be receptive, choose to be positive rather than negative and most importantly of all, never stop developing your own communicative skills within the learning environment both socially and in industry. Communication skills should be regarded holistically as a process of *Relationship Technology*. Whatever way you look at it, these skills are skills for living, and the level of success a person derives from life in general, can be attributable to communication skills which can be more accurately described as the "art of being understood".

If you wish to converse with me, define your terms.

Voltaire.

2.3 ORGANISATION AND TIME MANAGEMENT SKILLS

Time, its management and mismanagement is a constant cause of frustration for any manager concerned with maximising productivity. The skills of time management are as equally vital in educating the professional. These skills are essentially based on “quality control” i.e. identifying, prioritising and utilising the inherent strengths and weaknesses within each individual. What personal resources/qualities does the individual possess? What style of approach is he/she more comfortable and effective with? How much time do we have, and how do we make the very best use of it? Finding the answers to these questions is vital in our collective quest for success.

The economist Vilfredo Pareto(1848-1923) [5] is credited with what has become known as the “80/20 Rule” . The basis of this, which has been statistically verified is that eighty per cent of the results of a process can be attributed to twenty per cent of the input to that process. This proactive approach has not always been applied to work or study situations, but when and where it has been applied, the results have been most encouraging. In effect, if all teaching resources, including time, were used more efficiently, then learning can be undertaken with a clearer focus so that the aims and objectives of that programme/ module can be met. Self- directed learning, and critical thinking are skills that can be transmitted to the student in this context.

3.1 CONCLUSIONS

Education then, must be a comprehensive education, it must be a whole product, as cohesive as it is effective. It must comprise elements that emphasise the social, business and human skills of the student to complement and enhance creative ability and technical proficiency. Educators for the future must possess the foresight to realise that it is the total individual, complete with hard and soft skills that will be tried and tested in the emerging technical world of work ahead. The skills of critical thinking, self- directed learning, interpersonal ability, together with heightened self -awareness and self-confidence are skills that help inspire and sustain actual life-long learning. They are resources that the student will fall back on again and again throughout a lifetime of challenge and ongoing personal and professional development.

It is obvious that all graduates and in particular, engineers are closely related to practice and therefore future curricula must reflect this. Engineers are involved in the management of technology and resources in a global context, their education must prepare them for such a role.

REFERENCES

1. Gunter Heitmann, E4 Thematic Network, Enhancing Engineering Education in Europe, Claudio Borri and Francesco Maffioli (Eds)., Volume C, Firenze University Press, 2003.
2. Gardner Howard, Frames of mind: the Theory of multiple intelligences, Basic Books 3rd Edition 2011.

3. Goleman Daniel, Emotional Intelligence: 10th anniversary edition, Random House Publishing Group, 2012.
4. Beck AT, Cognitive Therapy and the Emotional Disorders, International Universities Press, 1975.
5. Pareto Vilfredo, Manual of Political Economy, Augustus M. Kelly(Publ.), 1971