# CHALLENGES OF TEACHING SOFT SKILLS IN DISTANCE LEARNING: A CROSS-DISCIPLINARY APPROACH

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## ABSTRACT
Soft skills are essential for degree accreditation and individual professional registration with an expectation that students should develop and demonstrate these skills in their education alongside technical knowledge. Soft skills is a loosely defined term involving several different but related characterisations covering skills such as problem solving, communication and interpersonal relations. They depend upon general tacit and explicit knowledge about human interaction which can be applied in many different fields and hence may also be termed transferable skills. In engineering degrees project work in teams plays a significant role in development of soft skills allowing students to practice various roles. Soft skills therefore pose a particular challenge for distance education in engineering as comprehensive groupwork is difficult to organise. Many students in distance education are mature bringing soft skills already developed in their personal or professional lives. However, the pattern and development of these skills vary with intersecting dimensions of diversity such as gender and socio-economic status. Recognition of existing soft skills has potential to boost confidence whilst the development of soft skills supports career progression. This paper reports on a research project about the development of soft skills at a UK based university which is an established distance education provider. The research engages with the question of whether soft skills can be taught in a generic way for different subjects or through a common approach that is customisable to particular subject contexts. As part of addressing this there is reflection on how soft skills expectations and teaching differ between engineering and nursing.

*Keywords: Competence, engineering, distance education, professional practice, soft skills*

## 1 INTRODUCTION
Engineering education focuses primarily on technical knowledge. Vincenti [1] classifies engineering knowledge in his seminal book *What Engineers Know and How They Know It* into fundamental design concepts, theoretical tools, criteria and specifications, quantitative data, practical considerations and design instrumentalities. Universities largely concentrate on the first two of these categories as the others are situated in the context of products, organizations and markets. What is missing from this, and other classifications of engineering knowledge derived from it, is an explicit discussion of soft skills in engineering. Engineering is a sociotechnical activity. Products are developed by teams of people with a wide range of skills and backgrounds and operating in a multitude of environments and use contexts that combine social, technical, and managerial skills [2]. Engineers usually rely on building their relational skills upon their technical skills [3]. The reliance on relational skills and other soft skills is slowly being recognized for example in degree accreditation requirements for several UK professional institutions. However, this poses a challenge for engineering educators as most universities rely on team projects as a vehicle for teaching and reinforcing soft skills. This option is much more limited for distance education courses where students have far less opportunity to interact as they also often work asynchronously. Distance education students, especially mature students, often have rich experiences from outside of engineering to draw on. Some of these issues also apply to part-time degrees at face-to-face university, where the part-time students, take some courses remotely and are less integrated into the student communities. This paper reports on some of the challenges and opportunities of teaching soft skills in distance education. These issues are addressed from the perspective of the skills an individual does or should possess as opposed to the skills that an organization requires. Nevertheless, the two are

intertwined and directly related to the exercise of skills in professional practice. As many soft skills are transferable between different fields this also raises the question whether soft skills can be taught in the same way or jointly across different degrees. The possibility of shared teaching of soft skills for engineering and nursing students is considered.

## 2 WHAT ARE SOFT SKILLS?

The notion of soft skills is surprisingly recent having first appeared in a 1972 US army conference [4]. While there is general consensus on the importance of soft skills there is little consensus on a definition. Soft skills are also referred to as generic skills, transferable skills or employability skills and are often described by contrast to hard skills, technical skills or professional skills.

### 2.1 Theoretical base

Soft skills are linked to tacit knowledge. Individual tacit knowledge is typically developed from experience and the application of explicit knowledge. Explicit knowledge might be shared in the process of acquiring tacit knowledge but cannot be fully described by explicit knowledge [5]. Wagner and Sternberg [6] define tacit knowledge as knowledge that is not formally taught, but underpins knowledge acquired from daily experiences [7]. Joie-La Marle et al. [8] carried out a systematic review of soft skills and point to the challenge of divergent terminology between different fields. Individual soft skills are highly interlinked and therefore can be described on different levels of detail and from various perspectives. For example, Joie-LaMarle et al. [8] illustrate that planning and organising is strongly related to other skills like team working, problem solving or leadership. While this is unsurprising it poses a challenge for how individuals and educators describe soft skills. What is seen as soft skills or core professional skills also varies with the context. For example, creativity is included in many classifications of soft skills but in the context of engineering it can also be a core professional skill.

### 2.2 Soft skills from experiences outside engineering degrees

Soft skills can often originate from everyday activities or be developed through non graduate jobs, as illustrated in Table 1. The suggestions are based on informal conversations with undergraduate students during residential schools held by the university and are purely intended to be illustrative.

*Table 1. Top 10 soft skills identified by Joie-La Marle et al. [8] and potential everyday sources of them*

| Soft Skill | Potential origin of experience |
|---|---|
| Teamwork | Past job, involvement in running a charity |
| Communication | School presentations, working with customers |
| Planning and organising | Domestic life, running a scout group |
| Responsibility | Family, jobs |
| Leadership | Sport club, church |
| Creativity | Hobby |
| Commitment | Doing a part-time degree |
| Interpersonal skills | Social life |
| Adaptability | Parenthood, working in different jobs |
| Ethics | Personal beliefs |

In particular, mature students enter degrees with considerable life and work experience. For example, the authors participated in student conferences where several students had worked in call centres handling customer enquiries or complaints which developed their communication and interpersonal skills. Another example is that a significant group of our university undergraduates are current or former soldiers who have army training in planning and organising or leadership skills. Whilst these students bring soft skills to their degrees the nature and level of attainment of these skills is highly varied. Importantly students might not be aware that they possess them. For example, a student working in a customer complaints department did not realise that she would be ideally placed for customer facing engineering roles. The extent to which people possess all soft skills is a matter of degree. In engineering at the lowest end of the soft skill range everyone communicates or works in teams and at the upper end some people are especially good at individual soft skills to the extent that they and other people recognise it. The importance of soft skills raises the issue of whether students possess particular soft skills to a

sufficient degree to claim that they have these skills. In a face-to-face university students can judge themselves against each other and also receive formal or informal feedback from fellow students. For example, if a student team has to give a presentation together, they might meet to work on the slides together, do a run through and then present to their peers. They give each other feedback in the team and negotiate over a presentation style but also are likely to get verbal feedback from their peers as well as being able to read the body language of peers to see whether they were engaged or not. If they get a top grade for their presentation and engaged their peers, they probably feel confident about their presentation abilities. This is much harder in an online setting where the direct and indirect feedback is much more formal. Soft skills are deeply personal because every person has differing experiences and skills. For example, artistic creativity is different from that involving solving abstract mathematical problems which differs again from that of an engaging storyteller. As the example illustrates, it might be hard for a person to recognise that they are creative because they can tell an entertaining story because this might be entirely normal and unremarkable for them so universities need to help students in recognising their skills. Although soft skills are transferable by definition, they are manifested differently in various academic disciplines and contexts. For instance, in a philosophy context people sometimes read out a talk to be sure they get the nuances correct but this mode of presentation would be considered dull and unengaging in an engineering context.

# 3 SOFT SKILLS IN ENGINEERING

Whilst the perceived stereotype of an engineer is a man who is technically and mathematically capable and rational [9] and who does not take human or social elements into account in the context of his work the reality is that engineering is highly social and most engineering roles rely heavily on soft skills [10].

## 3.1 Soft skills in professional practice

Engineering is done by people with complementary skills. For most modern products this involves a mixture of different disciplines (such as mechanical, electrical, software, production or materials engineering) each involving their own vocabulary, presentations and ways of working in what Bucciarelli [11] termed object worlds. Engineering teams require expertise covering the life cycle of the product and the stakeholders involved in it - from product users, material suppliers to capital investment project participants as well as business and quality control roles. Whilst many engineers are hired for their technical expertise, they acquire additional non-technical roles, such as strategy, coordination, communication or relationship building and maintaining roles (see Hatmaker [12]) throughout their careers. Typically, university focuses on the technical skills required to carry out these technical roles which leaves engineers to fall back on personals skills or on the job training to acquire soft skills

## 3.2 Accreditation requirements

Learning outcomes for UK engineering qualifications are set out in Accreditation of Higher Education Programmes (AHEP) [13] and the Approval and Accreditation of Qualifications and Apprenticeships [14]. These reference standards are designed to be compatible with the UK Standard for Professional Engineering Competence and Commitment (UK-SPEC) [15]. The current versions of the standards do not explicitly use the term soft skills but rather embed them in core professional competencies. One of the core competencies is responsibility, management and leadership which covers team leadership, project management and professional accountability (competency C). Another core competency is communication and interpersonal skills (competency D), which requires engineers to communicate complex engineering matters to technical and non-technical audiences and to work with others. The UK-SPEC also places emphasis on the values that engineers espouse like ethical practice or sustainable and social responsibility (competency E). The competencies C and D would be considered soft skills whilst competency E illustrates the blurred zone between soft skills and other skills (such as through discussion of ethical values). Accreditation is determined by various Professional Engineering Institutions (PEI), under licence, with the emphasis and extent tailored to the field. For example, the Institution of Mechanical Engineers (IMechE) requires an understanding of “human skills needed in manufacture” [16] whilst the Institution of Engineering and Technology (IET) highlights skills for lifelong learning [17]. As universities seek to accredit their degrees, they need to interpret the AHEP learning outcomes required for professional accreditation in the context of the different PEI and the courses that are on offer. This poses a particular challenge for general engineering degrees where beginning students do not know what registration they are seeking, with the course possibly being accredited by multiple PEI.

# 4 SOFT SKILLS IN THE UNDERGRADUATE ENGINEERING CURRICULUM IN DISTANCE EDUCATION

Whilst many face-to-face universities frequently require students to work in teams with differing roles and ask for oral presentations, this can be more difficult in the context of distance education. In distance education what are often tacit skills picked up by students during their degrees have to be taught explicitly and opportunities for students to acquire these skills have to be specifically created. For example, the soft skill of team working has been carefully designed into our level 1 university online summer school. One instance of this is that students spend a day learning team working skills based around understanding how different materials that maintain water temperature. This is followed by a research exercise to answer a bank of about 50 questions, covering topics including heat retention, sustainability and commercial development, through self-organised division of the work involved. The knowledge gained then feeds directly into a design task where the team identifies a use context and designs an insulated mug for this context, with each team member presenting an aspect of the design. This gives the students a flavour of different communication and leadership tasks and also reminds them of the value of their personal experience for engineering practice. The students have worked together as a small group but are missing aspects of non-verbal feedback and personal relationships with other students that enable them to exchange feedback in a positive way. This puts more onus on tutors and the assessment to provide students with feedback on their soft skills. Online summer schools balance the greater soft skills learning from face to face teaching with the cost for students and the fact that not all students can attend face to face summer schools. Another instance is that at the end of their degrees a component of student MEng dissertations is reflecting on how their project learning contributes to the UK-SPEC [15] competency requirements, especially those around project management. Both examples show the challenge and opportunity of designing soft skills learning into teaching activities.

Online opportunities for presenting and showcasing student work can also be created. For example, at our university final year project students are required to produce a poster summarising their work. There is an online extracurricular event where the students can show their posters, and prospective students can see what project expectations are. However, extracurricular events are optional with not all students wishing or being able to contribute to them. Organising and marketing online extracurricular events to students both involve considerable effort. Whereas an extracurricular event at a face-to-face university can generate a positive buzz and become what might be thought of as an occasion, it is harder to attract the attention of distance education students. A significant reason for this is that distance education students can be overwhelmed by the volume of university communication, so invitations to extracurricular activities can disappear unnoticed into this. Mature students are typically much more aware of their help or support needs but are far more restricted in being able to take advantage of these opportunities. They come to university to acquire the technical skills required for the roles they aspire to; hence soft skills may not be a priority for their limited study time. These considerations really put an emphasis on the deliberate integration of soft skill training into curriculum design so that our university can ensure that the necessary soft skills are included in modules.

Accreditation requirements are a driver of integration, to ensure that all students can develop and demonstrate the required learning outcomes. Our university offers a modular general engineering degree where different pathways are accredited by different institutions. As a result, compulsory modules need to a provide a framework for all the institutional accreditation requirements. The university offers an engineering practice and skills module where soft skills, such as presentation skills or decision-making skills, are wrapped up with practical skills, such as data analysis, measuring and modelling or research and information evaluation. As the work students undertake on the module is to some extent guided by their interests and abilities, the soft skills they acquire may vary. Assessment design is therefore critical to encourage and confirm the development of all required skills.

Preliminary results of a mapping of AHEP learning outcomes against Core skills proficiencies from the UK Standard Skills Classification [18] has illustrated the challenges of identifying appropriate proficiency level and demonstrate academic progress, see Figure 1, as the definition of the skills required at each level are subject to interpretation. The ambiguity in the definition of skills level poses a significant barrier to making soft skills transferable in practice. Given the effort to include some soft skills in distance education, it is necessary to teach soft skills at lower points of academic progression to a higher proficiency level.

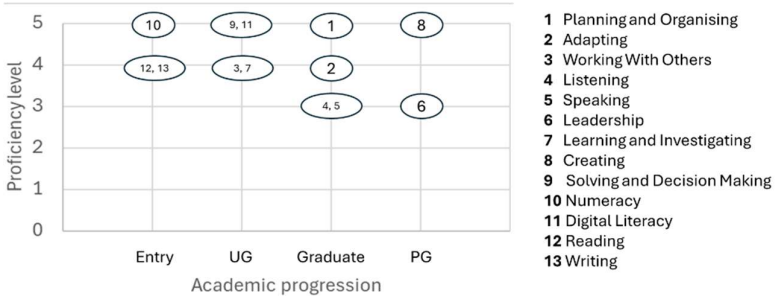


*Figure 1. Core skills proficiency levels and academic progression for Engineering*

## 5 TRANSFERABILITY OF SOFT SKILL TEACHING ACROSS DECREE SUBJECTS

Professional expertise across a wide range of areas centrally involves the acquisition of complex perceptual, judgement, and decision-making skills such as planning, co-ordinating, considering alternatives, considering advantages and disadvantages, communicating and evaluating. These soft skills rely upon and support the exercise of professional autonomy in the workplace, which is essential for expert performance in various tasks [19]. A plausible account of professional expertise that aligns with this view of soft skills is that expert knowledge is cognitively held in discrete chunks, which are gradually built upon and integrated as expertise increases, with these chunks being located within particular professional areas of activity [20]. Soft skills are shared across a wide range of professions and disciplines along with differences between various areas. These similarities and differences enable shared, suitably tailored teaching of soft skills across a range of degree subjects.

Engineering education is strongly influenced by PEIs that require soft skills, which as a consequence are designed into modules to ensure the accreditation process is smooth. Other vocationally orientated degrees such as nursing are accredited by professional bodies with a similar kind of requirement for both technical nursing knowledge and soft skills. In distance education it is important that soft skills are considered in the design phase of modules with effort required to design activities that support the acquisition of soft skills. As the example of our university online summer school indicates, the activities could have been carried out by students in isolation and asynchronously but were designed to enable a learning journey and team building. In this case, the design had to strike a balance between allowing the student groups to organise themselves but offer guidance in sufficiently small steps such that team leaning outcomes would not be excessively compromised by variations in individual student skill levels. A greater challenge across all qualifications is that of generating spaces where students can give each other feedback on their soft skills, such as presentation or leadership. Making collaboration mandatory is difficult because not all students are able to take part in joint activities due to their personal circumstances. As many students bring soft skills acquired from outside the university, there is a need to help them to recognise the skills that they have already. This could either take place through case studies and examples where these skills are highlighted in the accompanying narrative to these studies and examples, or by explicitly teaching soft skills. Within disciplinary contexts it can be difficult to distinguish between the particular exercise of soft skills and expert performance in various tasks. Hence, soft skill teaching done jointly across a range of disciplines might enable individuals to recognise how skills displayed in unfamiliar contexts could be valuable for performing tasks in areas that they are familiar with. In addition, broadening inter-disciplinary study beyond the standard grouping of allied professions, can promote inclusive practice by increasing diversity of both demographics and perspectives. As women are under-represented in engineering cohorts [21], improving gender balance may be particularly significant to ensure that all students have opportunities to work in mixed groups.

## 6 CONCLUSIONS

Soft skills are a valued element of engineering education, with development and assessment required for accreditation and professional registration. There is scope for transfer of soft skills from other contexts, including prior experience, extra-curricular activities and inter-disciplinary study. Recognising the soft skills that mature students already possess can free up time and attention for other learning outcomes and boost their confidence. Inter-disciplinary study, across the broad range of professions that also require both technical and interpersonal skills, has potential to enhance students' recognition of

soft-skills and promote inclusive practice. Teaching soft skills in distance learning is therefore not just a challenge but an opportunity to enhance student experience and professional development.

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