

## Incorporating emotional intelligence (EQ) skills into the engineering curriculum to facilitate communication competences

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**ABSTRACT:** Utilising skills in emotional intelligence (EQ) can facilitate the development of communication competences, which are considered to be a fundamental aspect in the education of engineers, especially by senior international engineering bodies. EQ impacts significantly on the acquisition and expression of communication skills, including listening skills. Likewise, self-actualisation can affect EQ-communication skills. It is important to avoid what Goleman terms *trained incapacity* by educating engineering students so that they are better equipped with EQ skills that can aid them not just in daily life and work, but in interacting and communicating with colleagues and team members. Intercultural issues play an import role in this increasingly globalised professional community. Enhancing students' EQ-communication issues will affect the curriculum, particularly with regard to assessment and its integration across the curriculum. Experiential approaches will also assist further in the education process. Notably, both EQ and communication skills are considered to be *career enhancers*; when combined they can significantly augment an engineer's skills base.

### INTRODUCTION

Communication skills have to be considered as a vital aspect in the education of engineers. Senior international engineering bodies, including the Accreditation Board for Engineering and Technology (ABET), recognise that communication skills are a fundamental engineering skill that all engineering students should graduate with. Communication skills are a regular feature of an engineer's job in industry; some graduates employed in industry have identified that education in communication skills needs to be improved, given the demands that have been encountered in industry [1]. Indeed, communication skills are considered to be a valuable *career enhancer* [2].

In a related but much younger area, the steadily growing field of emotional intelligence (EQ) offers cues that can contribute to the acquisition of communication skills, thereby contributing to the skills base of future global engineers. Emotions have been found to play an extremely important role in daily life and education. An individual's level of EQ influences a person's behaviour towards others, attitudes to work, including motivation and the ability to learn, and communication skills. As such, it also influences employment and promotion opportunities, as well as other people's perception of the individual. As EQ impacts on a person's learning capabilities, it is also of direct relevance to education [3].

### EMOTIONAL INTELLIGENCE (EQ)

The term *emotional intelligence* (later dubbed EQ) has been considerably expanded by Goleman (eg see refs [4][5]), who identified that IQ is actually less important for success in life and work than EQ, which involves a set of skills that is not directly related to academic ability [6]. Goleman identified five key domains of emotional intelligence, namely: self-awareness, self-regulation, motivation, empathy and social skills.

Importantly, these areas can be incorporated into student education and preparation for professional working life. This is particularly relevant as EQ skills are learnable and a person's EQ level is flexible.

A follow-up study found seven core skills, namely:

- Motivation: the drive and energy to achieve results;
- The ability to take other people's needs into account;
- Awareness of personal feelings and the ability to control them;
- Emotional resilience: the ability to perform consistently when under pressure;
- Decisiveness: arrive at clear decisions and drive them through;
- Influence and persuasive skills;
- Conscientiousness: display commitment to an action plan and match words and deeds [6].

A high EQ indicates that an individual is able to experience feelings as they occur and endows the person with compassion, empathy, adaptability and self-control. [7]. Therefore, it becomes a vital skill for workers across industries, work hierarchies and positions.

### THE IMPACT OF EQ ON COMMUNICATIONS SKILLS

It has been estimated that about 90% of emotional communication is actually non-verbal [8]. Indeed, when it comes to the appraisal and expression of emotions, this is expressed both verbally and non-verbally [9].

#### Listening Skills

Communication involves receiving as well as sending signals. As such, listening skills are just as important and verbal and

written communication skills competences. As an extension to this concept, listening habits and skills are an integral component of EQ, and carry the elements of self-awareness and control, empathy and social expertness [10].

Lynn developed various activities that target the work-based environment, potentially because EQ was first embraced by management and business studies [10]. However, only now does it seem to be filtering into other domains, such as engineering. Work-based activities also provide a direct context to the training. Such listening skills exercises can be integrated into the study environment, not least of which to aid students in team-based assignments, an increasingly staple task in engineering.

#### Self-Actualisation and EQ-Communication Skills

Communication may be inhibited depending on the level of self-actualisation of the communicator [11]. Maslow proposed a hierarchy of needs that a person needed to at least nearly satisfy before self-actualisation could take place [12].

This ties in with the EQ elements of self-awareness and self-regulation. Given that communication is ranked as one of the prime characteristics required by employers in the engineering industry, EQ has an important role to play in strengthening communication skills when certain EQ elements are enhanced in the student.

#### EQ and IQ Compared

Intellect, measured by IQ, can fall short without EQ. A detailed report from a very smart engineer may be close to undecipherable to the manager who makes the final decisions. EQ contributes to identifying the needs of others and to identifying those projects that are more important to the task at hand. Intellectual accomplishments and social skills can be enhanced through EQ. Furthermore, EQ can be changed throughout an individual's life, but an adult's IQ is said to be fairly constant [7].

It should be noted that EQ is *not* the opposite of IQ. In industry, *IQ gets you hired, but EQ gets you promoted* [8]. For example, a manager at AT&T Bell Labs was asked to rank his top performing engineers. High IQ was not the deciding factor, but instead how the person performed regarding the answering of e-mails, how good they were at collaborating and networking with colleagues, and their popularity with others in order to achieve the cooperation required to attain the goals [8].

This example highlights the benefits of high EQ regarding communication skills, time management, teamwork, leadership skills and business acumen. These important skills flow on from emotional intelligence, such as the skilful recognition of others' emotional reactions and empathy to come across as genuine and warm, which will achieve greater cooperation from others, rather than coming across as oblivious and boorish [13]. This also involves other empathy skills with regard identifying the target audience for communication, to reflection skills to ascertain personal strengths concerning communication.

#### EQ SKILLS AND THE MODERN ENGINEER

It needs to be noted that high IQ seems to be gained at the expense of EQ skills, resulting in *trained incapacity* [5].

Although not often taught as part of an engineering course, it is important to note engineering students, as well as fully qualified engineers receiving on-the-job training, can learn to augment their EQ skills.

#### EQ Skills and Engineering Students

Introducing engineering design students to EQ skills at the very start of the course proved beneficial in facilitating student learning at Rensselaer Polytechnic Institute in the USA [5]. The five *simple secrets of success*, as suggested by Goleman at that time, were communicated to students as *rappport, empathy, persuasion, cooperation, and consensus building*, and students engaged in recognition exercises of these aspects in groups [5]. These exercises contributed to increased student awareness of these skills and improved students' teamworking abilities in this example; one key component involved encouraging communication skills between team members.

An Exxon engineer identified that it was particular personal qualities that served to differentiate successful graduate engineers from average ones, including such factors as perseverance, motivation and finding a mentor [5].

#### Foreign Language Skills Acquisition

EQ skills contribute to the learning potential of foreign language acquisition, particularly as it relates to acknowledging the legitimacy of other cultures as being equally valid. Ultimately, this deters ethnocentrism as foreign cultures related to that language become more relevant, especially if empathy skills are heightened [9]. As such, this will improve understanding of another culture and its language.

#### Education Issues for Universities

If basic EQ skills are already present in graduates before they enter professional practice, then this will advance their standing in the workplace and, indeed, industry. Furthermore, work-based training tends to be favoured by medium-to-larger firms; as such leaving such skills training to post graduate work activities may exclude smaller firms.

EQ activities can be integrated into basic class activities, including preparations for team-based activities. At this point, it should also be noted that undergraduates (even postgraduates) should never be dropped into team-based assignments without some knowledge of fundamental team dynamics and solutions to team pitfalls. EQ skills can help facilitate enhanced team interaction in this regard.

Given the principles stated earlier, it becomes quite apparent that encouraging EQ abilities should be a component of student education. This becomes especially relevant given that the skills that employers value include a willingness to learn, flexibility, communication skills, teamwork and other forms of working with others [6]. Because such skills fall into the category of EQ, universities need to be aware of industry demands on graduates.

Engineers' attitudes to the *soft skills* area, incorporating people, ideas and self-reflection, have to be tackled at a fundamental level. Curricula has to incorporate general skills and abilities that are valued by both universities and particularly employers, including the following:

- Self- and context-awareness;
- Decision-making and action planning;
- Research and analysis;
- Communication skills;
- Critical reflection [14].

These characteristics incorporate elements of EQ. Indeed, subjects in humanities can play an active role in the education of future engineers who can reflect and display sensitivity to both individuals and society [15].

Enhancing communication skills across the curricula, again rather than in a stand-alone subject, will contribute to higher EQ by targeting certain elements. This includes delivery of oral presentations in engineering studies and incorporating communication and presentation skills in the marking structure of reports so that the students treat them more seriously. This may involve a restructuring of certain components of subjects and, indeed, the curriculum.

Experiential approaches, which involve the student in the actual experience of communication, with opportunities for debriefing and re-application, provide opportunities for the development of self-awareness. Videotape playbacks of oral presentations also stimulate reflection in the student [16]. Constructivist approaches build on past learning and should be utilised to build on students' positive learning experiences to enhance learning and skills development. Further, exercises in reflection were found to enhance the learning experience and communication skills of engineering students [17].

## COMMUNICATION SKILLS

### Communication Competences

EQ directly impacts on communication competences by targeting particular elements that improve and enhance the process of communication. In America, the biggest complaint of workers is poor communication with management, sometimes even preventing employees doing their best work. Further, the key to empathy is listening well. Being in control of personal emotions also makes the worker more accessible to other people, both inside and outside the workplace [5].

The importance of communication competences is reflected in a case study on automobile design. The Lincoln Continental design team reviewed its methods so that the car's 1995 launch was a success. Turnaround strategies included smoothing communication lines and openly stating what were perceived assumptions, thereby isolating and reducing conflict, focusing on the task on hand in a spirit of collaboration and developing better personal relationships among team members by overcoming fear, mistrust and power struggles. This was so much so that the design team came in under budget and early, despite starting four months late [5].

### Intercultural Communication Skills

Increasing emphasis is being placed on the global engineer: a person who is mobile across international boundaries and who is not bound by particular paradigms concerning intercultural communication. Given that many graduate engineers internationally will encounter situations where they deal with foreign professionals, or engage in work in a foreign nation, intercultural competences and empathy for foreign cultures are

important aspects to be considered in engineering education. Emotional intelligence relates directly to this field of intercultural communication, utilising elements of awareness, empathy and social skills [18].

Intercultural communication between people is coloured by the cultural context of the sender and the receiver. Given this factor, in order to achieve an accurate, effective and efficient communication process, the communication actually received is ultimately more important than what the communicator thought was sent.

EQ skills can contribute to improved learning of intercultural communication skills through particular aspects, including intercultural awareness, empathy, self-awareness and social skills. Further details can be found elsewhere [18].

In 1999, Goleman identified that engineers need EQ skills in this area, stating that:

*A lack of emotional intelligence can show up ... in being tuned out in working with those from different ethnic groups or nationalities, or with women ... the global economy makes the work force more diverse than ever [and] empathy ... matters more and more to assure smooth relationships on the job [19].*

### Workplace Applications

EQ skills can be applied across different work environments, not just for offices, but also the environments of engineers [19], computer projects [20], etc.

EQ skills improve teamworking skills, especially with regard to communication between team members. Furthermore, the context of the receiver of the communication, whether it be written, non-verbal or oral, is taken into account through empathy and self awareness. This is important whether the context be cultural, educational, professional, social or otherwise.

Open, honest and candid communication in the workplace is, mostly, more welcome in companies of today, as it helps in the identification of problem areas earlier. EQ skills contribute in area as well, as high-EQ people will be more receptive and better able to tackle negative, as well as positive, news and assists in the sharing of pertinent information, fostering better communication linkages [5].

The Lincoln Continental case showed that fostering emotional intelligence was not a direct goal, but evolved naturally they sought to reach their goals [5]. In this sense, open and collaborative communication enhanced the design process between separate engineering design teams, and achieved organisational goals earlier and cheaper than expected. This example clearly shows how the level of importance EQ skills has for today's enterprises.

### The Engineer-Manager

EQ skills can also be used by engineers in management positions, including conveying the vision of a firm as a guide and controlling fear responses in times of change. EQ communication skills can also ensure effective team-based cooperation and collaboration [21].

## EQ INTEGRATION

The earlier example of Rensselaer Polytechnic Institute illustrates how EQ can be integrated into a course structure after an initial introduction of the concepts is made to the students. From there, exercises that promote EQ skills can be integrated into the course. Such exercises include greater emphasis on oral presentations, experiential approaches, role-play, more encouraging feedback to students, peer reviews, opportunities for reflection and, notably, exercises that focus on teamworking and cooperation [3]. Furthermore, Northwood has argued for its integration in such areas as Problem-Based Learning (PBL) and Work-Based Learning (WBL), especially in the incorporation of experiential processes [22].

## SUMMARY AND CONCLUSION

Abilities related to emotional intelligence (EQ) contribute significantly to communication skills. Indeed, there seems to be a level of overlap wherein they complement each other. This includes intercultural communication, an important component in these times of globalisation.

Ultimately, EQ skills can be integrated into university teaching, whether it be at the basic instruction level or as part of a work-based learning structure. Enhanced integration of EQ skills will in turn enhance the work skills of graduates, particularly with regard to communication skills. Indeed, both EQ and communication skills are considered to be career enhancers; when combined they can augment an engineer's skills base significantly.

Goleman identified that EQ skills are declining in students, affecting performance (eg student drop out rates) [5]. This will also affect their abilities to perform on the job as engineers, including their communication skills. This highlights the need to integrate EQ skills in modern education; augmenting such skills will in turn facilitate communication skills for students as future engineers.

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