

## ENHANCEMENT OF EMPLOYABILITY QUOTIENT OF ENGINEERING STUDENTS THROUGH THE INTEGRATION OF THE KNOWLEDGE OF ENGINEERING BRANCHES WITH ENGLISH AND SOFT SKILLS TRAINING

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### **ABSTRACT**

*This paper seeks to present a framework for integrating the knowledge of the engineering branches with English and soft skills training with a view to enhancing employability quotient of engineering students. The paper specifically explores the ways in which engineering students can be made aware of core engineering concepts and new-age skills in areas such as Internet of Things (IoT), Artificial Intelligence (AI), machine learning, and data science and their industrial application while they are trained in enhancement of English language skills and soft skills such as communication skills, creative thinking skills, critical thinking skills, emotional intelligence, team working skills, time management and stress management. The paper demonstrates that the knowledge of hard skills of engineering branches could skillfully be exploited in the English and soft skills training. The paper also recommends that successful integration of the knowledge of engineering branches with English and soft skills training could pave way for engineering students to become more employable and improve their overall engineering ability. It is also hoped that the proposed training framework will equip the engineering students to better absorb the requisites of prospective jobs.*

**Keywords:** *Engineering branches, English and soft skills training, overall engineering ability, requisites of prospective jobs*

### **INTRODUCTION**

Engineering education is critical to the growth and prosperity of a nation. Engineering education in India has contributed significantly toward the creation of young workforce and to the launching of groundbreaking technologies. As a result, manufacturing sector in India is growing in an impactful way. Initiatives of the Indian government such as ‘Make in India’ and ‘Digital India’ are providing the needed push to the manufacturing sector and to the field of technology. Engineering innovations and applications are shaping every sphere of human life.

Engineering colleges are producing a large number of graduates. However, there exists a skills gap. There is a shortage of skilled talent. Most engineering graduates fail to meet the industry demands. Engineering graduates who possess the requisite hard skills and soft skills stand the chance of not only landing coveted positions but also be able to design and initiate start-ups in various in-demand technologies.

This paper presents a training framework that incorporates the awareness and knowledge of core concepts of the engineering with that of the requisite knowledge of English and soft skills. It illustrates the ways in which the knowledge of hard skills of engineering branches could be deployed in the English and soft skills training programs.

## BACKGROUND

The boom in engineering education in India has resulted in mushrooming of technical institutions. However, several lacunas are besetting the engineering sector. A questionable standard of education, ineffective institute-industry interaction, mediocre infrastructural facilities, insufficiently trained faculty, inadequately motivated students, abysmally low employment rate are some of the major issues confronting the engineering education.

Gohain (2019), citing the seventh annual report by Aspiring Minds, published in Economic Times on 20<sup>th</sup> March 2019, points to the pathetic state of engineering education in India. The report reveals that over 89% of Indian engineers are unemployable for any job in the knowledge economy and only 3.84% of our engineers have the technical, cognitive, and language skills necessary for software related start-ups. It also states that a mere 3% of engineers have new-age skills in areas like artificial intelligence (AI), machine learning, data science, and mobile development. It further adds that while around 18.8% of engineers applying for IT jobs in the US can write correct code, only 4.7% of the engineers can do so in India.

Varun Aggarwal (2019), co-founder and CTO of Aspiring Minds, says: “We found that only about 3% of engineers have new-age skills in AI, data, mobile, and cloud. This is a situation which must be immediately remedied — both for the sake of Indian industry, and our relevance to the world at large.” He further opines that “Engineers learn by doing and not reading. We found that the proportion of engineers taking up projects beyond curriculum and doing internships is low. Further, the faculty barely talks about industrial application of concepts in class, even as the exposure of students through industry talks is also wanting,”

Despite the lacunae, engineering education can contribute significantly by directing its efforts toward reductions in the use of fossil fuels, sustainable transport and agricultural practices, harnessing solar energy, securing cyber space, and provision of modern medical devices.

Against the above backdrop, it is axiomatic that engineering students should hone their technical, cognitive, language skills and soft skills and also develop new-age skills in areas such as Internet of Things (IoT), Artificial Intelligence (AI), machine learning, data science so that they can become industry and future ready.

## SIGNIFICANCE OF SOFT SKILLS

The term ‘soft skills’ is an umbrella term encompassing a wide variety of attributes, skills and traits. Elucidating the terms soft skills and hard skills, Hewitt Sean (2008) states ‘Soft skills are essentially people skills -- the non-technical, intangible, personality-specific skills that determine your strengths as a leader, listener, negotiator, and conflict mediator. "Hard" skills, on the other hand, are more along the lines of what might appear on your resume -- your education, experience and level of expertise.’

Hard skills and soft skills complement each other. Employers hire candidates who possess a right mix of hard skills and soft skills. Soft skills are considered essential for smooth functioning at workplace and to build a successful career path. Emphasizing the importance of soft skills, Urs Dana Sorana (2013) states: “Most universities worldwide have included soft skill modules in their educational programs, basically aimed at developing professional abilities.” The Indeed Career Guide comments: “While hard skills are important for completing technical tasks, strong soft skills will make you the kind of worker employers want to hire, keep and promote. It’s important to highlight the soft skills you have at all stages of the job search process, and continue developing those skills once you find the job you’re looking for.”

The current teaching-learning practices and the curriculum are not sufficiently geared toward improving the knowledge of soft skills in a holistic way. Pointing out the lacuna in the curriculum and advocating the need for integration of language skills with soft skills, Swarna Latha (2013) argues: “The current curriculum is so designed that only theory part of four language skills such as reading, writing, listening and speaking – is included. These skills should be learnt along with soft skills and then a change is needed in designing the curriculum so as to equip the learners to manage and excel at workplace.” It is to be noted in this context that the author of this article has coauthored a book, published in 2011, titled “Communication Skills and Soft Skills: An Integrated Approach” which integrates training in essential soft skills with all the four language skills – listening, speaking, reading and writing and all the four language components – pronunciation, vocabulary, grammar and spelling.

Engineering students with a sound knowledge of their core fields, the in-demand areas such as Internet of Things (IoT), Artificial Intelligence (AI), machine learning, data science and soft skills such as problem-solving skills, decision-making, skills, team working abilities, and working under pressure stand a good chance in the present job market situation.

### **ESSENTIAL SOFT SKILLS FOR ENGINEERING STUDENTS/GRADUATES**

Though each branch, by its inherent nature and by its explicit demands and the changing needs and expectations, necessitates the possession of certain soft skills, the following list of soft skills would serve as a useful checklist for students/graduates of all branches of engineering.

The knowledge and practice in these soft skills would enable engineering graduates to grab the best jobs in their respective fields.

#### **Communication skills**

Both oral and written communication skills are vital to present technical knowledge as well as to build relations with peers and higher-ups. Sherfield et al (2009) assert: “Oral and written communication are not only job-securing, but job-holding skills.”

#### **Creative thinking skills**

Innovation is the most in-demand ability for engineering students. New designs and products can be conceived by utilizing advanced cognitive and creative abilities. Looking at issues from fresh perspective and staying open-minded will enable the students to hone their creative abilities.

#### **Problem-solving skills**

Problem-solving ability is an essential competency for engineering professionals. Problem-solving involves identification of issues, generating solutions, and implementing right solutions. This skill requires elements of other skills such as creativity, critical thinking, effective communication, and decision making.

#### **Decision making skills**

Today’s young workforce is expected to be excellent decision makers. Decision making is an effective skill for successful execution of projects. Staying alert and critical; taking risks and managing risks are all essential elements in the decision making process. Leaders can enhance their credibility and productivity by taking and implementing effective decisions.

#### **Leadership skills**

Many jobs entail young engineering graduates to lead other people. They should learn to lead by example so that they can inspire others around them. Leadership skill is developed by taking on varied responsibilities and projects. A leader has to practice discipline at work in matters such as arriving on time, sticking to deadlines, keeping appointments, and commitment to project completion.

**Emotional intelligence**

Engineers focus on logic, technical aptitude, and problem-solving. However, emotional intelligence could augur well to build strong teams, manage conflicts, and practice social empathy.

**Multicultural skills**

Modern educational institutions and workplaces are characterized by diversity. Interpersonal and team working abilities alone will not meet the workplace needs. Engineering graduates should learn the essentials of cross cultural communication so that they function smoothly at their workplaces. Developing understanding of one's own culture, values, and belief systems and learning about and respecting that of the others is critical to developing multicultural competence.

**Team working skills**

Learning to work in teams is an important ability for engineering professionals. Effective communication, trust building and conflict management are integral to effective team work.

**Time management skills**

Time management abilities enable one to be more productive, especially when working with others. Learning to stay organized and focus on high priority tasks are crucial to getting more done in less time.

**Stress management skills**

Engineering courses demand greater workload from students as they need to master technical stuff, math and logic in order to excel in their courses. Course work, projects, and campus drives drive students to experience stress. The prospective workforce should learn to cope with deadlines and negative emotions to function efficiently at workplaces and in their daily life.

**BENEFITS OF SOFT SKILLS TRAINING FOR ENGINEERING STUDENTS**

- Increased self-awareness and self-motivation
- Clear and effective communication
- Enhanced innovative abilities
- Enhanced productivity at study and project work
- Improvement of overall engineering ability
- Efficient functioning with peers, teaching and administrative staff
- Increased employability skills and better absorption of the requisites of prospective jobs

**THE PROPOSED TRAINING FRAMEWORK**

This paper seeks to propose a training framework that incorporates the awareness and knowledge of core concepts of the engineering with that of the requisite knowledge of English and soft skills. It illustrates the ways in which the knowledge of hard skills of engineering branches could be deployed in the English and soft skills training programs.

**THE TRAINING PROCESS****Level 1: Identification of Hard skills and Soft skills**

**Objective:** To make lists of hard skills and soft skills for each branch of engineering

**Rationale:** Recognition and acknowledgement of areas for hard skills and soft skills will allow the students to activate their awareness, motivation and goal-orientation.

### Participation in Classroom Activities

The trainer divides the class into small groups and gets them to work as teams to identify the list of hard skills and soft skills that entail each branch of engineering. Once the teams are ready, one member from each team presents the lists of hard skills and soft skills they have identified. And then the whole class can be invited to add to the lists. This activity can be done either with students of one branch or with students of mixed branches. Further, the trainer can encourage the students to display the lists in attractive ways in the classroom or at other places.

Presented below is a list of hard skills and soft skills listed out by Erstad Will (2017) for computer programmers.

Top 10 programming and computer science technical skills:

- SQL
- JAVA
- JavaScript
- Microsoft C#
- Linux
- .NET Programming
- Oracle
- C++
- Python
- XML

Top soft skills for programmers:

- Communication skills
- Problem solving
- Teamwork/collaboration
- Research
- Creativity

Students of each branch should be encouraged to come up with a specific list of hard skills and soft skills for their own engineering branches and should be guided to understand why these are essential.

### Participation in Other Programs

At the time of admission, the Counseling Cell and Training & Placement Cell could brief the students about the hard skills and soft skills of the engineering branches. Respective departments can enhance students' knowledge of the same by conducting various programs such as seminars and guest lectures.

### Level 2: Incorporation of Hard Skills and Soft Skills into a Variety of Activities

**Objective:** To utilize various activities to enhance the knowledge of hard skills and soft skills for each branch of engineering

**Rationale:** Students' knowledge of the hard skills and soft skills of their branches can be strengthened by making them participate actively in a variety of activities. Their confidence levels and motivation for success can be increased only when they have a rich exposure through multiple means.

**Participation in Classroom Activities**

Students are made to work in a variety of classroom activities involving pair work, group work, presentations, discussions and debates. Activities involving role plays and language games are taken up to sustain participants' interest and motivation. Following are some interesting sample activities that can be implemented to enable students to develop not only language skills and soft skills but also the knowledge of core engineering concepts and new-age areas such as Internet of Things (IoT), Artificial Intelligence (AI), machine learning, and data science and their industrial application.

**Celebrity Hot Seating**

Students are made to work in teams and prepare a celebrity such as a CEO of a reputed company or organization. A chair is set up at the front of the class and the chosen celebrity interacts with the rest of the class. Students can be made to act as comperes/anchors developing the skills such as welcoming the audience, inviting the guests, prosing vote of thanks through this activity.

**STAR or EXPERT Talk**

Students are made to work in teams and choose some essential soft skills and hard skills related to the engineering streams, gather interesting ideas related to the topic, concept or innovation and prepare a Star or Expert on the topic who will present their ideas. Other teams listen to, contradict and/or add the ideas through discussions and debates.

**JAM sessions**

Give students a relevant topic and get them to speak for a minute setting parameters such as speaking without hesitation, repetition, deviation, and errors, speaking slowly, audibly and clearly, speaking with right tone, speed and pitch or speaking with appropriate gestures, facial expressions, eye contact. This activity can be used to check students' spontaneity and GK, in-depth knowledge of the topic, time management ability, inventiveness, ability to organize thought flow, influencing and convincing abilities, grace and poise, and verbal and nonverbal communication.

**Participation in Other Programs**

Students should be encouraged to participate in seminars, workshops, and campus drives conducted by the Department and Training and Placement (T & P) Division.

**Level 3: Exploration of Opportunities/Future Scenario**

**Rationale:** Collection and analysis of information related to market demands, leading recruiters in the public and private sectors, job opportunities, current and future demand will equip the students to prepare themselves with clear goals and challenges.

**Participation in Classroom Activities**

Students are allowed to work in teams and are asked to collect and analyze information related to their preferred branches/courses of engineering. They are asked to work on typical jobs and the nature of work. They can also identify leading recruiters for their branch, expectations/demands of the industry, and current and future job prospects. They should also explore opportunities for research and for designing and initiating entrepreneurships/start-ups.

**Participation in Other Programs**

Students should be made to participate in programs promoting industry – institute interaction, workshops, training programs conducted by the department and campus recruitment training and campus drives organized by the T & P Division of the college.

**Level 4: Assessment of Hard skills and Soft skills**

**Objective:** To assess students' knowledge of hard skills and soft skills

**Rationale:** Assessment plays a pivotal role in various aspects such as to check how much students have learned, to motivate the students to learn further, to enable facilitators to take appropriate measures to adopt right teaching strategies and instructional materials.

**Participation in Classroom Activities**

Assessment can be on-going as well as terminal. Facilitators can take recourse to a host of assessment tools and strategies such as assignments, projects, presentations, discussions, role-plays and mock interviews (focus on evidence of hard skills and soft skills during the interview process), resume preparation (focus on evidence of hard skills and soft skills in description of academic and work/project experiences). Self-evaluation, peer-evaluation, and teacher evaluation are other methods of evaluation.

**Participation in Other Programs**

Students' knowledge can also be assessed by making them complete surveys and taking online and offline tests conducted by the department and T & P Division in collaboration with test developers, companies and industrial establishments.

**NEEDED TEACHING METHODOLOGIES, METHODS AND STRATEGIES****Communicative Approach**

Individual presentations, pair work, group work/teamwork, discussions and debates around core concepts of the engineering branches, in-demand areas and soft skills are organized

**Dialogic Teaching**

Participatory approach, collaborative process, conversations, informal discussions, and critical enquiry are encouraged.

**Flipped Classes**

Presentation of topics/material before the class and the clarification and application of knowledge via discussions/activities during the class are implemented.

**Team Teaching**

The framework envisages that English and soft skills trainers and teachers of engineering branches can act together as facilitators in executing the training program. For instance, an interesting article related to designing an efficient robot can be taken up for the class work. Both the soft skills trainer and the subject expert can together decide how best to exploit the article for developing requisite skills.

**Smartphone with Internet Capability**

The use of smartphone in the classroom can enrich student's educational experience. A smartphone with internet capability can be a handy device for a variety of purposes. They can collect facts and information for various topics and activities. They can look for the word origin, synonyms, antonyms, and usage notes for words they need quick help with. Students can record their ideas in the form of voice notes and use them anytime.

**IMPLICATIONS OF THE PROPOSED TRAINING FRAMEWORK**

The proposed training framework has multiple implications. Classroom teaching should be learner-centered, interactive and collaborative so that learning becomes more meaningful and interesting. Instructional material should be designed so as to accommodate the knowledge of engineering core fields, in-demand areas and the language skills and soft skills. Further, facilitators should make use of authentic materials and learner-contributed materials. The

proposed framework also demands certain administrative measures which allow for activities promoting interaction among students of various branches, team teaching, and technology integration. In addition, infrastructural facilities such as movable seating, projectors for power point presentations, and photocopying facilities are warranted.

## CONCLUSION

The unique feature of the proposed training framework is the incorporation of the awareness and knowledge of core concepts of the engineering branches with that of the requisite knowledge of English and soft skills. This approach is flexible enough to accommodate changing job market situation. The deployment of the knowledge of hard skills of engineering branches in the teaching/learning of English and soft skills is a novel and refreshing idea aimed at producing engineering graduates who are ready to plunge into the corporate world with requisite skills.

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