



A Study of Selective English Language Lab Activities towards Honing Soft Skills by Using Analytical Hierarchy Method

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ABSTRACT: The Fourth Industrial Revolution is characterized by the seamless integration of digital technologies into industrial operations and systems. The twenty-first century is a witness to unparalleled advancements in data generation and connectivity, sophisticated analytics, and increasingly seamless human-machine interaction. The professional arena has significantly been reshaped as there is acceleration in adopting new technologies, driven by the need to remain relevant in the current competitive global market. For an engineering graduate, the digital shift in the industry has heightened the need to be equipped with the technological competency since they are required not only to understand traditional engineering principles but also to possess the aptitude to work with emerging technologies which in turn enables them to innovate, solve complex problems with ease and collaborate effectively in digitally integrated platforms. However, the employability and sustenance in the industry, fighting all odds are not guaranteed only by acquiring the hard skills. Technical competence once complemented by the essential soft skills can ensure holistic professional growth for an engineering graduate resulting into enhanced work efficiency and sustained relevance. The English language labs in engineering colleges across India can cater to these needs by effective designing of various lab activities such as debates, group discussions, role plays, power point presentations just to name a few. In this study the authors adopted the Analytical Hierarchy Process (AHP) as a decision-making tool to assess the impact of different lab activities and identify the most in-demand soft skill in the current professional landscape.

Key Words: Analytic hierarchy process, fuzzy AHP method, fuzzy TOPSIS method, soft skills, fourth industrial revolution, holistic development.

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1. Introduction

Organizations and thought leaders such as the World Economic Forum (WEF), UNESCO, and various industry analysts frequently define and forecast emerging industry needs, particularly in terms of workforce skills required in the context of Industry 4.0 (World Economic Forum, 2020; UNESCO, 2022). The World Economic Forum’s (2020) “Future of Jobs” report identifies the key emerging professional domains such as data analysts, AI specialists, and digital transformation experts etc. Thus, the technological transformation in engineering demands that graduates not only possess traditional technical expertise but also demonstrate digital fluency, adaptability to technological change, and proficiency in data-informed decision-making (Kamble et.al., 2018). It is worthy to be mentioned that the report along with the technological competence also underscores the crucial role of an array of soft skills. Thriving in

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technologically intensive environments requires more than just technical expertise; it also demands soft skills such as interpersonal communication, teamwork, leadership quality, flexibility, and conflict resolution—crucial for navigating collaborative, interdisciplinary, and digitally driven workplaces (Fuentes et. al., 2021). Since the need is identified, the next question is how to impart these essential soft skills. In this context, English Language labs play a vital role in the context of higher education and industry readiness. These labs offer a structured environment with its well-defined syllabus which incorporate equipped audio-visual tools, software, and various interactive modules that not only pave imbibing the soft skills but also facilitate real-time feedback. The skills are learnt by doing and experiencing and in the presence of the expert lecturers the students learn to overcome their stage fear too. The inclusion of interactive software and audio-visual content fosters active learning and helps bridge the gap between theoretical knowledge and practical application. Their study highlights that students who regularly participated in lab sessions showed improved teamwork and leadership skills—key components of soft skills (Patil and Bhavsa, 2019). It is observed that language labs are crucial in developing non-verbal aspects of communication, such as body language, tone modulation, and professional etiquette, through visual feedback and peer review systems. This holistic approach to language and soft skill training places the activities in the English Language Labs as an essential pedagogical tool in preparing students for Industry 4.0 demands (Mishra, 2020). This research paper aims at analysing the dominant soft skills needed by students pursuing professional courses that render them an extra edge compared to those who do not make an effort to embrace the soft skills. The authors chose AHP and Fuzzy-AHP as the decisive tool to determine the most effective soft skills that would enable the young students to sail the career graph smoothly and with confidence. Moreover, Malik and Malik (2022) emphasized that soft skills cannot be effectively integrated into curricula without a clear understanding of which skills are most valued by employers. Their study underlined the value of expert-based comparison methods—such as AHP and Fuzzy AHP—in bridging the gap between industry expectations and academic training. In doing so, the specific criteria and alternatives were established, and through mathematical application, a ranking of the soft skills was generated. The primary objective of the study was to bring forth valuable insights that would positively impact the curriculum design and promote judicious use of the pedagogical tools in the language lab scenario.

2. Preliminaries

Our current study has taken into account the following four Criteria: Group Discussion (C_1); Debate(C_2); Role-play(C_3); Group presentation with Power Point(C_4).

Group Discussion(C_1): A group discussion is an organised type of dialogue in which a number of people discuss a certain case, topic, or situation in order to exchange ideas, assess them, and come to a consensus. It is frequently used to evaluate interpersonal and communication abilities in academic, professional, and hiring contexts.

A crucial part of evaluating soft skills including leadership, teamwork, communication, critical thinking, and emotional intelligence is group discussions (GD). Professional training programs, business hiring, and university admissions make extensive use of it as one of the selection criteria. A group discussion can be based on factual topics, abstract topics and controversial topics. Case-studies and group tasks can also be considered under group discussion.

Debate(C_2): A debate is a planned conversation in which two or more people or groups offer divergent opinions on a certain subject. The objective is to persuade the judges or audience using reasoned arguments, supporting data, and persuasive speech. Learners have to express themselves with logical arguments rather than relying on mere assumptions.

Role-play(C_3): People use role-playing as a soft skills training and communication approach to practise real-life scenarios by acting out certain roles in a simulated environment. It is frequently used to foster interpersonal, emotional, and problem-solving skills in business training, education, counselling, and hiring. A role-playing exercise mimics a real-life situation where the participant is required to put

himself or herself into the shoes of the assigned character.

Group presentation with PowerPoint(C_4): Using PowerPoint slides as a visual aid, a group of people collaborate to conduct research, plan, and make a presentation on a particular subject. This is known as a group presentation with PowerPoint. It is frequently used to evaluate both content knowledge and soft skills in educational, training, and professional contexts. Power Point-based group presentation emphasises practical learning and workplace competency assessment.

In our current analysis, we have taken into consideration the following five alternatives. Critical Thinking(A_1); Persuasion(A_2); Adaptability(A_3); Emotional intelligence(A_4); Team spirit(A_5).

Critical Thinking(A_1): The capacity for objective information analysis, perspective evaluation, and reasoned, logical decision-making is known as critical thinking. Instead of depending solely on instinct or feeling, it entails challenging presumptions, recognising biases, and approaching challenges methodically.

Critical Thinking as a soft skill is crucial in a real-world professional scenario. Critical thinking demands analysing data, reaching logical conclusions, and resolve challenging issues.

Persuasion(A_2): The soft skill of persuasion involves using credibility, reason, emotion, and clear communication to change the opinions, choices, or behaviours of others. It entails making ideas appealing to others so they will willingly embrace or support them.

To pursue one has to employ judgements via reasoning, feeling, trustworthiness, and compassion.

Adaptability(A_3): The capacity to swiftly and successfully adapt to novel situations, surroundings, or obstacles is known as adaptability. It is a crucial soft talent that enables people to stay adaptable, receptive, and effective in the face of change, uncertainty, or unforeseen challenges.

Adaptability is a soft skill that demonstrates how experts cope with unforeseen obstacles at work. An adaptive person proves to be highly productive in the face of odds.

Emotional intelligence(A_4): The capacity to successfully identify, comprehend, control, and utilise emotions in both oneself and others is known as emotional intelligence. It has a significant impact on our interactions, relationships, stress management, and decision-making.

Emotional Intelligence (EI) encompasses social skills, self-regulation, empathy, and self-awareness that are instrumental in managing relationships at work, particularly when there is disagreement.

Team spirit(A_5): The feeling of solidarity, collaboration, and support among team members is known as team spirit. It displays a constructive outlook on teamwork, where everyone participates, supports one another, and works assiduously and respectfully towards a common objective.

Team spirit is a soft skill that demonstrates how cooperation and solidarity support group achievement in a work setting. Team spirit encompasses cooperating with respect for one another, having common objectives, and being prepared to help one another.

3. Literature Review

3.1. Attributes to the Fourth Industrial Revolution (4IR):

The Fourth Industrial Revolution is also known as Industry 4.0. It refers to the smart and digital integration of people, machines, and physical objects using advanced technologies such as augmented reality, big

data analytics, cloud computing, autonomous robots, the Internet of Things (IoT), and cyber-physical systems. It also encompasses both horizontal and vertical system integration, along with high-performance computing, to enhance business operations and drive value creation across networks (Dombrowski, Wullbrandt, and Fochler, 2019b). The integration of all these tools is to make industry operations faster, smarter, more efficient, and to add more value for customers and organizations.

The Second Industrial Revolution which began in the late 19th and early 20th centuries was characterized by the widespread adoption of electrical energy, mass production, and assembly lines. This era introduced systematic manufacturing through innovations such as the internal combustion engine, telegraph, and mechanized assembly processes, which significantly enhanced production efficiency and scalability. Labor during this period was manual and task-specific, with rigid hierarchical organizational structures (Mokyr, 1990).

On the contrary, the Fourth Industrial Revolution stresses upon digital transformation of industry through the integration of cyber-physical systems, Internet of Things (IoT), artificial intelligence (AI), and big data analytics (Schwab, 2017). According to Liao et al. (2017), Industry 4.0 is a phase of intelligent automation, real-time decision-making and decentralized production systems. It has rendered a fundamental shift to the role of human workers from routine tasks to more of cognitive functions.

While the Fourth Industrial Revolution brings numerous benefits, it also presents certain challenges and negative implications, much like the two sides of a coin. Several researchers have reflected upon the negative impacts of it in terms of workforce displacement, cyber security, and socioeconomic inequalities. Another issue that looms large is that not all workers are equipped with the emerging skills and competencies needed for the future, such as digital communication, content creation, and problem-solving in digital environments (Durisova, Kucharcikova, and Tokarcikova, 2015). Technological advancements are evolving more rapidly than educational institutions can cope with, thus leaving a gap in necessary training and curriculum design and implementation.

3.2. Soft Skills and Professional domain:

Soft skills which are also known as people skills or non-technical skills encompass an array of skills such as communication, interpersonal skills, team work, critical thinking, decision making and the list goes on. Heckman and Kautz (2012) present a psychological perspective, describing soft skills as “personality traits, goals, motivations, and preferences” which are not directly measurable but significantly impact life and work outcomes. They argue that soft skills like perseverance, conscientiousness, and emotional regulation are as important as IQ in determining job performance and career progression. Wats and Wats (2009) point out that soft skills are more difficult to quantify than hard skills, as they are contextually influenced and behaviorally expressed. They highlight that soft skills often develop through experiential learning, reflection, and social interaction, rather than formal instruction.

Soft skills have received widespread attention in academic and professional discourse, yet there is no denying of the fact a majority of the professional institutes continue to place disproportionate emphasis on domain-specific knowledge, often undermining the development of soft skills. This gap has been widely observed and remains a critical challenge in higher education systems globally. Robles (2012), in a study surveying executives, found that soft skills such as integrity, communication, adaptability, and work ethic were rated more critical to professional success than technical expertise. However, such competencies are rarely included in professional college curricula in a structured or assessed manner.

In the Indian context, Kumar and Pansari (2015) observe that while national policy frameworks have begun emphasizing employability, implementation at the college level remains poor. Most engineering colleges, for example, offer communication or personality development courses, but these are frequently non-credit and lack rigorous evaluation.

This misalignment impacts students' employability and growth and thus it is an imperative to narrow down this gap which in turn demands a systemic shift in curriculum design, faculty training, and institutional priorities. One has to recognize that soft skills lay the foundation, they are not supplementary, rather complementary.

4. Methodology

In this study, we have employed two techniques: the fuzzy AHP method and the fuzzy TOPSIS method. The following table incorporates a triangular fuzzy scale.

Table 1: Triangular Fuzzy Scale incorporated in the current study

Crisp No	Triangular Fuzzy Number	Definition
1	(1,1,1)	Equal importance
3	(1,3,5)	Little more significant than the other
5	(3,5,7)	Important or very important
7	(5,7,9)	Very strong importance
9	(7,9,11)	Extremely important
2,4,6,8	(1,2,4),(2,4,6),(4,6,8), (6,8,10)	Intermediate values

4.1. Fuzzy AHP Method:

Step-1: To the pairwise comparison of all criteria, each decision maker assigns a linguistic phrase, represented by a triangular FN. Let $\tilde{P} = \tilde{a}_{ij}$ be a $n \times n$ matrix, where $\tilde{a}_{ij}$ is the importance of criterion C_i with respect to criterion C_j ,

$$\tilde{P} = \begin{pmatrix} (1, 1, 1) & \tilde{a}_{12} & \dots & \tilde{a}_{1n} \\ \tilde{a}_{12} & (1, 1, 1) & \dots & \tilde{a}_{2n} \\ \dots & \dots & \dots & \dots \\ \tilde{a}_{n1} & \tilde{a}_{n2} & \dots & (1, 1, 1) \end{pmatrix}$$

Step 2: Calculate the normalized fuzzy weights. To determine the fuzzy weight of criterion C_i , use the indicated formula.

$$\tilde{w}_i = \tilde{r}_i \times (\tilde{r}_1 + \tilde{r}_2 + \dots + \tilde{r}_n)^{-1}, \text{ where } \tilde{r}_i = (\tilde{a}_{i1} \times \tilde{a}_{i2} \times \dots \times \tilde{a}_{in})^{1/n}$$

4.2. Fuzzy TOPSIS Method:

If $\tilde{X} = (a_1, b_1, c_1)$, $\tilde{Y} = (a_2, b_2, c_2)$ are two triangular Fuzzy Numbers then

$$d(\tilde{x}, \tilde{y}) = \sqrt{\frac{1}{3}[(a_1 - a_2)^2 + (b_1 - b_2)^2 + (c_1 - c_2)^2]}$$

Step 1: Give the alternatives and the criteria ratings. Consider a decision-making group with K members. With regard to criterion C_j , the k_{th} decision maker's fuzzy rating for alternative A_i is shown by $\tilde{x}_{ij}^k = (\tilde{a}_{ij}^k, \tilde{b}_{ij}^k, \tilde{c}_{ij}^k)$ and the weight of criterion C_j is indicated by $\tilde{w}_j^k = (\tilde{w}_{j1}^k, \tilde{w}_{j2}^k, \tilde{w}_{j3}^k)$

Step 2: Calculate the aggregated fuzzy weights and aggregated fuzzy ratings for criteria and alternatives. The aggregated fuzzy rating $\tilde{x}_{ij} = (\tilde{a}_{ij}, \tilde{b}_{ij}, \tilde{c}_{ij})$ of i_{th} alternative with respect to j_{th} criterion is calculated as given below.

$$a_{ij} = \min_k \{\tilde{a}_{ij}^k\}, \quad b_{ij} = \frac{1}{k} \sum_{k=1}^k \tilde{b}_{ij}^k, \quad c_{ij} = \max_k \{\tilde{c}_{ij}^k\}$$

The aggregated fuzzy weight $\tilde{w}_j = (w_{j1}, w_{j2}, w_{j3})$ for C_j can be obtained as given below:

$$w_{j1} = \min_k \{\tilde{w}_{j1}^k\}, \quad w_{j2} = \frac{1}{k} \sum_{k=1}^k \tilde{w}_{j2}^k, \quad w_{j3} = \max_k \{\tilde{w}_{j3}^k\}$$

Step 3: The normalized fuzzy decision matrix should be computed. The normalized fuzzy decision matrix is $\tilde{R} = [\tilde{r}_{ij}]$ where

$$\tilde{r}_{ij} = \left(\frac{a_{ij}}{c_j^*}, \frac{b_{ij}}{c_j^*}, \frac{c_{ij}}{c_j^*} \right) \text{ and } c_j^* = \max_i \{c_{ij}\} \text{ (Benefit criteria)}$$

$$\tilde{r}_{ij} = \left(\frac{a_j^-}{c_{ij}^-}, \frac{a_j^-}{b_{ij}^-}, \frac{a_j^-}{a_{ij}^-} \right) \text{ and } c_j^- = \min_i \{a_{ij}\} \text{ (Cost criteria)}$$

Step 4: Create a weighted normalized fuzzy decision matrix. The weighted normalized fuzzy decision matrix is $\tilde{V} = v_{ij}$, where $\tilde{v}_{ij} = \tilde{r}_{ij} \times w_j$

Step 5: Calculate the Fuzzy Positive Ideal Solution (FPIS) and Fuzzy Negative Ideal Solution (FNIS) as explained below:

$$A^* = (\tilde{v}_1^*, \tilde{v}_2^*, \dots, \tilde{v}_n^*), \text{ where } v_j^* = \max_i \{v_{ij3}\}; \quad A^- = (\tilde{v}_1^-, \tilde{v}_2^-, \dots, \tilde{v}_n^-), \text{ where } v_j^- = \min_i \{v_{ij1}\}$$

Step 6: Calculate the distance from each alternative to the FPIS and to the FNIS. Let $d_i^* = \sum_{j=1}^n d(\tilde{v}_{ij}, \tilde{v}_j^*)$, $d_i^- = \sum_{j=1}^n d(\tilde{v}_{ij}, \tilde{v}_j^-)$ be the distance from each alternative to the FPIS and to the FNIS, respectively. Compute the closeness coefficient CC_i for each alternative. For each alternative A_i we calculate the closeness coefficient CC_i as follows:

$$CC_i = \frac{d_i^-}{d_i^- + d_i^*}$$

Step 7: Sort the options in order. The best alternative is the one with the highest proximity coefficient.

Table 2 to Table 5 shows the normalised weight vectors that have been computed between the alternatives according to each criterion and Table 6 to Table 10 show the normalised weight vectors that have been computed between the criteria.

Table 2: Normalized weight vector with respect to Criteria 1

Group Discussion	A ₁	A ₂	A ₃	A ₄	A ₅	Normalized weight vector
A ₁	(1,1,1)	(1,3,5)	(1/5,1/3,1)	(1/7,1/5,1/3)	(1/8,1/6,1/4)	(0.03,0.07,0.17)
A ₂	(1/5,1/3,1)	(1,1,1)	(2,4,6)	(1/6,1/4,1/2)	(1/7,1/5,1/3)	(0.04,0.08,0.2)
A ₃	(1,3,5)	(1/6,1/4,1/2)	(1,1,1)	(1/7,1/5,1/3)	(1/8,1/6,1/4)	(0.03,0.07,0.15)
A ₄	(3,5,7)	(2,4,6)	(3,5,7)	(1,1,1)	(1/7,1/5,1/3)	(0.12,0.25,0.51)
A ₅	(4,6,8)	(3,5,7)	(4,6,8)	(3,5,7)	(1,1,1)	(0.27,0.54,0.16)

Table 3: Normalized weight vector with respect to Criteria 2

Debate	A ₁	A ₂	A ₃	A ₄	A ₅	Normalized weight vector
A ₁	(1,1,1)	(1/5,1/3,1)	(2,4,6)	(1/5,1/3,1)	(1/6,1/4,1/2)	(0.05,0.12,0.37)
A ₂	(1,3,5)	(1,1,1)	(3,5,7)	(1/6,1/4,1/2)	(1,3,5)	(0.1,0.29,0.73)
A ₃	(1/6,1/4,1/2)	(1/7,1/5,1/3)	(1,1,1)	(1/7,1/5,1/3)	(2,4,6)	(0.04,0.09,0.24)
A ₄	(1,3,5)	(2,4,6)	(3,5,7)	(1,1,1)	(1/7,1/5,1/3)	(0.11,0.3,0.7)
A ₅	(2,4,6)	(1/5,1/3,1)	(1/6,1/4,1/2)	(3,5,7)	(1,1,1)	(0.08,0.2,0.09)

Table 4: Normalized weight vector with respect to Criteria 3

Role Play	A ₁	A ₂	A ₃	A ₄	A ₅	Normalized weight vector
A ₁	(1,1,1)	(1/5,1/3,1)	(2,4,6)	(1/7,1/5,1/3)	(1/6,1/4,1/2)	(0.04,0.09,0.27)
A ₂	(1,3,5)	(1,1,1)	(1,3,5)	(1/7,1/5,1/3)	(1/4,1/2,1)	(0.05,0.15,0.41)
A ₃	(1/6,1/4,1/2)	(1/5,1/3,1)	(1,1,1)	(1/6,1/4,1/2)	(1/5,1/3,1)	(0.03,0.06,0.2)
A ₄	(3,5,7)	(3,5,7)	(2,4,6)	(1,1,1)	(1/6,1/4,1/2)	(0.13,0.3,0.73)
A ₅	(2,4,6)	(1,2,4)	(1,3,5)	(2,4,6)	(1,1,1)	(0.14,0.39,1)

Table 5: Normalized weight vector with respect to Criteria 4

Group Presentation	A ₁	A ₂	A ₃	A ₄	A ₅	Normalized weight vector
A ₁	(1,1,1)	(1/5,1/3,1)	(3,5,7)	(1/6,1/4,1/2)	(1/7,1/5,1/3)	(0.05,0.11,0.28)
A ₂	(1,3,5)	(1,1,1)	(1/5,1/3,1)	(2,4,6)	(3,5,7)	(0.12,0.32,0.8)
A ₃	(1/7,1/5,1/3)	(1,3,5)	(1,1,1)	(3,5,7)	(1/6,1/4,1/2)	(0.07,0.17,0.39)
A ₄	(2,4,6)	(1/6,1/4,1/2)	(1/7,1/5,1/3)	(1,1,1)	(1/7,1/5,1/3)	(0.04,0.09,0.2)
A ₅	(3,5,7)	(1/7,1/5,1/3)	(2,4,6)	(3,5,7)	(1,1,1)	(0.14,0.32,0.69)

Table 6: Normalized weight vector for each Criteria

	C ₁	C ₂	C ₃	C ₄	Normalized weight vector
C ₁	(1,1,1)	(2,4,6)	(3,5,7)	(2,4,6)	(0.25,0.48,0.85)
C ₂	(1/6,1/4,1/2)	(1,1,1)	(3,5,7)	(1/6,1/4,1/2)	(0.09,0.16,0.31)
C ₃	(1/7,1/5,1/3)	(1/7,1/5,1/3)	(1,1,1)	(1/7,1/5,1/3)	(0.05,0.08,0.15)
C ₄	(1/6,1/4,1/2)	(2,4,6)	(3,5,7)	(1,1,1)	(0.15,0.28,0.52)

Table 7: Weighted Normalized matrix by Fuzzy TOPSIS method

	C ₁	C ₂	C ₃	C ₄
A ₁	(0.02,0.07,0.28)	(0.01,0.03,0.16)	(0, 0.01,0.04)	(0.01,0.04,0.18)
A ₂	(0.02,0.08,0.34)	(0.01,0.06,0.31)	(0,0.01,0.06)	(0.02,0.11,0.52)
A ₃	(0.02,0.06,0.25)	(0.01,0.02,0.1)	(0,0,0.03)	(0.01,0.06,0.25)
A ₄	(0.06,0.24,0.43)	(0.01,0.07,0.22)	(0.01,0.02,0.11)	(0.01,0.03,0.11)
A ₅	(0.13,0.51,0.27)	(0.01,0.04,0.04)	(0.01,0.03,0.15)	(0.03,0.11,0.44)

Table 8: Distance from Fuzzy Positive Ideal Solution

	C ₁	C ₂	C ₃	C ₄	d*
A ₁	0.28	0.09	0.06	0.20	0.63
A ₂	0.27	0.00	0.05	0.00	0.32
A ₃	0.29	0.12	0.07	0.16	0.64
A ₄	0.16	0.05	0.02	0.24	0.48
A ₅	0.09	0.16	0.00	0.04	0.29

Table 9: Distance from Fuzzy Negative Ideal Solution

	C_1	C_2	C_3	C_4	d^-
A_1	0.02	0.07	0.01	0.04	0.14
A_1	0.05	0.16	0.02	0.24	0.47
A_1	0	0.04	0	0.08	0.12
A_1	0.15	0.11	0.05	0	0.30
A_1	0.27	0.01	0.07	0.2	0.55

Table 10: Ranking of alternatives

Alternatives	CCi values	Ranking
A_1	0.18	4
A_2	0.59	2
A_3	0.16	5
A_4	0.39	3
A_5	0.65	1

5. Conclusion

By comparing the weights acquired using the fuzzy TOPSIS and fuzzy AHP approaches, rankings have been established. The research clearly shows that Team spirit is the most valued soft skill and thus finds its place in the first position with respect to the CCi score of 0.65. Persuasion, Emotional intelligence, Critical thinking and Adaptability are placed in second, third, fourth and fifth position respectively. The research has tried to establish the point that team synergy and collaboration within our space not only lead to increased motivation and productivity, but also pave collective commitment which is essential for attainment of a common goal. The interactive group activities in the English language lab prove to be powerful tools to encourage strong interpersonal communication, problem solving mentality and a sense of belonging within a work environment which are integral to development of team spirit.

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