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Today's Challenges in Business Communication and Ethics for Engineers

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Objective - Business communication and ethics made their way into the engineering syllabus primarily due to industry demands for well-rounded graduates and the critical need to ensure public safety and ethical conduct in professional practice. Accreditation bodies like ABET (Accreditation Board for Engineering and Technology) now require engineering programs to include these elements, recognizing that technical skills alone are insufficient for modern engineering challenges. But is this skill set a mandatory requirement for the Engineering students? If yes, why? These are some of the questions that shall be touched upon in this paper to undermine the Cognitive and Metacognitive insights of the inclusion of these non-technical requirements in the Engineering learning process.

RATIONALE AND DRIVERS BEHIND THE REQUIREMENTS

The Rationale and Drivers behind this requirement can be accounted to the industry needs, Public Safety and professional responsibility, Accreditation Requirements, Complex Work Environments and career progression in a professional workplace. When this course was not formally included in the 4-year degree course of engineering, Employers consistently reported a gap between the technical knowledge of graduates and the "soft skills" required in the workplace. Companies found that new hires, while technically proficient, struggled with teamwork, presenting ideas, and general professional conduct. Historical engineering failures and scandals (e.g., the Challenger explosion) highlighted the severe consequences of unethical decisions and communication breakdowns. This led to a greater emphasis on professional responsibility and the integration of ethics into the curriculum to ensure engineers prioritize public welfare, safety, and environmental impact. In response to these needs, engineering education accrediting bodies revised their criteria. For example, in the U.S., significance of teaching engineering ethics and the societal context of engineering in its accreditation standards, effectively mandating its inclusion in university curricula. Modern engineering projects are often multidisciplinary, involving diverse teams, clients, and stakeholders, sometimes globally. Effective communication is crucial to bridge the gap between technical and non-technical personnel, resolve conflicts, and ensure project success. While technical skills can secure an entry-level job, soft skills like communication, leadership, and ethical decision-making are essential for career advancement into management and leadership roles.

TODAY'S CHALLENGES

Today's ethical challenges posed by a new entry with the advent of new technologies, which has enhanced the need for transparency and integrity in a data-driven world, and effective communication strategies for diverse and remote teams. The trending topics in Ethics for Engineering Students have more to do with Ethical AI and Data Privacy, Environmental, Social, and Governance (ESG) Criteria, Safety vs. Cost Conflicts, Whistleblowing and Professional Hierarchies, Intellectual Property Rights (IPR) and finally - Autonomous Technology and Weaponization.

A paramount concern involves the ethical considerations in the development and application of AI and machine learning, particularly regarding data collection and usage, algorithmic bias, and transparency in Artificial Intelligence (AI)-driven decision-making. Engineers are increasingly expected to incorporate sustainable practices and solutions that minimize environmental harm and address social equity, balancing these concerns with project costs and profitability. A classic but ongoing issue is the dilemma of prioritizing public safety and product quality when faced with pressure to reduce costs or meet tight deadlines. Engineers have an ethical and legal duty to safeguard public welfare. Engineering students need to understand how to handle situations where they discover unethical or unsafe practices within their firm. This includes the challenge of reporting misconduct, especially when it involves superiors, without fear of retaliation. Navigating the complexities of patents, copyrights, and trade secrets in a globalized, tech-driven environment is crucial for engineers who are essentially creators of intellectual property. The ethical implications of

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developing technologies like self-driving cars, delivery drones, and robotic weapons, and the question of where responsibility lies when these systems fail.

Similarly, in case of Business Communication for Engineering Students, today's trending topics revolve around Communication in Hybrid and Remote Work, Human-Centricity and Authenticity, Data Security and Compliance, Intercultural and Inclusive Communication, Crisis Communication and Reputation Management, and AI-Powered Communication Tools. The shift to hybrid work models from the Pandemic days of Covid has made effective virtual communication skills even more essential. Topics include using unified collaboration platforms, managing "Zoom fatigue," and ensuring clear, asynchronous communication across different time zones. There is a growing emphasis on communication that is empathetic, authentic, and "human-centric," rather than impersonal or overly automated. This helps build trust with both employees and customers. With increasing cyber threats and stringent data privacy regulations (like GDPR), engineers and businesses must communicate securely and transparently about data handling practices to build customer trust and avoid legal penalties. Engineers often work in globally distributed, diverse teams. Understanding cultural nuances, using inclusive language, and leveraging tools that offer real-time translation are vital for effective collaboration. The ability to communicate effectively and transparently during a crisis (e.g., product defects, data breaches, environmental incidents) is critical for managing a company's reputation and maintaining public trust. Integrating AI for tasks like real-time translation, sentiment analysis, and automating routine inquiries is a key trend, but requires careful management to avoid biases and maintain a necessary "human touch".

LITERATURE REVIEW

The growing inclusion of business communication and ethics in engineering curricula reflects a broader shift in how engineering competence is conceptualised in contemporary education. Traditional engineering programmes historically prioritised technical mastery, procedural efficiency, and problem-solving accuracy, often treating communication and ethical judgement as peripheral or implicit outcomes of technical training. However, as engineering practice increasingly operates within complex socio-technical systems, scholars argue that technical expertise alone is insufficient for addressing real-world challenges involving public safety, organisational accountability, and societal impact.

A significant catalyst for this curricular shift has been the intervention of accreditation bodies such as the Accreditation Board for Engineering and Technology (ABET), which formally articulated professional skills—including communication, ethics, teamwork, and lifelong learning—as essential programme outcomes. Shuman, Besterfield-Sacre, and McGourty critically examine this development, arguing that ABET's professional skills represent a fundamental redefinition of engineering competence rather than an administrative add-on. Their work challenges the misconception that communication and ethics are "soft skills," instead positioning them as cognitively demanding practices that require explicit teaching and assessment (Shuman et al. 41–55). According to the authors, these competencies involve higher-order cognitive processes such as analysis, judgement, and contextual evaluation, all of which are central to professional engineering decision-making.

Importantly, Shuman et al. emphasize that accreditation requirements alone do not guarantee meaningful learning. When professional skills are included merely to satisfy external criteria, they risk being reduced to symbolic curriculum components with limited pedagogical impact. The authors argue that communication and ethical reasoning must be embedded within instructional design through reflective writing, case-based learning, and performance-oriented assessments. This perspective foregrounds the metacognitive dimension of professional skills, as students must actively monitor their understanding, evaluate situational constraints, and regulate their responses in complex professional contexts.

Expanding this discussion, Martin, Conlon, and Bowe provide a multi-level analysis of engineering ethics education, examining its development across individual, institutional, and policy domains. Their review highlights how ethics education has frequently been confined to isolated modules or compliance-driven checklists, which undermines students' ability to apply ethical reasoning in authentic engineering situations (Martin et al.). The authors argue that ethical judgement in engineering is not merely a matter of knowing codes of conduct but involves integrating technical knowledge with social values, stakeholder interests, and long-term consequences.

From a cognitive standpoint, ethical decision-making requires engineers to engage in evaluative reasoning, perspective-taking, and anticipatory thinking—processes that are inherently metacognitive. Martin et al. advocate a shift from microethical approaches, focused narrowly on individual behaviour, to a socio-technical orientation that situates ethics within systems, organizations, and societal structures. This framework underscores the necessity of ethics education not only for regulatory compliance or public safety but also for cultivating reflective professional identities. When ethics is framed as an integral component of engineering thinking,

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students are more likely to internalise ethical responsibility as part of their professional self-concept rather than viewing it as an external obligation.

The role of metacognition in engineering education is further elucidated by Marra, Hacker, and Plumb, whose research demonstrates that self-directed learning is strongly linked to students' metacognitive awareness. Their study shows that students who are taught to plan, monitor, and evaluate their learning strategies are better equipped to handle ill-structured problems characteristic of real-world engineering practice (Marra et al. 137–161). These findings have direct implications for the teaching of business communication and ethics, as both domains require adaptability, contextual judgement, and reflective thinking.

Marra et al. argue that professional competencies such as communication and ethical reasoning do not automatically emerge from technical training. Instead, they must be cultivated through deliberate pedagogical interventions that prompt students to reflect on their reasoning processes. For example, deciding how to communicate technical risks to non-specialist stakeholders or evaluating the ethical implications of a design choice involves awareness of one's assumptions and limitations. Such tasks demand metacognitive regulation, including self-questioning and reflective evaluation. The study thus supports the view that non-technical requirements are not ancillary but central to developing autonomous and responsible engineers.

Complementing this perspective, Stanton and colleagues synthesise evidence from cognitive science to demonstrate that metacognition significantly enhances learning transfer and performance across disciplines. They argue that students often lack accurate insight into their own understanding, leading to overconfidence and superficial learning. This cognitive blind spot has serious implications in professional contexts, where misjudgement or unexamined assumptions can result in communication failures or ethical lapses (Stanton et al.). The authors propose evidence-based instructional strategies—such as self-explanation, reflective prompts, and structured feedback—to foster metacognitive awareness.

When applied to engineering education, these strategies help students develop the ability to evaluate their reasoning and adapt their approaches to complex situations. In communication contexts, this translates into greater audience awareness and message clarity; in ethical contexts, it supports more deliberate and responsible decision-making. Stanton et al.'s work reinforces the argument that metacognitive skills must be explicitly taught rather than assumed to develop incidentally. Consequently, business communication and ethics emerge as essential curricular components that support deeper cognitive engagement and professional competence.

Empirical support for this argument is provided by Devika and Singh's study on metacognitive awareness and communication performance among engineering students. Focusing on listening skills, the authors reveal a significant gap between students' perceived communication competence and their actual performance. This discrepancy highlights the limitations of assuming that communication skills develop naturally without structured instruction (Devika and Singh 136–141). Their findings demonstrate that explicit metacognitive training improves students' ability to regulate attention, interpret information accurately, and respond appropriately in professional interactions.

The study underscores that effective communication is a cognitively complex process involving continuous monitoring and evaluation. Without metacognitive awareness, students struggle to adapt their communication strategies to varying professional contexts. Moreover, the authors suggest that improved listening and reflective understanding also enhance ethical sensitivity, as attentive engagement with others' perspectives is a prerequisite for responsible professional conduct. This reinforces the view that communication training serves both cognitive development and ethical practice within engineering education.

Finally, Taebi and colleagues extend the discussion to advanced engineering education through a case study of ethics instruction at the doctoral level. Their programme integrates ethical reflection with technical research, using real-world case studies and interdisciplinary dialogue to cultivate ethical competence (Taebi et al.). The authors argue that ethical reasoning develops through sustained engagement and reflective practice rather than isolated instruction. Ethical competence, they contend, relies on advanced cognitive and metacognitive skills such as perspective-taking, self-regulation, and critical reflection.

Although focused on PhD students, the study's implications extend to undergraduate education. Early exposure to ethical reflection strengthens professional identity and reinforces the inseparability of technical expertise and social responsibility. Taebi et al.'s work thus supports the argument that ethics education should be mandatory across all levels of engineering education to prepare students for the societal consequences of engineering practice.

Taken together, the literature suggests that the inclusion of business communication and ethics in engineering curricula is not merely a response to industry demands or accreditation requirements but a pedagogical necessity grounded in cognitive and metacognitive theory. These non-technical competencies engage higher-order thinking processes essential for professional judgement, adaptability,

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and ethical responsibility. As engineering challenges become increasingly complex and socially embedded, communication and ethics function as core cognitive practices that shape how engineers think, decide, and act. Consequently, their inclusion in engineering education is not optional but fundamental to the formation of reflective, competent, and socially responsible engineers.

THE WAY FORWARD

The need of the hour is to have a more comprehensive integration of the Ethics and communication topics into the existing technical courses, using case studies and real-world scenarios to illustrate their practical application. Engineering Ethics, which falls under applied ethics, governs the standards of behavior and moral principles that describe how an engineer should act within the diverse situations they find themselves within the engineering profession. By exposing the students to the real-life case studies, one can easily correlate the learnings to first identify what went wrong and how it could have been corrected or avoided. The analysis reveals that communication and ethical reasoning engage higher-order cognitive processes such as analysis, evaluation, contextual judgement, and decision-making under uncertainty. More significantly, these competencies rely on metacognitive regulation—students' ability to monitor their understanding, reflect on assumptions, and adapt their responses to complex socio-technical situations. Without explicit instructional support, students are unlikely to internalise these processes, leading to superficial compliance rather than meaningful professional competence. From this perspective, accreditation frameworks such as ABET should not be viewed merely as regulatory mandates but as indicators of a deeper epistemological shift in engineering education. The inclusion of communication and ethics signals recognition that engineering knowledge is inseparable from its social consequences and communicative contexts. Engineers are required not only to solve technical problems but also to articulate risks, justify decisions, and act responsibly within diverse professional and societal settings.

The paper therefore argues that making business communication and ethics mandatory in engineering education is justified pedagogically and necessary for cognitive development. Their integration supports the development of reflective practitioners capable of ethical judgement, effective stakeholder engagement, and lifelong learning. As engineering continues to confront global challenges involving sustainability, equity, and public safety, curricula that foreground cognitive and metacognitive development will be essential in preparing engineers who are not only technically proficient but also socially accountable and professionally resilient.

REFERENCES:

[1] https://www.icsi.edu/media/website/Business%20Management,%20Ethics%20and%20Communication%20(FndPrg).pdf
[2] https://www.abet.org/
[3] https://gdpr-info.eu/
[4] https://www.dpiit.gov.in/ministry/about-us/details/Title=National-Intellectual-Property-Rights-(IPR)-Policy-ITMwETMtQWa
[5] https://www.researchgate.net/publication/313993922_Is_Engineering_Ethics_Just_Business_Ethics
[6] Shuman, Larry J., Mary Besterfield-Sacre, and Jack McGourty. "The ABET 'Professional Skills'—Can They Be Taught? Can They Be Assessed?" Journal of Engineering Education, vol. 94, no. 1, 2005, pp. 41–55.
[7] Martin, Diana Adela, Eddie Conlon, and Brian Bowe. "A Multi-level Review of Engineering Ethics Education: Towards a Socio-technical Orientation of Engineering Education for Ethics." *Science and Engineering Ethics*, vol. 27, 2021, article 60.
[8] Marra, Rose M., Douglas J. Hacker, and Carolyn Plumb. "Metacognition and the Development of Self-Directed Learning in a Problem-Based Engineering Curriculum." Journal of Engineering Education, vol. 111, no. 1, 2022, pp. 137–161.
[9] Stanton, Julie Dangremond, et al. "Fostering Metacognition to Support Student Learning and Performance." CBE—Life Sciences Education, vol. 20, no. 2, 2021.
[10] Devika, and Rajni Singh. "Influence of Metacognitive Awareness on Engineering Students' Performance: A Study of Listening Skills." Procedia Manufacturing, vol. 31, 2019, pp. 136–141.
[11] Taebi, Behnam, et al. "Teaching Engineering Ethics to PhD Students: A Berkeley–Delft Case." *Science and Engineering Ethics*, 2016.