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Editorial: Engineering technology and engineering: incorporating the humanities into the classroom

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Editorial on the Research Topic
Engineering technology and engineering: incorporating the humanities into the classroom

In today's educational landscape, the focus on Science, Technology, Engineering, and Mathematics (STEM) has steadily increased, with advocates emphasizing its importance for preparing students for rewarding careers in a technology-driven world. However, the significant role of the humanities in enhancing STEM disciplines is often overlooked. This Research Topic makes the case for integrating humanities into engineering education, highlighting its importance in fostering critical thinking, ethical reasoning, and a comprehensive understanding of technology's societal impact. Integrating humanities into STEM enriches education by contextualizing scientific and technical knowledge within broader societal narratives. Links to papers appear in parenthesis in this editorial. Disciplines like literature, philosophy, history, and the arts provide essential insights into the human condition and ethical considerations. By incorporating these perspectives into STEM curricula, educators can help students grasp technology's historical and cultural dimensions, transforming their understanding of its societal role.

For instance, studies show that embedding social contexts into biology courses can shift students' stereotypes of scientists and enhance their science identity, particularly among underrepresented groups (Thürer et al., 2018). This aligns with findings from Tovar (2018), who argue that infusing humanities into STEM courses fosters critical thinking and deep connections across disciplines. Incorporating humanities can significantly boost student engagement and critical thinking in STEM education. Research indicates that students' perceptions of STEM careers are shaped by their educational experiences, including the presence of supportive environments. By integrating humanities, educators can create a more relatable curriculum that resonates with students from diverse backgrounds, promoting greater retention and success in STEM fields. This integration also addresses disparities in gender and cultural representation within STEM. The expectancy-value model discussed by Spoelstra highlights how cultural expectations can deter female students from pursuing STEM careers (Spoelstra and Collins, 2023; Wolffgramm et al., 2021; Eccles, 1983). By integrating humanities, educators can challenge stereotypes and provide a more inclusive narrative that encourages all students to envision themselves as future STEM professionals. Addressing the ongoing underrepresentation of women and

minorities in engineering and related fields is crucial. As technology continues to shape our lives, it is vital for future engineers to not only hone their technical skills but also develop skills dependent upon the diversity that different students bring with them (Peters and Lucietto). We must highlight the value of these students' diverse perspectives, which can greatly enhance problem-solving and innovation. A diverse group fosters creativity and leads to more comprehensive solutions as individuals approach challenges from various cultural, social, and experiential backgrounds. This diversity enriches discussions and ensures that outcomes are more inclusive and reflective of society, ultimately resulting in technology that effectively serves everyone. Together, these qualities empower future leaders to create solutions that are both impactful and socially responsible.

The humanities offer a framework for exploring ethical dilemmas and understanding the societal implications of technological advancements. Discussions around artificial intelligence, data privacy, and environmental sustainability are enriched by philosophical inquiry and historical context (Kim et al., 2019). By incorporating humanities into engineering education, educators can cultivate a generation of technologists proficient in their technical skills and equipped to consider the ethical ramifications of their work (Schimpf et al.). This is particularly important as we confront complex global challenges like climate change and social inequality, where understanding historical and cultural contexts enables students to approach problem-solving with a nuanced perspective (Watkins et al., 2018).

Integrating humanities into STEM education offers significant benefits, enhancing students' technical skills while fostering critical thinking and ethical awareness. Successful interdisciplinary projects demonstrate that blending technical and humanities perspectives promotes collaboration and creativity among students (Cook-Sather, 2020; Cook-Sather et al., 2014). Despite concerns about fitting this integration into crowded curricula, faculty development programs focused on innovative teaching strategies, such as project-based and experiential learning, can equip educators to create engaging experiences (Kleinschmit et al., 2023). Collaboration between STEM and humanities faculty can lead to the development of interdisciplinary courses that prepare students to be skilled professionals and responsible citizens capable of navigating ethical complexities (Van Nuland et al., 2020).

The interdisciplinary approach that combines engineering with humanities and social sciences enriches students' educational experiences, enhancing their critical thinking and ethical reasoning skills. This is particularly evident in community engagement initiatives, which have been shown to foster a deeper understanding of the societal implications of engineering practices. For instance, Bielefeldt et al. emphasize that community engagement opportunities catalyze ethical behavior among engineering students by allowing them to reflect on the ethical dimensions of their contributions to real-world problems (Bielefeldt and Canney, 2016; Bielefeldt et al., 2016). Similarly, Goggins and Hajdukiewicz (2022) highlight that community-engaged learning significantly motivates engineering students by demonstrating the tangible impacts of their work on society. Moreover, the incorporation of traditionally feminine hobbies and cross-cultural communication into engineering curricula can further enhance inclusivity and broaden perspectives within the field (Ma and Lucietto). And by Hynes and Swenson (2013), a systematic inclusion of social sciences and humanities can help frame the humanistic side of engineering, which is essential for addressing the complex challenges faced in contemporary society. The importance of this integration is underscored by the findings of Acero et al. who discusses how community engagement can reshape engineering discourse to include social processes and community dynamics (Acero et al.). As we advance into an era marked by intricate global challenges, the call for a more integrated educational framework becomes increasingly urgent. The emphasis on community engagement, as articulated by Tucker et al. (2013), illustrates the potential for engineering education to evolve into a platform for social responsibility and civic engagement (Acero et al.).

By fostering partnerships between educational institutions and communities, we can create a learning environment that not only emphasizes technical proficiency but also prioritizes ethical considerations and social impact. This paradigm shift is not just an academic endeavor; it is a moral imperative that will shape the future of engineering and technology in a manner that is responsive to societal needs and aspirations. In summary, the integration of humanities into engineering education is essential for developing a well-rounded STEM workforce capable of addressing the multifaceted challenges of our time (Clark).

By embracing this interdisciplinary approach, we can cultivate engineers who are not only technically adept but also socially aware and ethically grounded, ensuring that technology serves as a force for good in society.

Author contributions

AL: Conceptualization, Investigation, Project administration, Writing – original draft, Writing – review & editing. DP: Conceptualization, Data curation, Investigation, Methodology, Project administration, Writing – original draft, Writing – review & editing.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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