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EDITORIAL

Point of view: human development and impact for sustainability—'A new pipeline theory in academia'

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Abstract

The role of academia in society is due for a comprehensive re-evaluation. Utilising the metaphor of a 'network of pipelines', this paper identifies two critical dimensions: a 'people pipeline', which includes a diverse range of students from various demographics—be they gender-based, socioeconomic or ethnic—and an 'experience pipeline' focused on the quality of teaching and learning. These components must be strategically synchronised to maximise societal and environmental impact. Drawing an analogy with engineered irrigation systems that require optimal operation and maintenance, the paper argues that academia should adopt a similarly meticulous approach. To this end, the article advocates for aligning educational endeavours more closely with Sustainable Development Goals, emphasising the need for a multi-layered, context-sensitive strategy.

Keywords Sustainability · Academia · Education · Strategy

Point of view

Society 5.0, a concept that has grown popular in policy discourse, represents an aspirational paradigm that seeks to harmonise economic growth with social welfare, including environmental sustainability and environmental integration. As the urgency to address ecological concerns escalates, higher education institutions are increasingly recognised as relevant actors for initiating meaningful change. Universities, traditionally confined to the dual missions of teaching and research, are increasingly being recognised for a third, societal mission: to facilitate achievement of global sustainability benchmarks (Stewart et al. 2022).

In transcending the techno-centric imperatives of the Fourth Industrial Revolution, which prioritised technological advancements often at the expense of broader social considerations, the emphasis must now pivot toward cultivating human capital as a strategic asset towards sustainable development, one which aligns with the United Nations' Sustainable Development Goals (SDGs) (AlMaadeed 2020 and AlMaadeed and Ponnamma 2020). Established in 2012, these goals present a multi-faceted approach to addressing global challenges that extend beyond mere technological solutions. In this setting, academia has the potential to emerge as a critical vector for advancing human development and actualising the SDGs and, thereby, serving as a catalyst for the larger objectives of Society 5.0.

The 'leaky pipeline' metaphor is frequently employed in academic discourse to describe the attrition of women at various stages of academia, from high school through graduate programs (Webster et al. 2021; Kulis et al. 2002). While societal and economic factors often make it difficult to retain female students in higher education, recent research suggests a changing dynamic. Namely, there is a noticeable shift in the education gender gap, with females increasingly outperforming males in national and international assessments and graduation rates (Natasha et al. 2017).

In light of these observations, it is essential to evolve our thinking beyond a singular pipeline model. As illustrated in Fig. 1, a more nuanced framework calls for the consideration of multiple, intersecting 'pipelines'. This expanded perspective should encompass a diverse range of demographic groups, including but not limited to women, individuals from socio-economically disadvantaged or minority backgrounds (Wong 2016) and, paradoxically, men—who, as per recent studies, are becoming a disadvantaged group within certain educational metrics. The framework is intended to be

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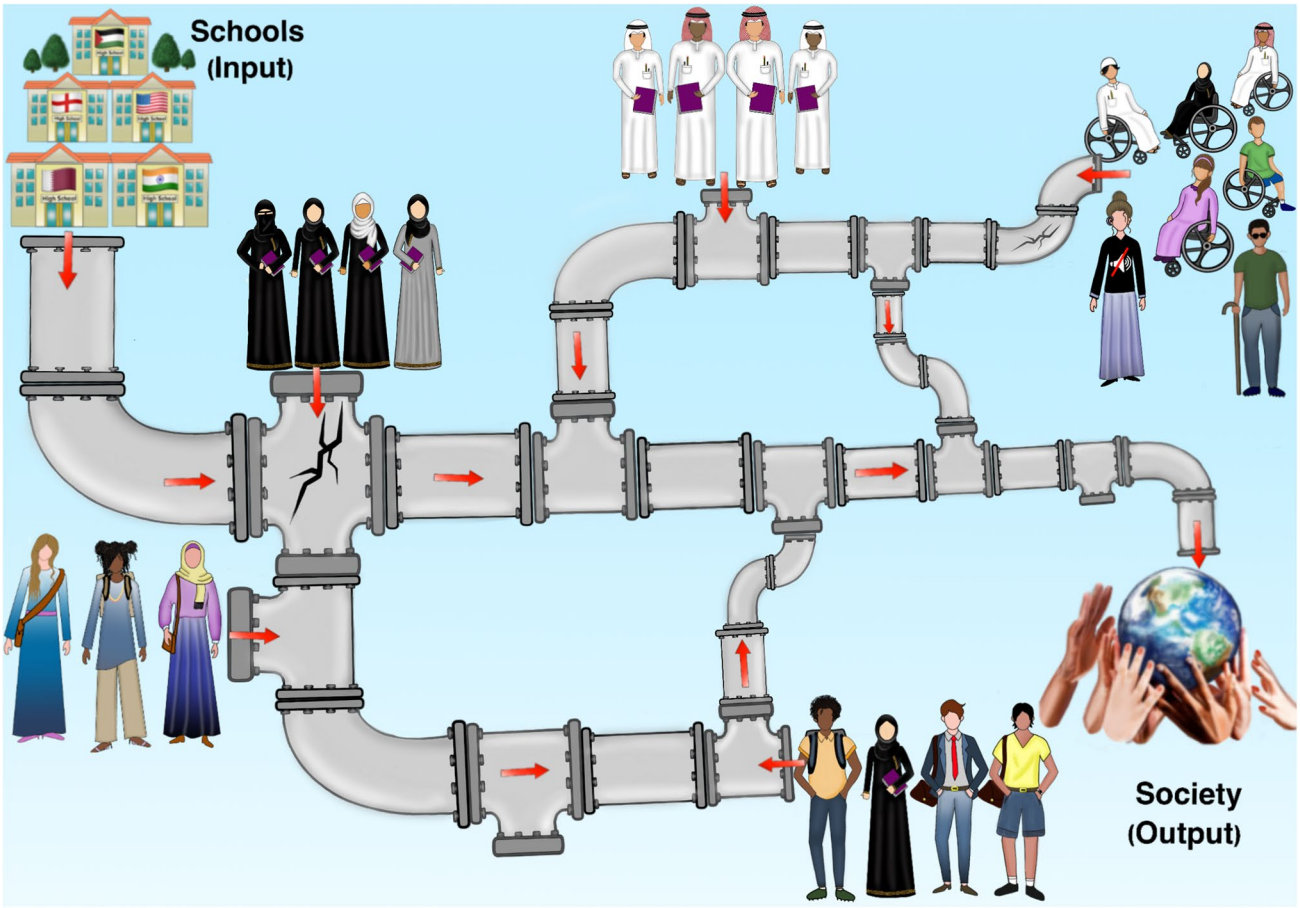

Fig. 1 Schematic representation of the 'people's pipeline' in higher education. This network diagram illustrates multiple inflows originating from diverse educational backgrounds. It features specialised metaphorical pipelines for different demographic groups, including gender-specific categories, individuals from disadvantaged backgrounds and students from both national and international educational systems. These diverse pipelines ultimately converge to contribute to a unified societal output (depicted at the bottom right)

comprehensive and encapsulate students from varied educational systems, both local and international.

The students in the wired pipeline go to the 'society', and the higher education system plays a pivotal role in equipping students with the skills and knowledge needed to adapt to the constantly evolving market, thereby fostering significant economic, social and technological advancement within the nation.

Moreover, our conceptualisation of pipelines should expand to include various layers that go beyond demographic factors. Figure 2 elaborates on this by introducing additional layers such as pathways in science, technology, engineering and mathematics (STEM), as well as competencies in creativity, teamwork and entrepreneurship. Additional contextual layers and rewiring dynamics—such as the prevailing political and economic conditions, job market trends and academic surroundings—could also be incorporated, though they are not depicted in the figure as they are beyond the scope of this short communication.

The synchronisation between the 'people's pipeline', composed of diverse demographic student groups, and the pedagogical experiences they encounter is crucial for optimising academia's broader societal impact, as outlined in Fig. 3. The maintenance, longevity and interconnectivity of these pipelines are key factors in achieving desired educational outcomes. Importantly, these pipelines are not uniform; they are shaped by cultural and traditional nuances, leading to distinct configurations in different national contexts. Further, while student retention has been a persistent challenge across these pipelines, the scope of concern must go beyond mere number-tracking, in which the quality, pathways and broader societal contributions of these students as they transition into intellectual and professional spheres is also scrutinised.

It must also be emphasised that the composition of each 'human capability pipeline' is contingent upon the specific discipline and prevailing social environment. For instance, while the under-representation of females in STEM fields

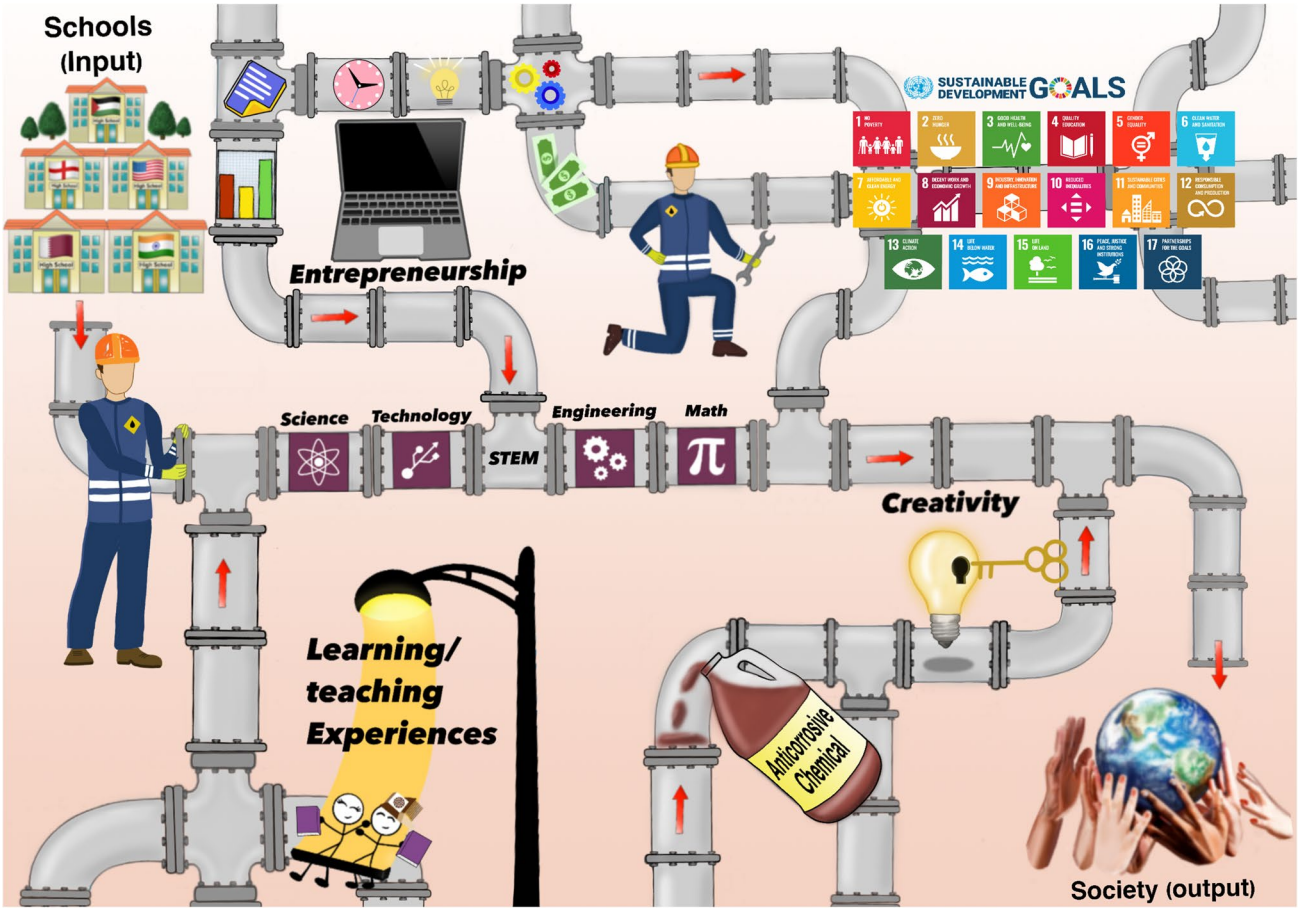

Fig. 2 Additional layer of educational pipelines: a focus on skill development and experience. This symbolic representation explores secondary pipelines that include pathways in science, technology, engineering and mathematics (STEM), as well as other experiential facets like creativity, teamwork and entrepreneurship

is a concern in Western contexts, the focus may shift to the under-representation of males in similar fields in other cultural settings, such as Qatar (Ridge et al. 2017). Therefore, a one-size-fits-all approach is inadequate; pipelines must be adapted to reflect cultural, traditional and contextual differences, including the allocation and types of resources needed.

In this light, each demographic and educational pipeline necessitates a tailored maintenance plan which would account for its endogenous type, structure, width and current (and expected) cracks and obstacles. To extend the metaphor, the usage of 'anticorrosive' elements is imperative to ensure the long-term integrity of each pipeline and their integration with other pipelines. In the context of education, these 'anticorrosive' elements correspond to well-crafted policies, regulations and intervention strategies tailored to enhance key performance indicators in each educational domain. It is vital that these individual pipeline maintenance plans are not only effective in isolation but also compatible with one another to create a coherent, integrated system. This system-wide compatibility is crucial for fostering a steady and sustainable flow of human capital that can drive national development and support broader sustainability goals. Any failure in a single pipeline—whether it manifests as attrition, blockages or other forms of dysfunction—has ripple effects that compromise the efficiency and effectiveness of the overarching educational infrastructure, impacting not just individual nations but also having potential international repercussions.

At the societal level, the 'feeding tank,' or the pool of incoming students within a population, could serve as an important variable for evaluating how well educational goals align with social and environmental factors. Moreover, the output of the tank, that is to say, the effectiveness of an educational system, can be gauged by its contribution to the United Nations' Sustainable Development Goals.

In analysing the educational pipeline system, one must also account for external political and economic contexts that can either support or compromise the efficacy of a knowledge-based economy. The interconnectivity within

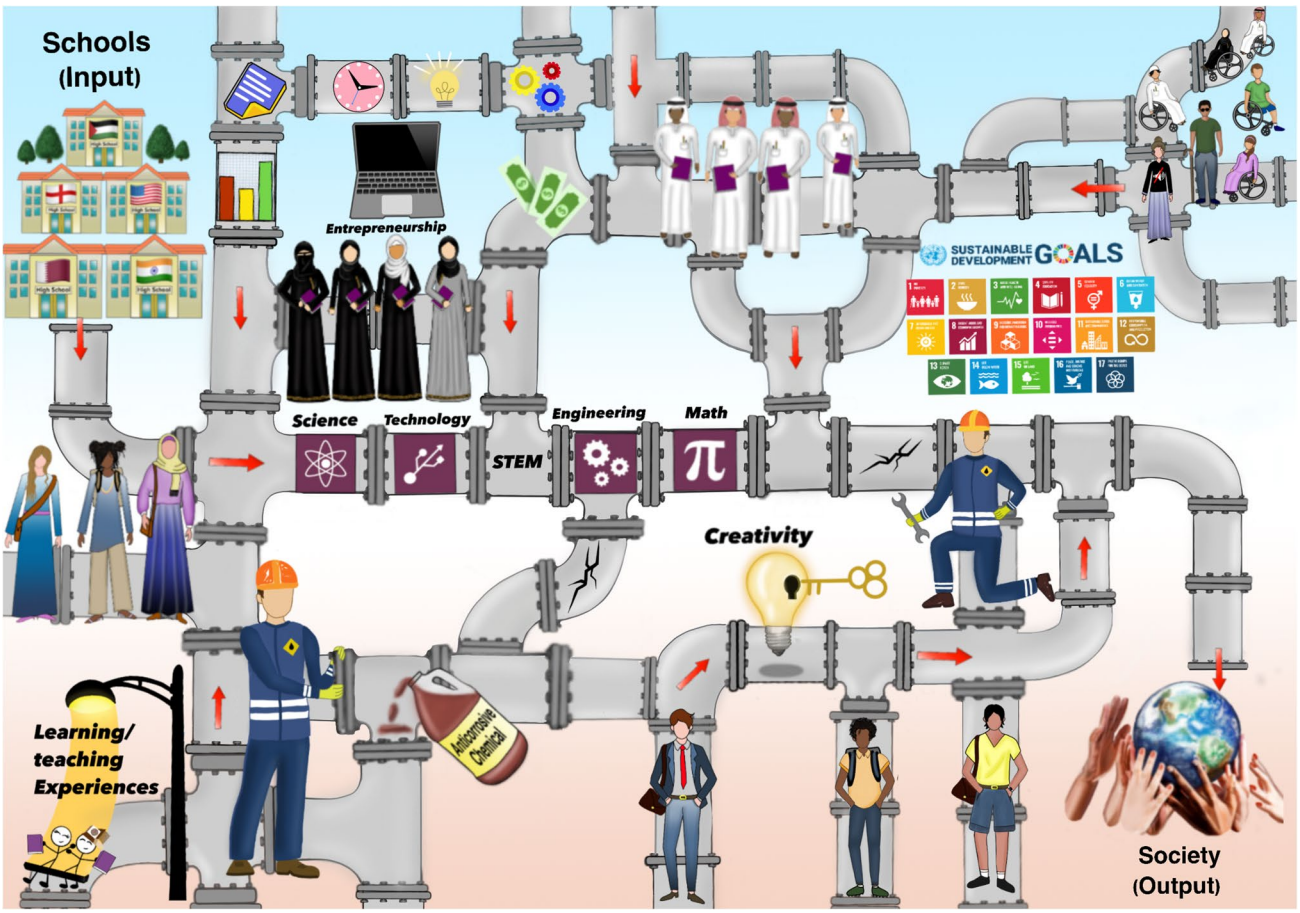

Fig. 3 Integrated model of the 'people's pipeline' and 'experience pipelines' for enhanced societal impact. This figure synthesizes components from Figs. 1 and 2 by offering an optimised framework aimed at societal betterment. It emphasizes the role of policy interventions in the efficient and effective management, maintenance and integration of these pipelines

the pipeline—from recruitment sources to academic and professional outputs—becomes a critical variable in the equation for producing a workforce that adheres to ethical, social and environmental standards. This is not merely an operational issue but also has implications on the effective allocation of human capital to sectors in need of development.

Considerable attention is also necessary to optimise educational systems that effectively recruit, train and retain individuals throughout their academic journey. While countries in the Middle East, Mediterranean and surrounding regions may share similar environmental characteristics (Litskas et al. 2023 and Papamichael et al. 2022), their socioeconomic structures diverge substantially. Therefore, a comparative analysis of these national educational infrastructures offers a pathway for identifying best practices and areas for transnational collaboration. By involving multiple stakeholders—from academia to industry to government—such endeavours can help align disparate efforts and produce outcomes that are beneficial across sectors.

The overarching goal is not merely systemic efficiency but a multi-dimensional development that is compatible with the Sustainable Development Goals (see also Alkair et al. 2023). This calls for a strategic reorientation from policymakers and educational administrators in line with the pipeline metaphor advanced herein: https://www.tandfonline.com/doi/full/10.1080/1533015X.2023.2179556.

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