

Overview of Industrial Engineering Courses in Brazil Under the Focus of Entrepreneurship

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Abstract

This study presents an overview of Industrial Engineering programmes in Brazil with a focus on entrepreneurship. The research is grounded in knowledge management concepts, including a brief discussion of the knowledge society and organisational knowledge. The main objective was to analyse the curriculum of the Industrial Engineering programme at the Federal University of Paraná from an entrepreneurship perspective. To support this analysis, a national panorama of Industrial Engineering programmes was developed, identifying their main characteristics and examining how entrepreneurship education has been incorporated into higher education institutions. A descriptive research method was adopted, using data collected from the National Institute for Educational Studies and Research (INEP) database. The results indicate a strong concentration of programmes in the Southeast region, representing sixty-one per cent of the total. The study also identified regional differences in the distribution of entrepreneurship-related subjects and highlighted the significant number of recently created programmes. Out of 805 programmes analysed, 443 had not yet graduated their first cohort, corresponding to fifty-five per cent, which demonstrates the relatively recent expansion of Industrial Engineering education in Brazil. This rapid growth reflects the increasing demand for professionals in this field. The findings further reveal that the curriculum of the Federal University of Paraná remains comparatively traditional when contrasted with other Brazilian institutions. The study suggests the need for curricular revision, emphasising the inclusion of entrepreneurship-related subjects to ensure that future engineers develop entrepreneurial competencies alongside technical skills, thereby strengthening innovation and professional adaptability.

Keywords: entrepreneurship, production engineering education, higher education, curriculum analysis, engineering education, knowledge management

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Introduction

This study builds upon the research paper titled “Proposal for the Inclusion of Entrepreneurship in the Production Engineering Curriculum,” which aimed to meet the contemporary demand for professionals capable of proposing innovations across diverse societal spheres, focusing primarily on small enterprises and intrapreneurship (Pellin and Santos, 2008).

Knowledge management demonstrates how not only organisations but also individuals are placing increasing value on knowledge (intangible assets) and less on tangible goods. This shift stems from the critical importance of knowledge sharing and dissemination. Unlike financial resources—whereby transferring funds to another party results in a personal loss—knowledge multiplies when shared, akin to learning a new language. Furthermore, if a learner goes years without sharing this knowledge, it becomes obsolete. However, to grasp the core meaning of Knowledge Management, one must first understand the distinctions between data, information, and knowledge, which are elucidated in the subsequent pages of this article.

Entrepreneurial Pedagogy

The entrepreneurial pedagogy proposed by Fernando Dolabela is a didactic strategy that utilises the Theory of Dreams to develop the entrepreneurial capacity of students in pre-school, primary, and secondary education. This theory initially proposes that students formulate a dream—a future state where they wish to arrive, be, or exist. In the second stage, students must endeavour to realise this dream, actively pursuing everything necessary to achieve this objective. This strategy is reintroduced at the commencement of each academic year throughout the 14 years of basic education. Simple language is maintained throughout this process, oriented around the core matrix: “What is your dream, and how are you going to realise it?” (Dolabela, 2003).

The supporting elements presented by Filion (1991a, 1991b) and adapted within entrepreneurial pedagogy aim to develop conditions for self-knowledge, skills to understand the reality in which the individual is embedded, and competences to comprehend the nature of their dream.

Entrepreneurial characteristics and competences (such as initiative, leadership, creativity, perseverance, commitment, and imagination) cannot be mechanically replicated to construct an entrepreneur as if they were a robot; rather, the individual must be motivated to self-construct. To achieve this, emotional involvement is essential, enabling the student to generate such behaviours as the pursuit of dream fulfilment (Dolabela, 2003).

Since emotion is the driving force that stimulates and triggers intelligence and the creative process, the dreamer must define their dream at the very outset of the process. This dream should correspond to their aspirations for self-actualisation, and they must seek to realise it while managing the energy of the forces supporting this attainment. The strategy of entrepreneurial pedagogy is founded primarily on stimulating the dream. Subsequently, regarding the construction and realisation of this dream, educators should not interfere; instead, they should merely offer supporting elements to develop the competences and skills required to formulate and pursue it. Finally, guidance in delineating the ethical contours within which this entire activity will unfold is highly encouraged (Dolabela, 2003).

The dream generates the emotion that stimulates the desire for knowledge. If a specific content or process bears no relation to a student's dream, three hypotheses may explain this occurrence: denying meaning to an individual's dream (which constitutes an authoritarian, limiting, and non-educational act), denying meaning to knowledge itself, or a lack of connection between knowledge and its practical application (the latter being the most probable cause). Rejecting dreams is precisely the practice that entrepreneurial pedagogy intends to transform. Entrepreneurial knowledge can be categorised into four pillars: learning to know, learning to do, learning to be, and learning to live together (Dolabela, 2003).

As reality undergoes constant transformations throughout an individual's life, demanding a redefinition of the relationships between the dream, the pursuit of realisation, and supporting elements, this dynamic may require a learning process that restarts daily, inevitably leading to errors. These errors are viewed as sources of learning rather than as failures or grounds for capitulation. The connection between dreaming (in constant mutation) and striving to realise the dream (in constant evolution) constitutes the essence of the process. The relationship between “dreaming” and “realising the dream” is more critical than either element in isolation. When this relationship is proactive and dynamic, it generates both the necessity and the capacity for knowledge acquisition (Dolabela, 2003).

A dream transformed into actionable objectives is termed a vision. Every viable dream contains a vision, which can be shaped by various factors, including maturity, knowledge acquisition, beliefs, and values. Individuals with similar dreams develop distinct visions due to their personal biographies. In attempting to realise a dream, individuals expand their knowledge regarding the object of that dream and its surrounding context. Consequently, they test their skills and competences, becoming capable of identifying what they enjoy doing. When a dream is realised, the individual moves past transient emotions and begins to cultivate the capacity for perseverance in the face of errors and difficulties. Knowing their dream provides entrepreneurs with the impulse and energy to seek its fulfilment and commence their journey. Students must seek to understand what is required to realise their dream; this pursuit serves as the generative source of the impulse towards knowledge acquisition, which comprises four phases: learning to be, learning to do, learning to live together, and learning to know (Dolabela, 2003).

It is through individuality that an individual constructs their representation of the world. Individuality does not imply individualism or isolation, but rather the recognition of diversity—the capacity of each individual to construct distinct dreams, differentiated by their worldview and way of being. Although the entrepreneur conceives the dream independently, its realisation is impossible without the assistance of others and a supportive environment (Dolabela, 2003).

Research Method

This study employs a descriptive research methodology, which is characterised by the observation, recording, analysis, description, and correlation of facts or phenomena without active manipulation. It seeks to ascertain with precision the frequency with which a phenomenon occurs and its relationship with other factors (Cervo and Bervian, 2002).

Descriptive research can assume various forms depending on the specific focus the researcher intends to establish for the study. Cervo and Bervian (2002) classify these forms as follows: exploratory studies, descriptive studies, survey research, and case studies. The present study

is classified under “descriptive studies.” These studies describe the characteristics, properties, or existing relationships within the group or the specific reality in which the investigation was conducted.

To collect data for this study, the official website of the INEP (Instituto Nacional de Estudos e Pesquisas Educacionais) [National Institute for Educational Studies and Research] was utilised, as it provides a comprehensive registry of all recognised higher education courses in Brazil. Based on data retrieved from the INEP and the websites of the respective educational institutions, a spreadsheet was developed containing the following information:

- The city and state where the course is conducted
- The name of the institution
- The duration of the course
- The shift/period of instruction (e.g., day, evening)
- The number of student places available
- The curricular emphasis or specialisation
- The modality (e.g., conventional, distance learning)
- The academic calendar regime (e.g., semester, annual)
- The date on which the course commenced operations
- The number of modules/disciplines related to entrepreneurship
- The official quality score/rating
- The minimum required workload hours
- The workload hours allocated to core areas (Basic, Specific, Electives)

The primary focus of this research is to identify whether production engineering courses in Brazil incorporate modules related to the theme of entrepreneurship within their curriculum grids. To achieve this, the curricula of all 805 production engineering courses identified in Brazil were analysed.

Results

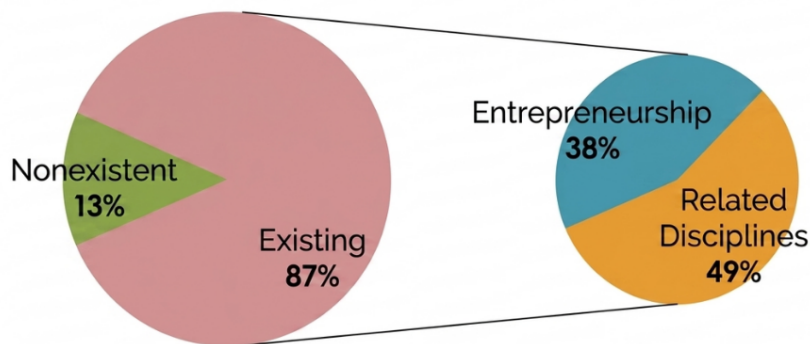
The results indicate a strong concentration of programmes in the Southeast region, representing 61% of the total. The study also identified regional differences in the distribution of entrepreneurship-related subjects and highlighted the significant number of recently created programmes. Out of 805 programmes analysed, 443 had not yet graduated their first cohort, corresponding to fifty-five per cent, which demonstrates the relatively recent expansion of Industrial Engineering education in Brazil. This rapid growth reflects the increasing demand for professionals in this field. Of the 362 programs found, 150 Production Engineering programs do not have a Ministry of Education (MEC) score because the students from the first cohort have not yet graduated (based on data observed up to October 2025). Of the 212 programs that provided their curriculum (96 did not provide it, so their courses were not analyzed), it can be observed that 13% do not have any entrepreneurship-related courses (non-existent). Of the 87% that do cover the topic, 38% have a specific course named “Entrepreneurship” and 49% have entrepreneurship-related courses.

Table 1*Distribution of Industrial Engineering Courses by Region in Brazil*

Region	Percentage
North	4%
Midwest	5%
Northeast	12%
South	18%
Southeast	61%

Source: Field research (2025)

Out of the 212 courses that provided their curriculum grids (96 did not provide this information and their modules were consequently not analysed), it is observed that 13% do not offer any modules related to entrepreneurship (non-existent). Among the 87% that address the subject, 38% feature a specific module entitled “Entrepreneurship,” whilst 49% offer modules related to entrepreneurship.

Figure 1*Disciplines Related to the Theme of “Entrepreneurship”**Source:* Field research (2025)

Among the institutions offering the highest number of entrepreneurship-related modules, UNISINOS (Universidade do Vale do Rio dos Sinos) ranks first, offering 10 modules related to the theme, followed by UVA (Universidade Veiga de Almeida) with 7 modules. This information is detailed in Table 2.

Table 2*Ranking of Institutions Offering the Highest Number of Entrepreneurship-Related Courses*

Institution	Quantity	Institution	Quantity
UNISINOS	10	FUMEC	5
UVA	7	FTE	5
UEPA	6	UNIRADIAL-Curitiba	5
CEFET-RJ	6	UFERSA	5
UNESA	6	PUC-RS	5
UNIPLAC	6	IST-Florianópolis	5
UNIVATES	6	FAMEG	5
PUC-PR	5	UNISUL	5
UNIFOR	5	UNIRADIAL	5
UNIUBE	5	Others	4, 3, 2 ou 1

Source: Field research (2025)

Regarding the average number of modules per region, it can be observed that the South and Northeast regions present the highest national averages of modules related to entrepreneurship, with 2.84 and 2.65 modules per course, respectively. Conversely, the Central-West region ranks lowest, offering an average of 2.13 modules per course.

The national average of entrepreneurship-related modules per production engineering course in Brazil stands at 2.44 modules per course. As previously demonstrated, the Central-West and Southeast regions fall below this benchmark. This disparity indicates that production engineering courses situated within the states and the Federal District of these regions must revise their entrepreneurship education to align with wider Brazilian developments.

Concurrently, this does not imply that courses located in the South, North, and Northeast regions should merely become complacent with their respective outcomes. Entrepreneurship is a highly contemporary subject that must be introduced to prospective undergraduate students of production engineering courses. This ensures they are equipped with a broader spectrum of activities to develop in their future professional careers, extending beyond the conventional employment options traditionally offered by the labour market.

Conclusion

Production Engineering is a highly contemporary field of study in the country, as evidenced by the findings of this research, which indicate that 55.5% of the courses were established less than five years ago. Such a high growth rate results from the substantial market demand for professionals within this area of expertise.

Furthermore, it is possible to discern the extent to which higher education institutions incorporate the subject of entrepreneurship into their production engineering courses in Brazil, as well as which regions are more advanced in this regard. A significant insight derived from the research data highlights that the UFPR (Federal University of Parana) the focal object of this analysis offers a considerably traditional course compared to those of other Brazilian institutions. When contrasting the curriculum of this university with its national counterparts, the most notable deficiencies lie within modules covering administration, entrepreneurship, management, governance, innovation, leadership, and marketing. To elevate the standards of entrepreneurship education, it is imperative to evaluate the modules offered to students across the basic, specific, and elective components of the curriculum.

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Declaration of Generative AI and AI-Assisted Technologies in the Writing Process

The authors used the Gemini software during the preparation of this manuscript. The software was utilized solely for the purpose of language editing and proofreading to improve the clarity and readability of the text. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the final context of the published article.

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