

POINT OF VIEW

Interaction between Industry and Academia: Is the Chemical Professional Master a Possibility?

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Between 2017 and 2020, the Brazilian chemical graduate education system comprised a total of 74 graduate programs spread over several states. However, a mere five of these (just 6.7%) were exclusively dedicated to professionals already engaged in industry or teaching in public and/or private schools.¹ This substantial underrepresentation reveals a significant imbalance within the system, suggesting that it is not fully aligned with the needs of the workforce and the educational sector. Unfortunately, as of 2024, the situation has only shown a slight improvement, as the proportion of professional-focused programs remains almost the same. The limited availability of these programs is particularly concerning given the critical role that professional master's programs play in bridging the gap between academic knowledge and practical application in industry. These programs equip industry professionals and educators with the advanced skills and knowledge they need to stay competitive in rapidly evolving national and international scenarios. Despite this need, the current offerings are insufficient to meet the demands of professionals seeking to enhance their expertise and to contribute more effectively to their respective fields.²

Moreover, the existing chemical professional programs are restricted to master's level courses, with no further opportunities for professional doctorates or specialized formation. This limitation further constrains the ability of professionals to pursue advanced, industry-relevant education within the chemical field. As a result, many may be unable to advance in their careers or are forced to seek opportunities abroad, leading to a potential brain drain and a weakening of Brazil's industrial and educational sectors. Considering these challenges, there is an urgent need to reassess and expand the professional education offerings within the Brazilian chemical graduate system. By doing so, professors and universities can be more active in supporting industry and educational professionals, fostering innovation, and driving economic growth. An increase in the number and diversity of chemical professional master's programs would address the current imbalance and ensure that the system is better aligned with the broader goals of national development and global competitiveness (e.g., Industry 4.0).³

One of the critical issues exacerbating this imbalance is the lack of awareness within the chemical industry, and related areas about the existence and benefits of chemical professional graduate programs. Many companies are unaware of these opportunities, which limits their ability to encourage employees to pursue further education that could enhance their skills and contribute to organizational growth. This lack of information impedes the fostering of stronger university–industry collaborations, which is essential for driving innovation and economic development. Based on a recent inquiry focusing on 48 former students from the Professional Master Graduation Chemical Program (PPGPQ)⁴ located at the Chemistry Department of the Federal University of São Carlos (DQ/UFSCar), (i) all professionals are employed, indicating that the graduates of this program have a high level of employability, and (ii) around 80% indicated that their income had increased after finishing the course. Hence, the course has a clear positive impact on the former student's professional life. In addition, a second survey with 54 professionals on LinkedIn⁵ revealed that

a significant majority (around 80%) acknowledged the positive impact of chemical professional master's programs (see Figure 1a) on their careers. However, many also recognized that companies (see Figure 1b), along with their leaders and managers (see Figure 1c), lack sufficient information about these types of courses.

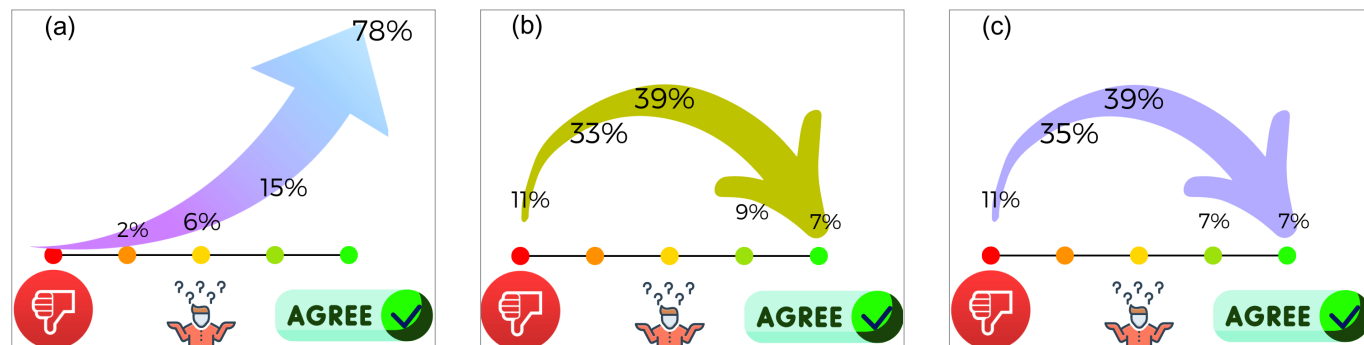


Figure 1. Professionals' opinions on the positive impact of these graduate programs on their lives (a), and the awareness of companies (b) and their leaders or managers (c) about such programs.

This issue is even more pronounced in teaching science, technology, engineering, arts/humanities, and mathematics (STEAM).^{6,7} The current educational system does not sufficiently prepare educators to teach these critical subjects in a way that is both innovative and aligned with industry needs. As a result, there is a growing disconnection between the skills taught in schools and the skills required in the workforce. By expanding professional master's programs and enhancing the focus on STEAM education, universities can help bridge this gap, ensuring that students are better prepared to meet the demands of modern industries. Another important aspect is the involvement of various stakeholders, such as *Empresa Brasileira de Pesquisa e Inovação Industrial* (Embrapii)⁸ and *Confederação Nacional da Indústria* (CNI), in promoting chemistry graduate programs.⁹

Considering these challenges, there is an urgent need to reassess and expand the professional education offerings within the Brazilian chemical graduate system. By doing so, universities can play a more active role in supporting industry and educational professionals, fostering innovation or tools, and driving economic growth. This expansion presents a significant opportunity for growth and improvement, instilling a sense of hope and optimism in the potential of the system. An increase in the number and diversity of professional master's programs in chemistry would address the current imbalance and ensure that the system is better aligned with the broader goals of national development and global competitiveness.

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