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Beyond the academic-professional dichotomy: graduate education institutions, knowledge regulation, and the social relevance of science in Brazil¹

Para além da dicotomia acadêmico-profissional: instituições da pós-graduação, regulação do conhecimento e relevância social da ciência no Brasil

Más allá de la dicotomía académico-profesional: instituciones del posgrado, regulación del conocimiento y relevancia social de la ciencia en Brasil

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Abstract

This study critically examines the potentially artificial nature of the dichotomies between basic and applied science and between academic and professional graduate education, demonstrating that neither may accurately reflect the actual dynamics of contemporary scientific production, particularly in legal research. Its objectives are to trace the historical origins of these divisions, analyze their consolidation within Brazil's regulatory framework, and present use-inspired theoretical research (UITR) as a means of overcoming them by showing that theory and practice are complementary dimensions of research. A theoretical, analytical, and documentary methodology was adopted, drawing on classical and contemporary scholars in epistemology and the theory of science, as well as an examination of legislation and ordinances that have shaped *stricto sensu* graduate education. The findings indicate that the separation between basic and applied science does not reflect actual scientific practice and that the distinction between academic and professional programs is, at least in part, artificial, since academic programs frequently provide applied solutions, while professional programs often update, revise, or formulate conceptual models. The study's primary contribution is to demonstrate that the integration of theory and practice is inherent to legal studies. Moreover, adopting UITR as a framework could guide the reformulation of evaluation and funding criteria, thereby strengthening both the social relevance and theoretical rigor of Brazilian graduate education.

Keywords: basic research; applied research; use-inspired theoretical research; academic graduate education; professional graduate education.

Resumo

O objeto deste estudo é examinar criticamente a possível artificialidade das dicotomias ciência básica/aplicada e pós-graduação acadêmica/profissional, demonstrando que ambas podem não traduzir a dinâmica real da produção científica contemporânea e, em especial, da pesquisa jurídica. Os objetivos consistem em recuperar a gênese histórica dessas divisões, analisar sua consolidação normativa no Brasil e apresentar a Pesquisa Teórica Orientada pelo Uso (PTOU) como chave de superação, evidenciando que teoria e prática são dimensões complementares da investigação. A metodologia adotada é teórico-analítica e documental, baseada em autores clássicos e contemporâneos da epistemologia e da teoria da ciência e no exame de legislação, bem como de portarias que estruturaram a pós-graduação *stricto sensu*. Os resultados apontam que a separação entre ciência básica e aplicada não condiz com a prática científica existente e que a distinção entre as modalidades acadêmica e profissional se mostra, pelo menos em parte, artificial, já que os programas acadêmicos, frequentemente, oferecem soluções aplicadas e os programas profissionais, muitas vezes, atualizam, reveem ou formulam modelos conceituais. A contribuição principal está em indicar que, nas Ciências Jurídicas, a integração entre teoria e prática é constitutiva. Além disso a adoção da PTOU como referência pode orientar a reformulação dos critérios de avaliação e fomento, fortalecendo a relevância social e o rigor teórico da pós-graduação brasileira.

Palavras-chave: pesquisa básica; pesquisa aplicada; pesquisa teórica orientada pelo uso; pós-graduação acadêmica; pós-graduação profissional.

Resumen

El objeto de este estudio consiste en examinar críticamente la posible artificialidad de las dicotomías ciencia básica/ciencia aplicada y posgrado académico/profesional, demostrando que ambas pueden no reflejar la dinámica real de la producción científica contemporánea y, en particular, de la investigación jurídica. Los objetivos son recuperar la génesis histórica de estas divisiones, analizar su consolidación normativa en Brasil y presentar la Investigación Teórica Orientada por el Uso (PTOU) como una vía para superar dichas dicotomías, evidenciando que la teoría y la práctica constituyen

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dimensiones complementarias de la investigación. La metodología adoptada es teórico-analítica y documental, basada en autores clásicos y contemporáneos de la epistemología y de la teoría de la ciencia, así como en el examen de la legislación y de las ordenanzas que estructuraron los programas de posgrado stricto sensu. Los resultados indican que la separación entre ciencia básica y ciencia aplicada no se corresponde con la práctica científica existente y que la distinción entre las modalidades académica y profesional resulta, al menos parcialmente, artificial, ya que los programas académicos con frecuencia ofrecen soluciones aplicadas, mientras que los programas profesionales, en numerosas ocasiones, actualizan, revisan o formulan modelos conceptuales. La principal contribución del estudio consiste en señalar que, en las Ciencias Jurídicas, la integración entre teoría y práctica es constitutiva. Asimismo, la adopción de la PTOU como referencia puede orientar la reformulación de los criterios de evaluación y apoyo, fortaleciendo la relevancia social y el rigor teórico del posgrado brasileño.

Palabras clave: investigación básica; investigación aplicada; investigación teórica orientada por el uso; posgrado académico; posgrado profesional.

1 Introduction

Since second half of the twentieth century, Brazilian stricto sensu graduate education has become a central setting for scientific training and the production of advanced knowledge, playing a strategic role in the development of universities and the establishment of a national scientific community. Throughout this process, it has incorporated international frameworks while also developing distinctive characteristics associated with the country's institutional and social needs.

This study critically analyzes the categories that structure contemporary understandings of science and graduate education, particularly the dichotomies between basic and applied science and between academic and professional graduate education.

The research question may be formulated as follows: To what extent do the dichotomies between basic and applied science and between academic and professional graduate education correspond to the contemporary reality of knowledge production? The hypothesis advanced here is that these divisions, although historically relevant and institutionally consolidated, are partly artificial constructs that fail to reflect the interdependence of theory and practice observed in contemporary science. In this context, use-inspired theoretical research (UITR) provides a framework through which these oppositions may be overcome.

The general aim of current study is to critically examine the potentially artificial nature of the dichotomies between basic and applied science and between academic and professional graduate education, with reference to the contemporary dynamics of scientific production and legal research in particular. Its specific objectives are as follows: first, to understand the origins of the dichotomy between basic and applied science and its influence on science policy; second, to examine the development and consolidation of the distinction between academic and professional graduate education in Brazil by identifying its regulatory and institutional foundations; and third, to present UITR as an epistemological alternative to the traditional linear model, demonstrating its relevance to the understanding of scientific research, particularly legal research.

Current study is justified by the need to reassess categories that continue to shape both epistemological thought and the institutional organization of graduate education but no longer adequately reflect the complexity of contemporary scientific production. At the theoretical level, the study contributes to bridging epistemology, the theory of science, and education policy by proposing an integrated interpretation of knowledge production. At the institutional level, it provides a foundation for reflection on criteria used to evaluate and organize graduate education, particularly within Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES). In law, this issue is even more relevant because the relationship between theory and practice is a defining feature of legal studies.

The study adopts a theoretical, analytical, and documentary methodology grounded in a critical literature review and an analysis of regulatory documents concerning the organization of science and stricto sensu graduate education in Brazil. The investigation draws on the relationship among the epistemology of science, academic research, and institutional policies governing graduate education. Narrative literature review focused on classical and contemporary scholars in epistemology and the theory of science who challenge the distinction between basic and applied science and examine the social contextualization of knowledge production, including Ziman, Gibbons, Nowotny, Latour, and Stokes. The works were selected based on their relevance to the debate surrounding the limitations of the linear model of scientific production, particularly regarding the relationship among theory, application, and the social relevance of research.

At the documentary level, the study examined regulatory acts and institutional documents that have shaped Brazilian graduate education and continue to govern its contemporary organization, with particular emphasis on Federal Council of Education (CFE) Opinion No. 977 (Brasil, 1965), Law No. 9,394 (Brasil, 1996), National

Council of Education/Higher Education Chamber (CNE/CES) Resolution No. 7 (Brasil, 2017), Ministry of Education (MEC) Ordinance No. 389 (Brasil, 2017), and CAPES Ordinance No. 60 (Brasil, 2019). The analysis is critical and comparative in nature and seeks to identify convergences, tensions, and potentially artificial distinctions between basic and applied science and between academic and professional graduate education. The methodological approach therefore integrates two complementary dimensions: the epistemological dimension, which critically examines traditional classifications of science and research, and the institutional dimension, which focuses on understanding the regulatory and evaluative structures governing Brazilian graduate education, particularly within CAPES.

During final drafting stage, ChatGPT was used to assist with language editing, textual integration, and organization of manuscript. Full human responsibility is retained for final content, accuracy of information presented, arguments developed, and originality of work.

The study is structured to integrate these elements progressively, beginning with an analysis of the epistemological foundations of the traditional dichotomies, followed by an examination of their incorporation into the organization of Brazilian graduate education, and culminating in the presentation of UITR as an interpretive and forward-looking framework. In doing so, the study seeks to contribute to a more accurate understanding of contemporary science and to the improvement of graduate education, particularly in the field of law.

2 Traditional model and emergence of UITR

Historically, science has been organized around a seemingly irreducible dichotomy: basic science, devoted to understanding the fundamental principles of nature and society, and applied science, aimed at solving immediate practical problems. This division, embedded in institutional models and public research funding policies, has shaped how universities, research centers, and governments organize their scientific endeavors (Ziman, 2000).

Basic science was idealized as the domain of pure intellectual advancement, driven by disinterested curiosity, whereas applied science was associated with technology, utility, and the demands of markets and society. This division was reinforced by Bush's (1945) classic report, *Science: The Endless Frontier*, which influenced research policies in the United States and many other parts of world after World War II. Bush (1945) argued that scientific progress should be driven by disinterested inquiry, from which practical applications would eventually emerge. From this perspective, scientific progress, regardless of its immediate applicability, is driven by curiosity and the pursuit of knowledge.

As modern societies advanced and increasingly complex challenges emerged, the limitations of the linear model – from theory to practice – became evident. Boundaries between fundamental knowledge and technological application proved porous: many theoretical discoveries arose from practical problems, while technical solutions, in turn, challenged theoretical understanding. UITR thus emerged as an epistemological approach intended to transcend the opposition between pure and applied science.

In this context, Gibbons et al. (1994) developed the concept of Mode 2 knowledge production – an interdisciplinary, heterarchical, and contextualized pattern. Unlike Mode 1, which is narrow and discipline-based, Mode 2 is characterized by the production of knowledge in contexts of application, in which theory and practice develop through continuous dialogue.

Latour (2000) subsequently presented science as the product of complex networks – networked science – involving laboratories, industries, governments, and social actors. Nowotny, Scott, and Gibbons (2001), in turn, emphasized the increasing contextualization of knowledge and its socially defined value. Ziman (2000) further argued that applied science, far from being inferior, is an integral part of contemporary scientific dynamics because it translates knowledge into real-world impact. Within this new model, the rigid distinction between pure research, motivated by curiosity, and applied research, motivated by practical problems, begins to dissolve.

The most prominent epistemological contribution within this body of scholarship was offered by Stokes (2005) in *Pasteur's Quadrant: Basic Science and Technological Innovation*. Stokes proposed a two-dimensional matrix for classifying scientific research along two axes: the quest for fundamental understanding on the vertical axis and consideration of use on the horizontal axis. The matrix comprises four quadrants:

- pure basic research, which seeks understanding without immediate use;
- pure applied research, which seeks immediate use without theoretical understanding;
- use-inspired basic research, which integrates theoretical inquiry with application; and

- a residual fourth quadrant comprising less significant activities.

Stokes (2005) demonstrated that theory and practice are not mutually exclusive. The work of Louis Pasteur is emblematic: his investigations into fermentation and microorganisms solved practical problems in industry and public health while simultaneously establishing the theoretical foundations of microbiology. As Stokes (2005) argued, scientists may pursue both fundamental understanding and the practical application of their discoveries.

UITR occupies a particularly advantageous position within Pasteur's Quadrant. It avoids reducing science to a merely utilitarian endeavor or isolating it within abstractions disconnected from reality. Instead, it emphasizes the formulation of robust theories that emerge from concrete needs, are empirically validated in real-world contexts, and are ultimately generalized to similar situations.

This model recognizes the inevitable interdependence between understanding and use. This proposition closely aligns with the transition from linear science to contextualized, interdisciplinary, and socially integrated knowledge – the most productive contemporary epistemological framework for understanding science in all its practical and theoretical complexity.

3 Academic graduate education

Brazilian *stricto sensu* graduate education, structured into programs offering master's and doctoral degrees, has become one of the pillars of advanced education in the country since the second half of the twentieth century, particularly beginning in the 1960s and 1970s. Its origins can be traced to an institutional structure inspired by the US model and to the first regulations introduced in the 1960s, including the landmark CFE Opinion No. 977/1965 (Brasil, 1965), which established the regulatory foundations of the national system. Since then, graduate education has become a vital setting for scientific production and the training of academic personnel, directly contributing to the consolidation of research in Brazil (Cunha, 2007; Rodrigues; Grubba, 2023).

However, the system's evolution has revealed a persistent tension: the division between academic and professional graduate education. This distinction was explicitly incorporated into more recent regulations, particularly MEC Ordinance No. 389/2017, CNE/CES Resolution No. 7 (Brasil, 2017), and CAPES Ordinance No. 60 (Brasil, 2019), which more clearly established the characteristics and purposes of professional master's and doctoral degrees, as opposed to those offered through academic programs. Although intended to serve an operational purpose, this distinction is partly artificial because it disregards the complex interaction between theory and practice in knowledge production.

This section and the following two sections seek to demonstrate that the academic–professional dichotomy may be insufficient to describe the realities of graduate education and may become an obstacle to scientific and educational innovation. To this end, the analysis draws on UITR, an epistemological approach inspired by Stokes (2005) and Pasteur's Quadrant that points toward overcoming the rigid opposition between pure and applied science.

In Brazil, CFE Opinion No. 977 (Brasil, 1965) did not explicitly refer to this division. Its focus was on preparing faculty members for higher education and consolidating scientific research. Emphasis was placed on the ideal of academic graduate education as a means of establishing Brazil's emerging scientific community. Professional training was viewed with reservation, as though it represented a departure from the core purpose of university research (Balbachevsky, 2005).

In subsequent decades, however, the expansion of the system and growing demand for advanced training in different sectors of the economy and public administration created room for another type of program. Professional master's programs emerged in this context and were initially recognized under CAPES Ordinance No. 80 (Brasil, 1998). Their stated purpose was to bring graduate education closer to societal and workplace demands, enabling qualified professionals to develop solutions to concrete problems within an academic environment.

Nevertheless, the distinction between academic and professional programs became entrenched more as a regulatory opposition than as an accurate description of reality. Academic programs across various fields have always maintained strong ties to social and professional practice, just as professional programs have continued to produce research with theoretical impact. Engineering, health, education, and law, among other fields, provide examples of this interaction. The dichotomy is therefore predominantly institutional and artificial, arising more from regulatory and evaluation requirements than from the actual dynamics of scientific production.

Academic master's and doctoral programs emphasize the production of original knowledge, rigorous methodological training, and the international reach of research. This model was inherited from the European university tradition, which values science as a disinterested endeavor primarily aimed at expanding the boundaries of knowledge.

Academic graduate education was conceived as the principal pathway for preparing higher education faculty and researchers to consolidate national science and was characterized primarily by its theoretical dimension. More recent CAPES documents, particularly the Reference Document for the 2025-2028 Continuing Evaluation Cycle (Brasil, 2025a), have increasingly emphasized dimensions such as social impact, engagement, innovation, internationalization, and research relevance, including for academic programs. This shift demonstrates a growing convergence between theoretical rigor and the concrete needs of society.

Nevertheless, the academic model is subject to recurring criticism. One concern is academic inbreeding – i.e., the tendency to train faculty members to work within academia itself without sufficient engagement with broader societal needs. This insularity may create a disconnect between theory and practice, producing research that demonstrates a high degree of formal rigor but has limited impact.

This criticism also resonates in the international debate. Ziman (2000) argued that contemporary science can no longer sustain itself solely as academic science because it must respond to external pressures related to utility, funding, and social legitimacy. Similarly, Gibbons et al. (1994) highlighted the emergence of Mode 2 knowledge production, which is interdisciplinary and contextualized, in contrast to the discipline-based and inward-looking nature of Mode 1.

Another challenge facing academic graduate education lies in the tension between the pursuit of universality and the demand for social relevance. On the one hand, research is expected to be rigorous and theoretically and methodologically sound, thereby contributing to international debate. On the other hand, it is expected to engage with national problems and offer concrete solutions for public policy, technological development, and social inclusion.

This dilemma reflects what Stokes (2005) characterized as the opposition between Bohr's Quadrant, representing pure basic science, and Pasteur's Quadrant, representing use-inspired basic science. Many academic programs move between these two positions, demonstrating that the very notion of what constitutes "academic" research is not free from ambiguity.

Finally, academic graduate education has also been criticized for its evaluation model. Particularly since the 2000s, CAPES has implemented heavily quantitative metrics, such as the number of articles, impact factors, and journal indexing, which may encourage mechanistic productivity at the expense of quality or genuine innovation (Rodrigues, 2025). This quantitative approach began shifting toward a more qualitative model during the 2021-2024 four-year evaluation cycle (Brasil, s.d.), a trend reinforced for the 2025-2028 cycle (Brasil, 2025a, 2025b), although quantitative measures have not been entirely abandoned.

The reformulation of CAPES evaluation instruments for the 2025-2028 cycle (Brasil, 2025b) thus demonstrates a gradual movement beyond an exclusively quantitative approach. The Common Guidelines for the Continuing Evaluation of *Stricto Sensu* Graduate Programs (Brasil, 2025a) place greater and more explicit emphasis on qualitative dimensions related to the social relevance of research, the impact of academic outputs, the institutional and regional engagement of programs, internationalization, innovation, and self-evaluation processes. The new model also underscores the need for alignment among program objectives, student training, scholarly output, and social contributions, partially shifting the focus from merely counting outputs toward a broader analysis of the quality and effects of the research produced.

Despite this progress, the evaluation model remains significantly dependent on quantitative and bibliometric indicators, particularly those associated with scholarly output and the international circulation of publications. The system is therefore undergoing a transition in which traditional productivity criteria coexist with new requirements concerning social impact and research relevance. This development, albeit only partially, aligns with epistemological perspectives advocating greater integration between theoretical rigor and concrete societal problems. It also reinforces the perception that the evaluation structure of Brazilian graduate education is beginning to recognize the limitations of rigid dichotomies between theoretical knowledge production and its practical application.

Thus, although academic graduate education has consolidated research in Brazil and raised quality standards, it also faces limitations arising from its own structure, including academic inbreeding, excessive formalism, and difficulties engaging with society. These weaknesses become more apparent when compared with the potential of professional programs, which will be discussed in the next section.

4 Professional graduate education

Professional graduate education was officially established in Brazil through CAPES Ordinance No. 80 (Brasil, 1998), which recognized professional master's programs as a legitimate modality within the *stricto sensu* system. Its stated objective was to serve sectors of society that required advanced training aimed not exclusively at university teaching but also at the practical application of knowledge in professional settings.

Over following decades, regulatory framework gradually expanded, reaching greater maturity with CAPES Ordinance No. 60 (Brasil, 2019), which also recognized professional doctoral programs. This ordinance and other regulations currently governing the subject emphasize that these programs must maintain scientific rigor while focusing on problems arising from the world of work.

From this perspective, the main strength of professional graduate education lies precisely in its capacity to connect scientific knowledge with society's concrete needs. Professional programs seek to prepare master's- and doctoral-level professionals capable of solving complex practical problems in both the public and private sectors.

In law, for example, projects associated with professional master's programs have addressed topics such as Consensual Dispute Resolution Methods (UFSC, s.d.) and Law and Entrepreneurship (FGV, s.d.), in which applied research provides technical and legal support for practical decision-making. Moreover, these studies often produce innovative conceptual models that transcend their specific contexts and contribute to the development of a broader legal theory.

Despite their importance, professional programs still face a degree of academic prejudice. They are frequently accused, for example, of being lower in quality because they do not prioritize the production of theoretically oriented theses and dissertations (Rodrigues, 2025). This perception, however, is misguided. The CAPES evaluation criteria for professional programs (Brasil, 2025a, 2025b) require methodological rigor, scientific output, and social engagement.

Accordingly, the evaluation of professional graduate education in the 2025-2028 CAPES cycle reflects a movement toward consolidating this modality as a legitimate setting for the production of advanced, socially oriented knowledge. The new evaluation guidelines reinforce the requirements of scientific rigor and high-quality student education while assigning greater importance to dimensions such as social impact, innovation, knowledge transfer, institutional engagement, applicability of findings, and interaction with public- and private-sector organizations (Brasil, 2025a; 2025b). In this context, technical and technological products, institutional solutions, and the development of methodologies, protocols, processes, and intervention tools are more consistently recognized as legitimate outcomes of *stricto sensu* research.

This evaluation model reveals a significant transformation in the institutional understanding of science and graduate education in Brazil. Evaluation is no longer based exclusively on traditional bibliometric indicators and has begun to recognize forms of knowledge production linked to concrete problems and contexts of use. Although the distinction between academic and professional modalities remains formally in place, CAPES documents indicate a gradual convergence of theoretical rigor, social relevance, and research applicability, aligning with epistemological perspectives that recognize the interdependence of theory and practice in contemporary scientific production (Brasil, 2025a; 2025b).

The difference between academic and professional graduate education therefore lies not in quality but in purpose: whereas academic programs primarily seek to advance theoretical knowledge, professional programs focus particularly on developing solutions with direct impact. These are two complementary emphases rather than hierarchically organized modalities.

Despite the progress achieved by this modality, one problem persists: the perception that its creation has intensified the fragmentation of the system. In other words, rather than strengthening the unity of graduate education, CAPES may have institutionalized a division that bears little relation to actual research practices, in which the boundaries between theory and use are continually challenged (Bianchetti; Machado, 2006).

This criticism is echoed in the experiences of the programs themselves: some academic master's and doctoral programs conduct research with immediate applications, whereas some professional programs refine or develop theoretical models or integrate theoretical and applied research. The dividing line between the two is therefore more regulatory than epistemological.

5 Academic versus professional graduate education: potential artificiality from the perspective of uitr

At the regulatory level, the division between academic and professional graduate education is presented as though it were an objective reality. However, an examination of the dynamics of knowledge production reveals that this dichotomy is, at least in part, questionable or even false.

Academic research in fields such as engineering, health, education, and law sometimes produces findings with immediate applications. Conversely, professional research must draw on theoretical frameworks and often supplements or develops conceptual models that transcend the specific contexts from which they originated. The practices of both types of programs therefore frequently overlap, revealing that the division may be artificial and grounded more in formal classifications than in actual differences.

Another problem is the hierarchical perception that has become entrenched over time: academic graduate education is regarded as more prestigious, whereas professional graduate education is considered secondary. This view, however, is unsupported by contemporary scientific production. On the contrary, the literature points to a growing need to integrate pure and applied science, a phenomenon already identified internationally by Gibbons et al. (1994), Latour (2000), and Ziman (2000).

This dichotomy also affects evaluation and funding mechanisms. Academic programs tend to be assessed primarily through bibliometric metrics, including articles, journals, and citations, whereas professional programs are expected to demonstrate social impact. In this respect, it is important to note that recent evaluations have increasingly required academic programs to demonstrate social impact as well (Rodrigues, 2025). This separation creates distortions: internationally influential articles produced by professional programs may be undervalued, just as innovative solutions developed by academic programs may not receive appropriate recognition. The rigid dichotomy therefore not only fails to describe reality but may also hinder an integrated evaluation of Brazilian graduate education.

UITR offers an innovative analytical framework for addressing this issue. Inspired by Stokes's (2005) Pasteur's Quadrant, UITR seeks to transcend the opposition between basic and applied science by demonstrating that scientific production can simultaneously pursue fundamental understanding and respond to concrete problems.

UITR is based on the premise that theory and practice are not mutually exclusive poles but interdependent dimensions of research. Rather than classifying science as either pure or applied, it understands science as a problem-oriented process in which theoretical rigor is tested and validated in concrete contexts of use. This perspective also resembles the Popperian notion of piecemeal social engineering, according to which institutional transformations and public policies should be implemented gradually and experimentally, remain subject to critical revision, and undergo continuous evaluation based on their concrete outcomes (Popper, 1980).

This approach aligns with Popper (1972) by emphasizing the fallible and conjectural nature of knowledge, which develops through trial and error, and with Ziman (2000) by recognizing that contemporary science is increasingly post-academic, contextualized, and socially responsible. In this sense, the adoption of theories in public policy, accompanied by empirical monitoring and opportunities for institutional correction, reinforces the idea that scientific knowledge is consolidated not only through the abstract coherence of its models but also through its capacity to respond critically to society's concrete problems.

In Stokes's (2005) model, UITR belongs to Pasteur's Quadrant, which combines the pursuit of fundamental understanding with consideration of practical use. The paradigmatic example is Louis Pasteur himself, whose research sought to solve industrial and public health problems while simultaneously establishing enduring theoretical foundations for microbiology.

Similarly, applying UITR to graduate education recognizes that a thesis or dissertation may arise from a concrete problem, such as reducing court delays or developing new educational technologies, while simultaneously producing theory relevant to other contexts.

When UITR is adopted as an analytical lens, the distinction between academic and professional programs loses much of its legitimacy. In both cases, research is often guided by real-world problems and validated at both the theoretical and practical levels. Indeed, academic and professional programs alike may produce UITR without sacrificing rigor or relevance.

In Brazil, concrete examples of research aligned with UITR can already be identified, even when they are not described in these terms.

In education, theses and dissertations produced by both academic and professional programs have sought solutions to concrete pedagogical problems while simultaneously formulating theories applicable to other contexts. Research on active learning methodologies, literacy in vulnerable settings, and digital learning technologies has therefore produced knowledge with both empirical validity and theoretical relevance (Rodrigues, 2025).

In public health, professional programs associated with Brazil's Unified Health System (SUS) have developed care protocols and management models that, in addition to producing an immediate impact, have been adopted by academic programs as theoretical frameworks for further research (Rodrigues, 2025). In such cases, theory emerges from concrete problems, thereby validating the very concept of UTR.

Within this context, Brazilian public policies incorporating the theoretical concept of food and nutrition security are significant examples of UTR. Although this concept is rooted in academic debates in economics and public health, its theoretical strength increased when it was incorporated into programs such as Zero Hunger, implemented in the early 2000s, and institutionalized through the National Food and Nutrition Security System (SISAN) (MDS, s.d.). This process required policymakers to translate the abstract idea of the human right to adequate food into concrete policies aimed at increasing access to food, strengthening family farming, and creating participatory councils. From the perspective of UTR, this is a paradigmatic case: theory was reconstructed through implementation while simultaneously providing conceptual frameworks to guide practical decisions. This was therefore not merely an application of theory but a conceptual reformulation arising from use, reinforcing the bidimensional nature of UTR.

The concept of citizenship also clearly illustrates the logic of UTR. Traditionally discussed in philosophical and legal terms, it acquired new dimensions when incorporated into public policies promoting inclusion and social participation. Institutions and initiatives such as public policy councils, participatory budgeting in Brazilian cities, and participatory democracy initiatives in other Latin American countries illustrate how citizenship has been reshaped through practice (Rodrigues, 2025). These experiences show that citizenship cannot be understood solely as a legal status but must also be viewed as a social practice of continuous participation. From the perspective of UTR, this confirms that the concept is strengthened precisely when it is mobilized in concrete arenas, where it is challenged, redefined, and validated. Citizenship thus ceases to be an abstraction and becomes a theory continually reconstructed through social use.

In public health, the concept of Social Determinants of Health (SDH) (FIOCRUZ, s.d.) has been incorporated into SUS policies. This concept emerged from epidemiological and sociological research demonstrating how income, education, housing, and working conditions directly influence health outcomes. Its incorporation into public policy occurred, for example, through the National Commission on Social Determinants of Health (CNDSS), which operated from 2006 to 2008 (FIOCRUZ, 2006). When applied, the concept necessarily had to be adapted to the specific characteristics of the Brazilian health system, generating new ways of understanding and addressing health inequalities. From the perspective of UTR, this is an exemplary case because it demonstrates how an initially academic theory was validated and expanded through its practical circulation, becoming more complex and socially relevant.

A similar movement can be observed internationally. In the United States and Europe, applied research in engineering, artificial intelligence (AI), and environmental sciences generates theoretical advances that feed back into fundamental science (Rodrigues, 2025). Projects funded by the European Union (EU) under the Horizon 2020 program (EU, 2020), for example, have demonstrated how integrating academic research with practical solutions can produce not only technological innovation but also robust theories of sustainability, global governance, and digital regulation. Use-inspired research, as proposed by Stokes (2005), is already an established practice in universities and innovation centers.

At the international level, UTR finds paradigmatic examples in which theoretically developed concepts are adopted, reformulated, and tested in contexts of use. The concept of "sustainable development" is perhaps one of the most emblematic cases of the incorporation of theory into public policy. Initially formulated in the report *Our Common Future* (UN, 1987, 1991) and subsequently consolidated through interdisciplinary academic debate, the concept sought to reconcile economic growth, environmental protection, and social justice. Its true consolidation, however, occurred when it was incorporated into national policies and multilateral initiatives, such as the United Nations Sustainable Development Goals (SDGs) (UN, 2015). From the perspective of UTR, this is a typical example because it demonstrates that theory did not remain abstract; rather, it was reformulated through its application in environmental, social, and economic programs across different countries, gaining explanatory strength and legitimacy.

through practice. Sustainable development therefore became a normative concept that is continually challenged by differing contexts and, precisely for this reason, has been enriched in both its theoretical and social dimensions.

These examples indicate that UITR can serve as a point of convergence between academic and professional graduate education. By addressing concrete problems without sacrificing theoretical rigor, it dissolves the artificiality of the dichotomy and creates space for a more integrated understanding of science.

Within this context, CAPES plays a central role in regulating and evaluating Brazilian graduate education. Its evaluation guidelines for the 2025-2028 cycle (Brasil, 2025a, 2025b) have already incorporated dimensions such as social impact and innovation into the evaluation of academic graduate education, demonstrating an alignment with the principles of UITR. Nevertheless, the rigid separation between academic and professional modalities continues to pose challenges: each is evaluated, at least in part, according to different metrics, reinforcing the perception of a hierarchy.

The explicit incorporation of UITR could lead to a revision of the evaluation model. This would make it possible to recognize that both academic theses and professional outputs can produce relevant theoretical knowledge and significant social impact.

The Brazilian National Education Guidelines and Framework Law (Brasil, 1996) does not fundamentally distinguish between academic and professional graduate education. This differentiation was established through the regulatory practices of MEC, CAPES, and CNE. CNE/CES Resolution No. 7 (Brasil, 2017), for example, reinforces that both types of programs belong to the same *stricto sensu* system.

Accordingly, no insurmountable legal barrier exists between the two modalities. The distinction is primarily operational and evaluative, making it possible to incorporate UITR as a unifying framework.

In terms of funding, projects associated with academic programs are often prioritized in calls for fundamental research proposals, whereas professional programs tend to seek support through agreements with public- and private-sector organizations. An approach inspired by UITR could generate hybrid funding models that recognize the value of projects integrating theory and practice while promoting the greater international integration of Brazilian graduate education and aligning it with global trends.

The first step toward overcoming the dichotomy is to recognize that knowledge production increasingly follows the model of contextualized science (Gibbons et al., 1994; Ziman, 2000). From this perspective, theory and practice are not separate stages but interdependent dimensions. UITR therefore provides the epistemological foundation for this integration.

CAPES must adopt evaluation criteria that not only accommodate but also value use-inspired research in academic programs and theoretically robust research in professional programs. This requires moving beyond predominantly bibliometric metrics and expanding qualitative dimensions such as social impact, innovation, and relevance.

Overcoming the dichotomy also requires encouraging interdisciplinarity, one of the defining features of Mode 2 knowledge production. By connecting theory and use, UITR naturally requires collaboration among different fields. Policies that support interdisciplinary projects can therefore help dismantle regulatory barriers.

Finally, universities, funding agencies, and regulatory bodies must recognize the artificial nature of this dichotomy across many *stricto sensu* graduate programs. Adopting UITR as a conceptual framework could support the development of policies that focus less on formal classifications and more on research quality and impact.

Although the division between academic and professional graduate education may be useful in certain administrative contexts, it is insufficient to describe contemporary scientific practice. Academic programs frequently produce findings with immediate applications, whereas professional programs contribute to the development of theoretical models with the potential for generalization.

Within this context, UITR provides an epistemological framework for overcoming this dichotomy. By affirming the simultaneous relationship between theory and practice, it aligns with the contributions of Stokes (2005), Ziman (2000), Gibbons et al. (1994), and Nowotny, Scott, and Gibbons (2001). In Brazil, its incorporation could guide the revision of CAPES evaluation criteria, promote greater alignment among funding policies, and strengthen the international integration of graduate education.

Recognizing UITR as a framework therefore entails understanding *stricto sensu* graduate education, regardless of modality, as an integrated setting for the production of rigorous, innovative, socially relevant, and theoretically sound knowledge. Overcoming the academic-professional dichotomy does not eliminate institutional specificities but

demonstrates that both modalities participate in the same process: building a science guided by concrete problems, empirically validated, and committed to society's needs.

Accordingly, the convergence between UITR and the documents governing the new CAPES evaluation cycle for 2025-2028 demonstrates a significant transformation in the institutional understanding of research and graduate education in Brazil. The new evaluation guidelines emphasize dimensions such as social impact, engagement, innovation, internationalization, self-evaluation, and alignment among education, scholarly output, and the social relevance of research (Brasil, 2025a, 2025b). Although CAPES does not explicitly use the category of UITR, this multidimensional evaluation model significantly converges with an epistemological understanding according to which scientific production can be reduced neither to the abstract logic of science detached from reality nor to the instrumental application of knowledge.

In this context, UITR provides not only a theoretical framework for understanding the partly artificial nature of the dichotomy between academic and professional graduate education but also a means of interpreting the institutional changes currently underway in the Brazilian graduate education evaluation system. By simultaneously valuing theoretical depth, social relevance, innovation, and concrete impact, the new evaluation cycle approaches the concept of problem-oriented research characteristic of Stokes's (2005) Pasteur's Quadrant. This suggests that Brazilian science policy is beginning to recognize, albeit gradually and partially, that theory and practice are interdependent dimensions of knowledge production, particularly in fields such as law, in which scientific research develops through an ongoing dialogue with concrete institutional and social needs.

6 UITR, legal research, and graduate education in law

The production of legal knowledge in Brazil and elsewhere has historically moved between two poles. On the one hand, theory has been valued as an abstract and systematic construct intended to explain legal phenomena in terms of their internal coherence. On the other hand, practice has been valued as an immediate response to society's concrete and urgent problems.

This opposition, however, is insufficient to describe the complexity of contemporary research, particularly the distinctive role of law. UITR emerges in this context as a methodological perspective intended to transcend reductionist approaches by recognizing that theory achieves its full vitality only when it engages with the social, institutional, and regulatory challenges that call it into question.

As discussed above, UITR is based on the premise that scientific research cannot be reduced to two extremes – pure speculation or immediate application – but must integrate conceptual depth and practical relevance. In law, this relationship is particularly evident because legal studies simultaneously describe an institutional past, interpret current rules, and establish guidelines for future conduct.

This distinctive characteristic had already been highlighted by the philosophy of science, which placed law in a boundary position as neither strictly theoretical nor merely practical. At the same time, more recent critical epistemologies, such as the complexity approach (Rodrigues; Grubba, 2012, 2023), indicate that legal research can be fully realized only when it recognizes the coexistence of theoretical, axiological, and empirical dimensions.

In this regard, the contribution of UITR can be better understood when situated within the debate on the nature of science. Whereas the traditional positivist paradigm sought to draw a rigid distinction between theory and application, regarding theory as an autonomous stage of validation, more recent perspectives emphasize that knowledge is constructed in contexts of use.

As previously noted, Stokes (2005), in proposing the well-known Pasteur's Quadrant, emphasized that research driven by an interest in fundamental understanding may also be guided by considerations of use. UITR reflects this insight but extends it to the normative domain: in law, the objective is not merely to apply discoveries but to formulate theories that are oriented from the outset toward concrete social needs, such as ensuring the effectiveness of fundamental rights, democratizing public administration, and improving the administration of justice.

This point is important because it challenges the view that reduces legal doctrine to an instrumental technique and disregards the plurality of legal studies and their different ways of integrating theory, empirical evidence, critique, and application. UITR values theory but reconceptualizes it as a setting for conceptual development that must remain attentive to problems arising from reality. The study of constitutional principles, for example, is not limited to doctrinal

reconstruction but also involves examining how these principles operate in practice within public policies, structural litigation, and the mediation of social conflicts. This dynamic allows theory to remain both critical and relevant.

The Brazilian legal research tradition has consolidated two major approaches: the doctrinal approach, centered on the systematic interpretation of the legal system, and the critical approach, which focuses on the sociological, philosophical, or political analysis of legal phenomena. Both have undeniable value but reveal limitations when pursued in isolation. The doctrinal approach risks becoming self-referential and incapable of engaging with urgent social problems. The critical approach, in turn, may lose contact with legal practice and policy and with the need for workable normative solutions.

UITR seeks to overcome this dichotomy through integration rather than denial. It maintains that, at least in part, theoretical research should be guided by problems of use – i.e., it should respond to concrete questions without abandoning rigorous conceptual development. Rather than opposing theory and practice, UITR therefore proposes that practice serve as a criterion for the relevance of theory. The issue is not whether research is applied, but how it connects its reflective depth to problems requiring normative solutions.

This perspective has a direct impact on the structure of *stricto sensu* graduate education in law. Since CAPES Ordinance No. 80 (Brasil, 1998) officially recognized professional master's programs, the field of law has engaged in a lengthy debate over the implementation of this modality. In the context of the coexistence of academic and professional modalities, law took longer than other fields of knowledge to adopt professional programs.

As discussed above, academic master's and doctoral programs were traditionally assigned the task of preparing faculty members and researchers, whereas professional master's programs were intended to prepare professionals for the labor market and public administration. This division, however, created implicit hierarchies that regarded academic programs as more prestigious and professional programs as focused solely on practice.

UITR makes it possible to reinterpret this division. If legal research must, in some way, be guided by problems of use, then both academic and professional programs can adopt robust methodologies that integrate theory and practice. The distinction between the modalities therefore does not lie in the degree of theoretical rigor but in the emphasis each places on the type of problem addressed and the form of social contribution it provides. An academic master's program can, and should, produce research with practical impact, just as a professional master's program must be grounded in sound theoretical reflection.

This discussion has become even more relevant with the possibility of professional doctoral programs. Although some members of the legal community fear a dilution of scientific research, UITR indicates that the appropriate criterion of quality is not the institutional modality but the capacity of each study to produce theory connected to concrete problems. This entails valuing both conceptual sophistication and social applicability, criteria that are equally relevant to CAPES evaluation policy.

Another relevant aspect is the relationship between UITR and the constitutional mission of higher education. Article 205 of the 1988 Federal Constitution defines education as a right of all people and a duty of the state, aimed at the full development of the individual, preparation for citizenship, and qualification for work (Brasil, 1988). In graduate education in law, this mission is expressed through a commitment to preparing researchers capable of contributing to the consolidation of the democratic rule of law, the promotion of social justice, and the protection of human rights. By orienting theory toward use, UITR strengthens this civic dimension of research and prevents the knowledge produced from being confined to internal debates or theoretical formulations detached from reality.

In this respect, the proposal also approaches the epistemologies of science in context (Ziman, 2000), which emphasize that the legitimacy of knowledge depends on its capacity to engage with social needs. This idea is particularly significant in law: legal theories are not contemplative exercises but intellectual activities that affect people's lives by regulating relationships, guaranteeing rights, and structuring institutions.

The development of UITR in law therefore represents progress in how research is understood and graduate education is organized. Rather than maintaining rigid divisions between academic and professional programs, theory and practice, or doctrinal and critical approaches, UITR proposes a synthesis that preserves the reflective depth of theory without relinquishing practical relevance. It thereby contributes to redefining evaluation criteria, strengthening the social legitimacy of legal research, and preparing new generations of researchers who are better equipped to address contemporary challenges.

The convergence between UITR and the most recent CAPES documents governing the field of law demonstrates that the regulation of Brazilian graduate legal education is beginning, albeit implicitly, to incorporate a less dichotomous

understanding of knowledge production. The Guidance Document for New Course Proposals (APCN) in law for the 2025–2028 cycle emphasizes the need for alignment among program objectives, social engagement, research impact, internationalization, student education, and the institutional relevance of the research conducted (Brasil, 2025c). At the same time, the evaluation forms for academic and professional programs in law have begun to place greater and more explicit value on innovation, social impact, engagement with institutional needs, and the quality of scientific education, indicating a more integrated understanding of theoretical development and society's concrete problems (Brasil, 2025d).

This development aligns with the epistemological logic of UTR. Although CAPES documents for the field of law preserve the formal distinction between academic and professional modalities, their qualitative evaluation criteria show increasing convergence, particularly regarding the social relevance of research, the production of innovative knowledge, and the capacity to connect theoretical depth with institutional application. In other words, contemporary CAPES evaluation standards are beginning to recognize that legal research cannot be adequately understood through a rigid separation between theory and practice but should instead be viewed as an intellectual activity developed through ongoing dialogue with concrete normative, institutional, and social problems.

This convergence is particularly relevant in law because legal studies may simultaneously be interpretive, critical, and forward-looking. Legal theory is therefore not limited to an abstract description of the legal system but seeks to guide decisions, structure institutions, formulate public policies, and offer responses to complex social conflicts. In this context, UTR provides an epistemological framework particularly well suited to understanding graduate education in law as an integrated setting for rigorous conceptual development and qualified social intervention, in alignment with the transformations that are beginning to emerge in contemporary CAPES evaluation instruments for the field of law (Brasil, 2025c, 2025d).

7 Conclusão

This study's conclusion revisits the analytical path developed throughout the investigation by integrating its epistemological and institutional dimensions. By examining the dichotomies between basic and applied science and between academic and professional graduate education, the study sought to demonstrate that these distinctions, although historically relevant, do not adequately describe the contemporary dynamics of scientific production, particularly in law.

The first section demonstrated that the traditional separation between basic and applied science, consolidated in the postwar period, has become increasingly insufficient for understanding current scientific practice. The emergence of UTR demonstrated that theory and application are not isolated spheres but interdependent dimensions of knowledge production, which develops in concrete contexts of use.

The second section analyzed academic graduate education, highlighting its fundamental role in consolidating scientific research in Brazil as well as its limitations, particularly its tendency toward academic inbreeding and its difficulty engaging more directly with social needs. Although this modality is structured around theoretical production, it incorporates practical dimensions that already challenge the traditional dichotomy.

The third section examined professional graduate education and demonstrated its importance in connecting scientific knowledge with concrete problems. Far from representing an inferior form of scientific production, this modality also requires theoretical rigor and contributes to updating and formulating conceptual models, demonstrating that its distinction from academic graduate education lies more in emphasis than in the nature of the research itself.

The fourth section demonstrated that the separation between academic and professional graduate education is at least partly artificial because research practices reveal constant overlap between the two, even though institutional evaluation and funding mechanisms reinforce distinctions that do not fully correspond to scientific reality. Within this context, UTR was presented as a framework for explaining and overcoming this dichotomy. Drawing on Pasteur's Quadrant, it demonstrated that scientific production can simultaneously seek theoretical understanding and respond to concrete problems, thereby allowing graduate education to be reinterpreted as an integrated setting for problem-oriented knowledge production.

The fifth section further developed this perspective in law, finding that the plurality of legal studies – which encompass interpretive, systematizing, empirical, applied, and norm-prescriptive approaches – makes any rigid

separation between theory and practice questionable. In this context, UITR proved particularly appropriate for understanding legal research as an activity that is both theoretical and oriented toward use.

The study concludes that both the distinction between basic and applied science and the division between academic and professional graduate education are historical and institutional constructs that do not fully reflect the contemporary reality of scientific production. Science develops in contexts of use, and graduate education, regardless of its formal classification, shares the same purpose of integrating theoretical rigor and practical relevance. This interdependence is even more evident in law because, by its very nature, theoretical development is already oriented toward solving normative and social problems.

The study makes contributions at several levels. At the theoretical level, it brings epistemology and the theory of science into closer dialogue with education policy, offering an integrated interpretation of graduate education through UITR. At the analytical level, it demonstrates the largely artificial nature of established dichotomies and proposes a critical reinterpretation of the categories that structure understandings of science and advanced education. At the institutional level, it provides a foundation for revising evaluation and funding criteria, particularly within CAPES, and recommends recognizing the value of research that integrates theoretical depth and social impact. At the practical level, it guides researchers, faculty members, and administrators in formulating more integrated projects capable of meeting both scientific requirements and social needs.

Finally, the study reaffirms that overcoming rigid dichotomies does not entail eliminating the differences among educational modalities but recognizing that they all participate in the same process of knowledge production. Adopting UITR as a framework therefore allows graduate education to be understood as an integrated setting in which theory and practice mutually reinforce one another, contributing to a more coherent and socially relevant science that is institutionally aligned with contemporary challenges.

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