





# Satisfaction in a Spanish international and interdisciplinary doctoral studies: the impact of motivation, critical thinking, and academic engagement

*La satisfacción en un doctorado español internacional e interdisciplinar: el impacto de la motivación, el pensamiento crítico y el engagement académico*

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## Abstract

This paper explores the factors that affect the satisfaction of doctoral students, making a special emphasis and focus on subjective variables such as motivation, critical thinking and academic engagement, aspects that have been scarcely addressed in previous literature. In the context of the growing significance of doctoral studies for academic and institutional development, this study aims to identify the motivations underlying the pursuit and choice of a doctoral program and the different types of critical thinking that students possess. Additionally, it seeks to explore how these factors interact with each other and how they impact the academic experience of doctoral students in a differentiated way. The research was conducted at a public Spanish university using a mixed-method approach that included semi-structured interviews and surveys administered to doctoral students. The findings reveal that learning motivation and academic engagement are crucial determinants of students' satisfaction with their doctoral studies. Furthermore, and while most critical thinking dimensions do not have a direct impact on the doctoral student's satisfaction, perceived utility does exert a notable effect on satisfaction. Results provide valuable practical implications for doctoral program managers, who may implement strategies to enhance students' experience, thereby contributing to the improvement of doctoral training.

**Keywords:** doctoral studies, student satisfaction, motivation, academic engagement, critical thinking, interdisciplinary.

## Resumen

El presente trabajo explora los factores que inciden en la satisfacción de estudiantes de doctorado, con especial atención a variables subjetivas como la motivación, el pensamiento crítico y el *engagement* académico, aspectos escasamente abordados en la literatura previa. En un contexto de creciente importancia de los estudios de doctorado para el desarrollo académico e institucional, este estudio tiene como objetivo identificar las motivaciones que subyacen en la realización y elección de un doctorado y en los distintos tipos de pensamiento crítico que poseen los estudiantes. Asimismo, se busca explorar cómo estos factores interactúan entre sí y cómo impactan de manera diferenciada en la experiencia académica de los doctorandos. La investigación se llevó a cabo en una universidad pública española, utilizando un enfoque metodológico mixto que incluyó entrevistas semiestructuradas y encuestas aplicadas a estudiantes de programas de doctorado. Los hallazgos revelan que la motivación de aprendizaje y el *engagement* académico son determinantes cruciales para la satisfacción del estudiantado con el doctorado. Los análisis muestran que, si bien la mayoría de las dimensiones del pensamiento crítico no tienen un impacto directo en la satisfacción, sí lo tiene la dimensión de utilidad percibida. Estos resultados ofrecen implicaciones prácticas para la gestión de los programas de doctorado, ya que permiten diseñar estrategias orientadas a mejorar la experiencia del estudiantado y, con ello, fortalecer la calidad de la formación doctoral.

**Palabras clave:** doctorado, satisfacción de estudiantes, motivación, *engagement* académico, pensamiento crítico, interdisciplinar.

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## 1. Introduction

Doctoral studies are a career path for many students who decide to continue their university education or become more involved in an academic career. However, the process of completing a doctorate is often accompanied by various challenges, both personal and academic, which can significantly influence their progress and completion. One of the fundamental elements is the degree of satisfaction with their academic experience, as this factor not only reflects their assessment of the quality of the program, but also influences their commitment, motivation, and overall well-being. Recent literature has shown that such satisfaction cannot be separated from structural factors such as institutional support, the quality of supervision, the organization of the curriculum, and mental health and academic belonging (De la Vega, 2024). Added to this is the need for strategic planning consistent with the academic and professional demands of those pursuing these studies, as Fabara (2012) emphasizes in his analysis of postgraduate education. Understanding which elements influence doctoral satisfaction is therefore essential not only to guide improvements in programs but also to reinforce their role as strategic training elements within contemporary university systems.

### 1.1 Academic satisfaction

Academic satisfaction can be defined as students' evaluation of their educational experiences and their environment (Astin, 1993) and involves an affective response to the educational institution (Yeh and Li, 2009). This assessment integrates cognitive, affective, and contextual components and is mediated by factors such as the perception of quality, the fit between expectations and experience, and the emotional well-being of the student throughout the educational process (Nogueira et al., 2019; Cheng et al., 2016). In the field of higher education, and specifically in doctoral studies, academic satisfaction is a key indicator of educational quality, not only because it reflects students' evaluation of their programs, but also because it is related to their commitment, performance, and psychological well-being during the doctoral process (Cheng et al., 2016; Nogueira et al., 2019). As De la Vega (2024) has pointed out, this variable lies at the intersection between institu-

tional conditions and individual trajectories, acting as a critical measure of educational effectiveness at advanced levels. Likewise, understanding the factors that affect student satisfaction has important implications for universities, as they serve as a basis for implementing improvement measures, increasing the university's effectiveness and competitive advantage. In addition, this understanding allows for progress toward more sustainable and inclusive learning environments that are sensitive to student diversity and their commitment to knowledge (Barrientos de Bojórquez, 2024). In this vein, some studies have analyzed how graduates' assessments contribute to reviewing the educational relevance of graduate programs (Perales-Mejía, 2020).

The literature has shown that satisfaction with a doctoral program is influenced by multiple factors, some related to the context in which it is developed. Thus, it has been observed that satisfaction can vary throughout the stages of the doctorate, decreasing as the program progresses (Cheng et al., 2016), although there do not appear to be significant differences between the satisfaction shown in different academic disciplines (Barnes and Randall, 2012). Other studies point to the type of supervision (Zhao et al., 2007), the training received and the flexibility of the program (Bolliger and Halupa, 2012), interaction with other peers, and even the support that students receive from the academic institution as key aspects that influence satisfaction (Dericks et al., 2019). These structural dimensions are linked to more subjective aspects that also affect the academic experience.

In addition to contextual factors, there are student-related elements that have a crucial impact on satisfaction with the doctoral program but have been studied to a lesser extent. These include motivation, critical thinking, and academic *engagement*, which, although intrinsic to the student, can have a direct impact on academic satisfaction. Despite their relevance, there is little literature exploring how these factors jointly influence satisfaction with doctoral programs, specifically in the Spanish university setting.

### 1.2 Academic motivation

The first aspect, motivation, has been defined as any factor that drives and affects human behavior in relation to the achievement of clear objectives (Renata et al., 2018). Among the theories used to

analyze the motivations or benefits sought by individuals in their behavior are the Uses and Gratifications Theory (Katz et al., 1973)—which posits that individuals choose and decide the media and messages they receive in order to satisfy their own needs and goals— Maslow’s Hierarchy of Needs (1954)—which uses a hierarchy of needs that motivate people, from the most basic, such as physiological needs, to the highest, such as social, esteem, or self-actualization needs—and McClelland’s Motivation Theory (1961)—which identifies the main needs that drive human behavior: achievement, power, and affiliation. All three theories suggest that human motives are primarily oriented toward gratification and satisfaction of the individual. Since Katz et al. (1973) uses and gratifications theory, cognitive, affective, and personal integration motivations have been studied and applied to the study of media use (Ruggiero, 2000). From the perspective of Maslow’s needs, doctoral studies would appeal to self-actualization needs. Finally, following McClelland’s (1961) theory of motivation, there are motivations for achievement, power, and affiliation.

In the academic context, motivation (MA) can be divided into two main types: intrinsic motivation refers to the desire to learn for the pleasure of knowledge itself, while extrinsic motivation is linked to external rewards such as better job opportunities or social recognition (Deci and Ryan, 2000). Both forms of motivation play a crucial role in doctoral students’ satisfaction, as they influence their commitment to the program and how they perceive their academic experience (Mueller et al., 2015). In any case, a motivated student is expected to be engaged in the program and have greater autonomy to manage and make decisions about their academic progress (Mason, 2012). This relationship between motivation, self-regulation, and performance has also been highlighted in recent studies, which analyze how variables such as self-efficacy and procrastination directly influence the academic experience of students (Zumárraga-Espinosa and Cevallos-Pozo, 2022).

In operational terms, four types of motivation have been identified that reflect different aspects of the decision-making process for pursuing a doctorate, which align with the dimensions of the Academic Motivation Scale (AMS) (Vallerand et al., 1992). On the one hand, there is learning-related motivation, which reflects an intrinsic desire to learn and acqui-

re new skills. Those who study for the pleasure of knowledge and a genuine interest in learning show a strong commitment to their studies and tend to experience greater academic satisfaction. Secondly, motivation for professional improvement (extrinsic) can be distinguished. In this case, extrinsically motivated individuals would see the doctorate as a means to achieve employment benefits or better professional opportunities, which may be motivated by the desire for recognition, financial rewards, or better positions in the job market (Berrio-Calle et al., 2022; Smith et al., 2016). Thirdly, motivation for self-improvement and self-actualization has been differentiated. Those who pursue a doctorate as a form of self-improvement and to fulfill self-actualization goals of achieving meaningful goals in their personal and professional lives. Finally, there is the absence of motivation or doubts, “amotivation” or demotivation, a state in which students find no value or purpose in academic activity. According to the AMS, demotivation is related to a lack of interest or the perception that academic activities will not lead to the desired results (Vallerand et al., 1992). However, few studies have explored how the type of motivation impacts satisfaction with a doctoral program in Spanish universities. Recent studies have pointed out that motivation acts as a mediating factor between the demands of the academic environment and the perception of satisfaction, especially when students interpret their efforts as valuable and aligned with their personal and professional goals (De Clercq et al., 2021). This perspective reinforces the need to consider not only the predominant type of motivation, but also its consistency with institutional conditions and the individual trajectories of doctoral students.

### 1.3 Critical thinking

The second factor analyzed is critical thinking (CT), defined as “the art of analyzing and evaluating thinking with a view to improving it” (Richard and Elder, 2011), which is essential in doctoral programs. Previous studies have highlighted that those who perceive an improvement in their critical thinking skills during their doctoral studies experience higher levels of satisfaction, as they feel they are acquiring valuable tools for their professional future (Stubb et al., 2011). Critical thinking, in addition to being a key cognitive skill in academic research, is also linked to a sense of

autonomy and control over the learning process. In this sense, critical thinking is not limited to an instrumental skill, but rather constitutes a component of academic identity that allows students to actively position themselves in relation to knowledge. As highlighted in the literature, the development of critical thinking skills allows students to question, analyze, and critically reflect on the complex problems they face in their doctoral research, fostering greater confidence in their own abilities (Pinto and Olson, 2008).

In this regard, doctoral programs not only foster technical skills, but also promote attitudes such as curiosity, open-mindedness, and constructive skepticism in students, which is essential for doctoral students to develop the ability to reflect independently and improve their performance. In studies with university students, the dimensions of argumentation, analysis/evaluation, and problem solving have been identified (Vendrell-Morancho et al., 2024). Kobylarek et al. (2022) developed a critical thinking questionnaire with different dimensions, although not for university students, and found dimensions of recall, understanding, application, analysis, evaluation, and creation. For their part, Zipp and Olson (2008) demonstrated how effective mentoring in doctoral studies favored different skills related to critical thinking, such as the development, understanding, analysis, synthesis, and evaluation of information. These contributions allow us to consider critical thinking as a cross-cutting competence that not only favors the quality of research but also the construction of a more satisfying, meaningful, and sustained doctoral experience.

#### 1.4 Academic engagement

*Academic engagement* (AE) has been defined as the dedication of students to incorporating, understanding, and mastering the knowledge imparted by professors (Lawson and Lawson, 2013). It has also been linked to performance in the learning process and academic success (Korobova and Starobin, 2015). The effects of AE extend to the institution itself, as it generates greater commitment from those most involved in the educational process—particularly students and teaching staff—contributing to its recognition and quality (Grocia, 2018). Studies that have analyzed *engagement* in doctoral studies have pointed out that it is related to the student's own motivation and

determination (Cavazos and Encinas, 2016), and may therefore vary depending on the stages or courses of the doctoral program and the type of commitment of the student, for example, when it is combined with another professional activity. Other studies have shown that *engagement* not only improves academic performance but also emotional well-being, an aspect that significantly affects student satisfaction (Stubb et al., 2011). In this sense, the interaction between motivation, the ability to manage learning, and academic satisfaction cannot be analyzed in isolation: the characteristics of the program and supervision directly condition the extent to which motivated students manage to maintain their commitment and well-being throughout the process (De la Vega, 2024). Furthermore, when this commitment is sustained and properly channeled, academic *engagement* becomes a driving force for educational innovation, fostering collaborative networks, a sense of belonging, and active transformation of the learning environment (Barrientos de Bojórquez, 2024).

#### 1.5 Objectives and research question

The objective of this exploratory work is two-fold: first, to investigate the types of motivations and critical thinking of doctoral students and, second, to identify the factors that influence the satisfaction of university students other than those specific to the student profile. Although most research on academic satisfaction has focused on variables such as academic performance, institutional support, or student demographics, there is a lack of studies analyzing how more subjective factors, such as motivation, critical thinking, or academic *engagement*, which can also influence satisfaction and whose complexities have yet to be investigated, as indicated by Vendrell-Morancho et al. (2024) in the case of critical thinking.

In this paper, we analyze the role played by these factors, which have been less addressed in the literature, in their impact on doctoral student satisfaction. The central question guiding this work is: how *do* motivation, critical thinking, and *academic engagement* influence satisfaction with doctoral studies?

## 2. Methodology

The methodology used is a sequential mixed method that combines both qualitative and quantita-

tive approaches (Hamui-Sutton, 2013). First, a qualitative analysis using semi-structured interviews was used to identify the key factors that influence doctoral students' academic satisfaction. These interviews also served to validate the questionnaire used later in the quantitative analysis. Subsequently, a statistical analysis of the data obtained through surveys was carried out, which allowed us to identify significant relationships between the proposed variables and student satisfaction.

This sequential mixed-method methodology was chosen because it combines both qualitative and quantitative approaches to capture not only the richness and depth of individual opinions, but also to statistically verify the patterns observed in the broader sample (Hamui-Sutton, 2013). Thus, the methodology used in this study combined qualitative methods, with semi-structured interviews, and quantitative methods, through a survey of doctoral students at a Spanish public university that offers personalized treatment, scholarships for students to present papers at conferences, thesis progress in doctoral workshops with feedback, facilities for research stays, the possibility of presenting the thesis in different languages, and obtaining international recognition. Although the program does not have an explicit international orientation, it does allow doctoral theses to be written in English, which facilitates the participation of international students and, in part, promotes its international profile. Founded in the 1990s, the institution has experienced remarkable growth in its academic offerings, infrastructure, and recognition both nationally and internationally. In this context, doctoral programs represent a fundamental pillar for the university, as they promote advanced research, innovation, and the training of highly qualified researchers. There are currently eight active doctoral programs in different areas, in addition to seven inter-university programs. Most of them are characterized by their diversity and interdisciplinary and international approach, covering areas of knowledge ranging from experimental and technical sciences and education to the humanities and social sciences.

## 2.1 Participants

In the first phase of the study, qualitative information was collected through semi-structured interviews with 11 doctoral students and 13 profes-

sors in the legal, social, and economic fields, seeking a balanced representation among them. In the case of the students, four doctoral students from the economic field, three from the legal field, and four from the social field were included, among whom was one foreign student. The professors were distributed as follows: five from the economic field, four from the legal field, and four from the social field, three of whom were from abroad. Diversity was also sought in the doctoral program in which they were enrolled: four students were in advanced stages of the process, close to submitting their theses; four were in intermediate courses (second year or later); and three were in their first year. Their level of dedication was also taken into account: four of the 11 doctoral students were pursuing their doctorates full-time and the remaining seven were pursuing them part-time. This sample allowed for a rich exploration of the motivations, difficulties, and satisfaction factors associated with heterogeneous doctoral trajectories. In the second phase of the study, a structured questionnaire was distributed online to doctoral students with the aim of investigating the key dimensions identified in the qualitative phase, as well as their relationship with academic satisfaction. The instrument allowed for an empirical approach to the theoretical variables and an initial validation of the patterns observed.

## 2.2 Data collection procedure

In the case of qualitative interviews, participants were contacted by email and/or telephone, and the purpose of the research and the confidential treatment of their data were explained to them. Students and teachers from the different fields of knowledge that make up the doctoral program analyzed (economics, politics, sociology, law) were contacted, taking into account both disciplinary diversity and their availability to participate on the scheduled dates. Although initially the possibility of conducting the interviews in person was considered, in the end they were all conducted via the TEAMS platform, which facilitated the participation of people with different levels of commitment and teaching loads. The sample was selected based on convenience criteria, as a large number of potential participants were invited, but only some of them could be interviewed within the established period. The interviews were recorded with the express consent of the stu-

dents and faculty. Subsequently, all interviews were transcribed and anonymized. The interviews were conducted between June and July 2023 and followed a similar script for teachers and another for students. However, due to their semi-structured nature, the interviews differed in terms of duration, ranging from 15 to 40 minutes, and also in terms of the depth and development of the responses. In addition to their flexibility, semi-structured interviews offer greater freedom in responses and the possibility of adapting to the specific context of the interviewees, which allows for the collection of very detailed information (Cohen et al., 2018).

In the case of quantitative surveys, a structured survey was prepared using Google Forms and sent via link to the 71 students who make up the Doctoral Program for its completion. Specifically, 63 valid surveys were obtained from interdisciplinary doctoral students at the UBU, of whom 49% were men and 48% were women (3% other), 9.5% were aged 18 to 24, 38% were aged 24 to 35, 17.5% were aged 35 to 44, 15.9% aged 45 to 54, 14.3% aged 54 to 64, 5% over 64, 77.8% without a scholarship to pursue their studies, and 73.8% working. The scales used were 5-point Likert scales (with 1 being totally disagree with the item in question and 5 being totally agree) and were based on the literature and reviewed and adapted in accordance with the previous qualitative analysis carried out with teachers and experts. Table 1 provides a detailed summary of the data collection.

### 2.3 Data analysis techniques

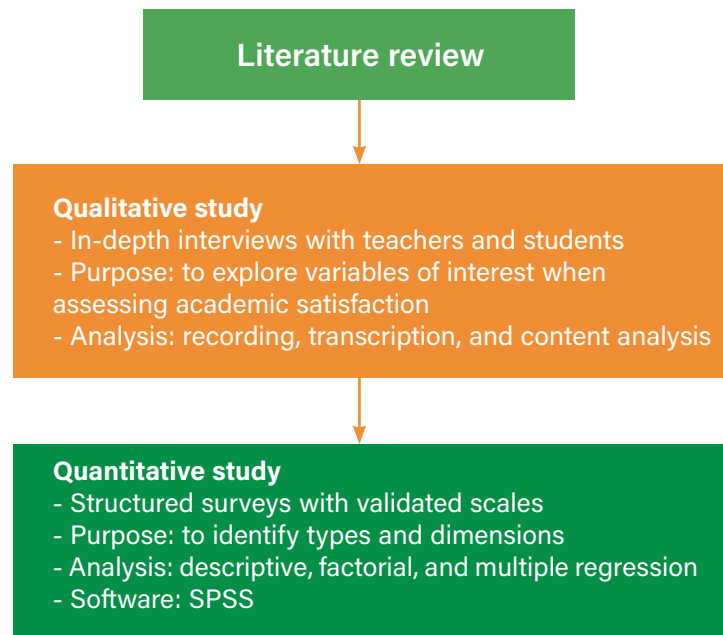
In the case of the interviews with faculty, the questions were open-ended and focused on the advantages of studying an interdisciplinary doctorate versus a specialized one, as well as the perceived

involvement and satisfaction of the students. Based on advantages such as the development of critical thinking, the enrichment derived from the interdisciplinarity of certain doctoral programs, and the factors that influence their choice, interviews were conducted with the students. In this case, the interviews focused on their general perception of the advantages and disadvantages of studying an interdisciplinary doctorate, the motivations and reasons that led them to enroll in the program, their level of academic *engagement*, and their degree of satisfaction with the program.

These qualitative interviews made it possible to identify the relevant factors and key variables that were subsequently integrated into the structured questionnaire used in the second phase of the study, which was quantitative in nature. In both cases, the interviews were analyzed using an inductive approach based on content analysis (Braun and Clarke, 2006). Two expert researchers independently coded the interviews based on an in-depth reading of the transcripts and developed an initial categorical matrix based on three dimensions: motivation, satisfaction, and cross-cutting skills. Discrepancies were discussed until interpretive consensus was reached. Using the variables noted in the interviews, measurement scales were sought in the literature to develop the structured questionnaire to be used in the next, quantitative phase. In this case, the reliability of the scales used was analyzed, along with factor analyses to verify the dimensions of each key variable and a subsequent linear regression to identify the factors influencing academic satisfaction using IBM-SPSS v.27 statistical software.

Everything mentioned in this section is summarized in Figure 1.

**Figure 1.** Summary of the empirical study phases



### 3. Results

#### 3.1 From the qualitative analysis

The first factor analyzed in the interviews was the motivation to study for a doctorate. The responses revealed two main types of motivation: for some students, the motivation is related to the intention to pursue an academic career: “I decided that this was the way to get in, to start this long-distance career (ent\_2), “it was clear to me almost from the moment I finished my degree that I wanted to do a PhD” (ent\_6). For other students, who were already working, the doctorate represented an opportunity for professional advancement, as several interviewees expressed: “The reason I started the doctorate was mainly because I have been working professionally in a certain field for many years and I wanted to culminate it with a doctoral thesis” (ent\_7). “I had already been at the university for a few months, I liked what I was doing, and I knew that in order to continue and be eligible for a position, the path was a PhD” (ent\_8).

A minority of interviewees highlighted a motivation related to the need to continue their education: “I like to continue learning... my personal desire is to expand my knowledge a little” (ent\_6), or as part of their constant interest in learning: “Well, my main

motivation is to continue in the field of education, to continue learning, because I have always been interested in learning a little more” (ent\_9). Finally, there were those who did not indicate a clear or specific motivation: “Well, I didn’t really know what to do, but I liked research at the university and they encouraged me to follow this path” (ent\_10).

In relation to academic *engagement*, the student interviews highlighted the influence of personal circumstances that cause this commitment to vary. In several cases, greater commitment was recognized at the beginning of the program, when students have to meet mandatory attendance requirements for courses and seminars: “I think my commitment has increased. Even though I have less time, my involvement has increased over time” (ent\_11). “I think it has evolved into greater involvement. In other words, in the early years, my involvement was less. ... I think so, it has been increasing because I became more and more interested in what I was seeing” (ent\_7). Some interviews revealed a constant commitment over time: “In general, my *engagement* has been quite stable and quite strong” (ent\_6).

However, as the literature highlights, aspects such as the availability of funding contribute to greater commitment to doctoral studies (Cavazos and Encinas, 2016): “My involvement really came when I got funding and I started working full-time at the

university” (ent\_4). “I would say that I have been very involved from the beginning, mainly because I am here at the university on a scholarship and can participate in activities” (ent\_10). In addition, there are aspects such as age, personal/family situation, or the fact of working at the same time that condition the level of academic *engagement* of students: “Well, due to personal circumstances... my commitment could be medium-low, but my goal from now on is to increase my involvement” (ent\_5). “I’m not totally focused on the PhD, but I’m very involved... I just try not to disengage too much, because if I detach myself too much, it’s hard to get back into it and keep up the pace” (ent\_9). “In my case, my commitment is moderate, because I have to balance it with my job... & I think that’s why it hasn’t been higher until now.” (ent\_3). “Considering that it’s part-time, because I also have a job outside” (ent\_8).

Given that we are not aware of any doctoral studies that investigate variables that seemed essential in the previous interviews, we will address satisfaction, motivations, critical thinking, and academic *engagement* in the quantitative study.

### 3.2 From the quantitative analysis

In order to verify the unidimensionality of the scales (AE and satisfaction) and obtain factors in the multidimensional ones (critical thinking and academic motivations), an exploratory factor analysis

of principal components with varimax rotation was performed on the critical thinking indicators (Table 1); a second analysis was performed on the academic motivation indicators (Table 2); another exploratory factor analysis with the AE indicators (Table 3) and satisfaction (Table 4). In this way, we obtained four dimensions of critical thinking, four types of motivations for studying a doctorate, one factor for academic *engagement* (involvement), and one factor for satisfaction.

First, in the analysis of motivations (mo1 to mo26), four factors were also obtained. Factor F1, called learning motivations, allows us to differentiate between individuals who feel pleasure and excitement when reading and learning new things and those who do not. Factor F2, professional motivations, measures precisely the search for a better salary, job promotion, or position. Factor F3, called motivations for self-improvement/self-actualization, reflects the individual’s desire to improve themselves, feel continuous improvement and progress, and succeed in their studies. Finally, factor F4 is mainly related to doubts about why one should be studying for a doctorate and even whether it is a waste of time, so we define this factor as a lack of motivation to continue (the latter would include *reverse-coded* items). Some of these types of motivations have been studied in the Academic Motivation Scale (applied by Vallerand et al. (1992) in the context of master’s studies).

**Table 1.** Factor analysis of academic motivations (mo)

Dimension	Explained variance	ITEM	Item name	Weight or factor loading
F1. Learning motivations	36.309	Mo15	For the pleasure I get from learning more about topics that interest me.	0,936
		Mo8	For the pleasure I get from discovering new and unknown things.	0,920
		Mo23	For the great excitement I get from reading about interesting topics.	0,873
		Mo10	For the pleasure I get from reading interesting researchers.	0,816
		Mo21	Because studying will allow me to continue learning many things that interest me.	0,810
		Mo2	Because I find satisfaction and enjoy learning new things.	0,802
		Mo16	Because I like to feel completely absorbed by what some authors have written.	0,761
		Mo18	Because I enjoy doing difficult activities.	0,692
F2. Professional motivations	22,806	Mo7	To subsequently obtain a more prestigious and higher-level job.	0,866
		Mo20	To earn a better salary in the future.	0,826
		Mo14	Because I want to live comfortably later in life.	0,801
		Mo9	Because it will allow me to choose a job in the field I like.	0,721
		Mo1	Because without the degree, I won't find a well-paid job.	0,693

Dimension	Explained variance	ITEM	Item name	Weight or factor loading
F2. Professional motivations	22,806	Mo22	Because I believe that more years of study will improve my professional qualifications.	0,508
		Mo26	Because I want to prove that I can pass and succeed in my studies.	0,799
		Mo6	To prove to myself that I can get a doctorate.	0,796
		Mo19	To prove to myself that I am an intelligent person.	0,744
F3. Motivations for self-improvement/ self-fulfillment	7,661	Mo25	Because it gives me personal satisfaction when I try to get good grades in my studies.	0,701
		Mo13	Because succeeding and passing at university makes me feel important.	0,623
		Mo3	Because it allows me to communicate my ideas to others, and I like that.	0,550
		Mo5	Because I like to see myself excel in my studies.	0,491
		Mo12	Because it allows me to feel the pleasure of surpassing myself in some of my personal achievements.	0,400
F4. Lack of motivation to continue	5,552	Mo17	I'm not sure why I'm studying for a doctorate, and honestly, I don't really care.	0,898
		Mo24	I don't know, I can't understand what I'm doing.	0,868
		Mo4	Honestly, I don't know; I feel like I'm wasting my time here.	0,816
		Mo11	I was excited before, but now I wonder if I should continue.	0,808

Secondly, in order to condense the information provided by the set of measures proposed as critical thinking variables (pc1 to pc24), a principal component analysis was performed, which allowed four factors to be extracted. Factor F1 separates individuals who use information to compare opinions, discuss them, and create debate and their own opinion from those with opposite traits, hence the name creation or development of information. Factor F2, understanding of information, measures the degree to which

the individual is able to comprehend information, understand it, and use it to justify the points of view. Factor F3 relates to the use of various sources of information—hence the name information analysis. Finally, factor F4, recall, differentiates between individuals who value and remember information and those with opposite traits. These four dimensions of critical thinking are in line with the work carried out by Zipp and Olson (2022) and Kobylarek et al. (2022).

**Table 2.** Factor analysis of critical thinking (CT)

Dimension	Explained variance	ITEM	Item name	Weight or factor loading
F1. Information creation	40,582	Pc24	When I read the text, I look for a relationship between the information it contains and other texts I have read.	0,784
		P21	I like to compare different opinions and contrast them with each other.	0,768
		Pc8	I form my impression based on different pieces of information that I connect with each other.	0,694
		Pc7	I can understand texts from various fields.	0,692
		Pc16	When I am interested in a piece of information, I try to check if it is true.	0,649
		Pc20	I like to discuss new meanings in texts I already know.	0,638
		Pc25	I pay attention to the contexts and nuances of statements.	0,618
		Pc6	The same content can be expressed in many different ways.	0,548
		Pc11	In the discussion, I pay attention to justifying my position on the issue and understanding the other party at the same time.	0,541
		Pc23	I try to use the information I have learned in everyday life.	0,464

Dimension	Explained variance	ITEM	Item name	Weight or factor loading
F2. Understanding information	9,619	Pc14	When debating, I try to use practical examples to justify my position on the issue.	0,761
		Pc15	If necessary, I can recall information that I have read about.	0,742
		Pc13	I can see the structure of the text and could change it.	0,691
		Pc10	When I speak, I give many examples.	0,669
		Pc12	I like to find coincidences/relationships between seemingly different phenomena.	0,562
		Pc11	In discussions, I pay attention to justifying my position on the issue and understanding the other party at the same time.	0,531
		Pc17	I can extract the most relevant parts of a text.	0,517
F3. Information analysis	6,472	Pc1	After reading, I review important information, even if it appears to be true.	0,791
		Pc3	I am willing to share newly obtained information.	0,668
		Pc5	After reading it, I can repeat the important aspects of the text.	0,600
		Pc2	I like to combine information from different texts.	0,566
		Pc18	To evaluate information, I review many sources.	0,510
F4. Recall of information	6,017	Pc19	I don't remember much of what I learned in my previous studies.	0,862
		Pc9	Everything already exists, so nothing completely new can be created.	0,713
		Pc22	I have difficulty paraphrasing.	0,702
		Pc4	In-depth analysis of reality are a waste of life.	0,482

Thirdly, the analysis carried out using academic *engagement* or involvement indicators indicates a single variable, which reflects enthusiasm for studying a doctorate, perceived immersion in studies, and the happiness and energy this brings to the

student. This variable and its measurement correspond to those previously used by other authors in an academic setting (Portalanza et al., 2017; Coelho-Martinho and Conde Pérez, 2013), based on the original UWES-S9 designed for the workplace.

**Table 3.** Factor analysis of academic engagement

Variable	Explained variance	Item	Item name	Weight or factor loading
EA	74,074	Ea2	I feel strong when I am studying for my doctorate.	0,954
		Ea4	I am enthusiastic about my PhD.	0,951
		Ea3	When I wake up in the morning, I feel like studying for my doctorate.	0,930
		Ea7	I am happy when I am doing tasks related to my doctorate.	0,922
		Ea1	My tasks as a student make me feel full of energy.	0,823
		Ea5	My doctorate inspires me to do new things.	0,786
		Ea6	I am proud to be doing this doctorate.	0,704
		Ea8	I am immersed in my doctorate.	0,600

Finally, the factor analysis performed with the satisfaction indicators shows enjoyment, enthusiasm, and satisfaction with the decision to study for a doctorate. This is a variable that has been studied

extensively in the literature and measured as Lent et al. (2007) and Vergara et al. (2018).

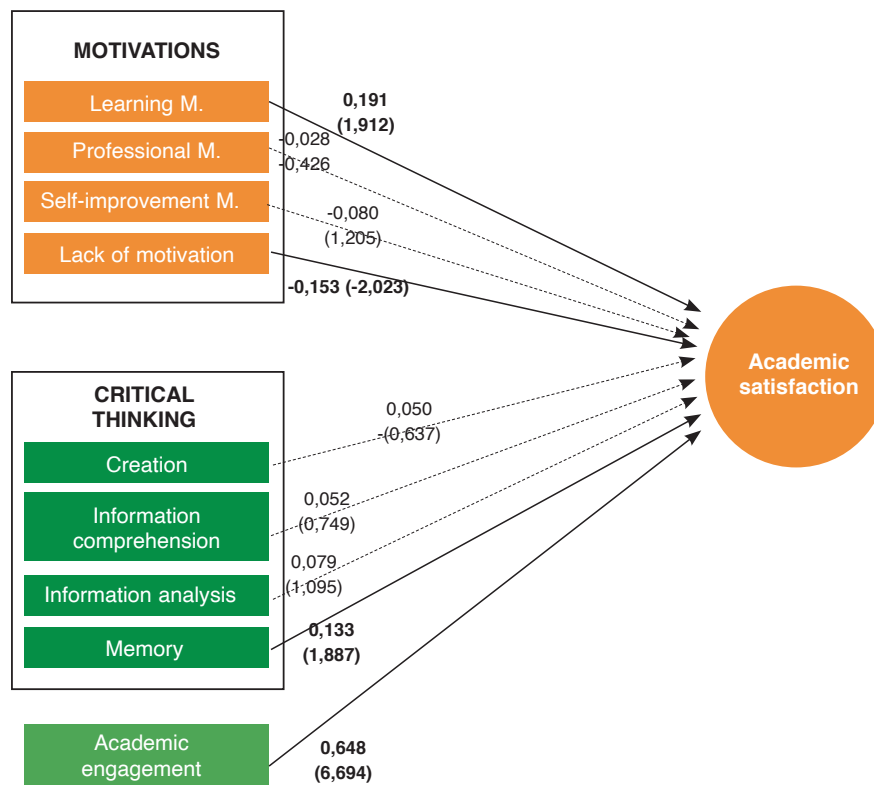
**Table 4.** Factor analysis of satisfaction

Variable	Explained variance	Item	Item name	Weight or factor loading
SATIS	76,982	Sat4	Overall, I am satisfied with this academic experience.	0,917
		Sat6	I am enthusiastic about the content taught in this doctoral program.	0,884
		Sat5	I enjoy being intellectually stimulated in this doctoral program.	0,879
		Sat3	I enjoy my doctoral program most of the time.	0,876
		Sat7	I like what I have learned in this doctoral program.	0,823
		Sat1	I am satisfied with my decision to pursue this doctorate.	0,807
		Sat2	I feel comfortable with the educational environment created in this doctoral program.	0,798

Reliability using Cronbach's alpha meets the minimum requirements, as it is above 0.7 on all scales (Hair et al., 2017). With these factors, a multiple linear regression was performed (Hair et al., 2017), which shows that academic engagement, two dimensions of motivation (learning and lack of motivation to continue), and a type of critical thinking (memory/usefulness) influence student satisfaction

with their doctoral studies (Figure 2). Thus, the higher the AE, the greater the motivation to learn, the lower the lack of motivation to continue studying for a doctorate, and the greater the desire for recall and the perceived usefulness of learning, the greater the student's satisfaction with their doctoral studies. The adjusted R2 coefficient is high, at 0.741, F of 20.660\*\*\* (p <0.001).

**Figure 2.** Results of the linear regression on academic satisfaction



Note: The lines show the standardized Beta coefficient and, in parentheses, the Student's t-statistic corresponding to the relationship between each independent variable and the dependent variable academic satisfaction (significant relationships appear in bold and non-significant ones in regular font and on a dotted line).

#### 4. Discussion and conclusions

The study of satisfaction among doctoral students has become increasingly relevant in recent years due to its direct influence on academic success, student retention, and future employment (Dericks et al., 2019; Cheng et al., 2016; Vergara et al., 2018). This study has addressed the role of motivation, academic *engagement*, and critical thinking in such satisfaction. This study is one of the few empirical investigations that address critical thinking and motivation in doctoral studies and explore their possible influence on satisfaction with studies. As indicated by Vendrell-Morancho et al. (2024), critical thinking is key to the success of university students.

In addition, this study on doctoral studies, which has an international and interdisciplinary focus, has used a mixed empirical method. A first qualitative phase with teachers and students provided an initial impression of the essential variables when it comes to analyzing academic satisfaction, and the second phase identified types of motivation and critical thinking and explored which factors have the greatest impact on student academic satisfaction. As for the dimensions or types of motivation obtained, the first is related to learning, the second to the professional improvement that can be achieved after studying a PhD, the third to the desire for personal improvement and self-fulfillment, and the last indicates a lack of motivation to continue or doubt or uncertainty about the decision to study a PhD. Thus, the motivations that appeal to the higher levels of Maslow's hierarchy (1954) stand out. Regarding the dimensions of CT for doctoral studies, the creation or development of information has been found, which includes the aspects of debate, criticism, comparison of documents, evaluation and processing of information, comprehension of information, and memory. While academic *engagement* and two types of motivation contribute to the satisfaction of doctoral students, only critical thinking has an impact on such satisfaction.

Academic *engagement* is the most important factor in generating satisfaction among doctoral students. Not surprisingly, the relevance of this variable has been highlighted in previous studies with students (Portalanza et al., 2017; Coelho-Martinho and Conde-Pérez, 2013). In light of the results obtained, it is key to foster the AE of doctoral students through a community of students who share their experiences and pro-

gress. A high level of academic *engagement* not only improves student well-being but can also become a driving force for educational innovation processes by facilitating the development of collaborative networks, the appropriation of the educational environment, and the adaptive transformation of institutional practices (Barrientos de Bojórquez, 2024).

In addition, efforts should be made to prevent motivation from declining during the development of the doctoral thesis, as this can clearly reduce satisfaction with studies and perhaps encourage students to drop out, something that could be investigated in future work. This exploratory work also indicates that critical thinking is not related to satisfaction with studies, except for the dimension of perceived usefulness or memory. Furthermore, mere professional motivation and the desire to excel do not seem to affect satisfaction as much as learning motivation. Further investigation of the results obtained is needed in the future, but it is possible that some of the types of critical thinking and motivations that do not directly generate satisfaction are considered by students to be mere hygiene factors, following Herzberg's motivation-hygiene theory (1954) and that doctoral students acquire and develop them during the study of a doctoral thesis (e.g., the first three types of CT), while the fourth is truly a factor that generates satisfaction.

As *limitations* of the study, the sample size is small, but it should be noted that enrollment in doctoral programs is low, even more so in the case of interdisciplinary doctorates, whose analysis is relevant due to their unique characteristics and the little attention they have received in the literature, despite their recognition in the academic sphere.

Likewise, it should not be ignored that students' previous trajectories, in particular their socioeconomic background and expectations of social mobility, also shape their perception of the doctorate. In contexts where this level of education is perceived as a mechanism for social advancement or professional legitimization, academic satisfaction may be conditioned by extrinsic expectations that go beyond the educational process itself (Murphy et al., 2025). As Fabara (2012) has shown, the absence of structural planning in the provision of postgraduate programs can lead to training that does not adequately respond to the needs of those who place their expectations of recognition or stability on

the doctorate. Incorporating this dimension would allow for a more critical and inclusive view, one that is not limited to individual variables but also considers the structural conditions that affect the academic experience of students. As future lines of continuation and improvement of this exploratory work, it would be interesting to incorporate the analysis of the recommendation of doctoral studies, the abandonment of them, variables such as student anxiety during their doctorate, differences by student profile, and even to design a complete causal model to analyze, through structural equations, the prescription pathways of one doctoral program versus others. It would also be relevant to move towards a deeper understanding of the structural role of doctoral studies in scientific, economic, and social development, exploring the contribution of doctoral students through processes of knowledge transfer, innovation, patent generation, or strengthening of the productive fabric. Finally, it would also be advisable to compare the views of other decision-makers, such as program managers and coordinators, and even organizations and companies.

### Authors' contribution

**Sonia San Martín:** conceptualization; data curation; formal analysis; research; methodology; project management; software; supervision; validation; writing—original draft, writing—review and editing.

**Patricia Otero-Felipe:** conceptualization; data curation; formal analysis; investigation; methodology; resources; validation; visualization; writing—original draft; writing—review and editing.

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